



TEST REPORT

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SØULD LABORATORY MEASUREMENT OF SOUND ABSORPTION COEFFICIENT

Project name: Søuld – laboratory measurements Project no.: 35.7985.01 Client: Søuld Report no.: P2.026.21 The report comprises 14 pages, including appendices A-H

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Summary

On April 23rd 2021 Sweco – Acoustica performed reverberation chamber measurements of the sound absorption coefficient of acoustic panels from Søuld. Søuld manufactures acoustic panels from treated, compressed eelgrass. The report documents test results of two different panel types, an uncoated version and a coated, fire protected version. A total of seven different configurations of the acoustic panels were tested.

The following has been measured:

Measurement of equivalent sound absorption area in compliance with DS/EN ISO 354:2003.

No.	Test object	Area of test object	Sound absorption coefficient							
		[m²]	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	α _w NRC SAA	Abs. class
A1	Søuld, 35 mm coated panel. Directly mounted. Surface weight: 4.800 g/m ²	10,5	0,15	0,55	1,00	1,00	1,00	1,00	0,85 0,90 0,88	B(MH)
A2	Søuld, 35 mm coated panel. Mounted on 12 mm MDF lists. Surface weight: 4.800 g/m ²	10,5	0,20	0,65	1,00	1,00	1,00	1,00	0,95 0,90 0,93	A
A3	Søuld, 35 mm coated panel. Mounted on 25 mm MDF lists. Surface weight: 4.800 g/m ²	10,5	0,25	0,80	1,00	1,00	1,00	1,00	1,00 0,95 0,95	A
A4	Søuld, 35 mm coated panel. Mounted on 40 mm MDF lists. Surface weight: 4.800 g/m ²	10,5	0,45	0,85	1,00	1,00	1,00	1,00	1,00 0,95 0,96	A
A5	Søuld, 40 mm uncoated panel. Directly mounted. Surface weight: 4.800 g/m ²	10,7	0,25	0,65	1,00	1,00	1,00	1,00	0,95 0,90 0,92	A
A6	Søuld, 40 mm uncoated panel. Mounted on 12 mm MDF lists. Surface weight: 4.800 g/m ²	10,7	0,30	0,75	1,00	1,00	1,00	1,00	1,00 0,95 0,94	A
A7	Søuld, 40 mm uncoated panel (base) + 35 mm coated panel (top). Directly mounted. Surface weight: 9.600 g/m ²	10,7	0,75	0,95	1,00	1,00	1,00	1,00	1,00 1,00 0,99	A



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1. Introduction

Sweco - Acoustica has been commissioned by Søuld to perform reverberation chamber measurements of the sound absorption coefficient of various acoustic panels.

2. Test objects

Søuld acoustic panels are made of eelgrass, which is treated and compressed into acoustic panels. Two different types of panels were tested, a 35 mm coated, fire protected panel and a 40 mm uncoated panel. Both panels were tested in various configurations as listed below.

The test objects were placed directly on the floor of the reverberation chamber. The perimeter of each of the test objects was covered by an acoustically reflective 16 mm wooden frame.

The tested products are:

- A1. 35 mm coated panel, mounted directly on the floor. Surface weight 4.800 g/m².
 Total test area: 10,5 m².
- A2. 35 mm coated panel, mounted on 12 mm MDF lists. Surface weight 4.800 g/m². Total test area: 10,5 m².
- A3. 35 mm coated panel, mounted on 25 mm MDF lists. Surface weight 4.800 g/m². Total test area: 10,5 m².
- A4. 35 mm coated panel, mounted on 40 mm MDF lists. Surface weight 4.800 g/m² Total test area: 10,5 m².
- A5. 40 mm uncoated panel, mounted directly on the floor. Surface weight 4.800 g/m² Total test area: 10,7 m².
- A6. 40 mm uncoated panel, mounted on 12 mm MDF lists. Surface weight 4.800 g/m² Total test area: 10,7 m².
- A7. 35 mm coated panel, mounted on top of 40 mm uncoated panel directly on the floor. Surface weight 9.600 g/m². Total test area: 10,7 m².

3. Procedure

3.1. Methods used

The measurements were performed according to DS/EN ISO 354:2003, using the interrupted noise method and a broadband pink noise signal with 1/3-octave band filters. Two speaker positions and six microphone positions were used. In each microphone position the reverberation time was measured as an average of three measurements.

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3.2. Deviations from, additions to, and exclusions from test method

No deviations from the test method.

3.3. Rating of sound absorption class

The practical sound absorption coefficient and the sound absorption class are determined according to DS/EN ISO 11654:1997 and are distributed between the following classes:

Sound absorption class	α_{w}
А	0,90; 0,95; 1,00
В	0,80; 0,85
С	0,60; 0,65; 0,70; 0,75
D	0,30; 0,35; 0,40; 0,45; 0,50; 0,55
E	0,15; 0,20; 0,25
Not classified	0,00; 0,05; 0,10

If the practical sound absorption coefficient exceeds the reference curve in one or more frequency bands by more than 0,25, one or more shape indicators are added:

Shape indicator	The sound absorption coefficient is 0,25 greater than the reference curve in the octave band:
(L)	250 Hz
(M)	500 Hz and/or 1000 Hz
(H)	2000 Hz and/or 4000 Hz

3.4. Reverberation chamber information

The reverberation chamber used for the measurements is located at the Techninal University of Denmark, DTU Elektro, Ørsted Plads, building 355, Room 005, DK - 2800 Kgs. Lyngby.

The chamber is fitted with several sound diffusing screens on the walls. Furthermore, during the measurements, the chamber was equipped with transparent freely suspended sound diffusors.

According to DTU, the volume of the room is approx. 240 m³.



3.5. Equipment

The measuring equipment used is shown in appendix H.

3.6. Temperature and humidity

During the measurements, the temperature varied from 18,4-18,7°C and the humidity varied from 36-40%. the temperature and humidity for each measurement is shown in appendix A-G.

4. Results

The measured reverberation times (in seconds) are shown in the table below.

Meas.no.	A 0	A1	A 2	A 3	A 4	A 5	A 6	Α7
	Emptyroom	35 mm coated	35 mm coated	35 mm coated	35 mm coated	40 mm uncoated	40 mm uncoated	35 mm coated
Frequency		directly mounted	mounted on	mounted on	mounted on	directly mounted	mountedon	mounted on
[Hz]			12 mm lists	25 mm lists	40 mm lists		12 mm lists	40 mm uncoated
100	8,5	7,6	7,1	6,3	5,4	6,7	6,2	3,7
125	8,1	6,2	5,8	5,5	4,1	5,5	5,3	3,1
160	8,0	5,3	4,7	4,1	3,4	4,1	3,9	2,6
200	7,4	4,3	4,0	3,2	3,0	3,8	3,4	2,6
250	7,0	3,6	3,1	2,9	2,7	3,1	3,0	2,5
315	6,7	2,8	2,7	2,5	2,5	2,5	2,3	2,4
400	6,8	2,4	2,2	2,2	2,4	2,3	2,2	2,2
500	6,4	2,3	2,2	2,2	2,3	2,1	2,2	2,3
630	6,3	2,2	2,1	2,2	2,3	2,1	2,2	2,2
800	5,8	2,1	2,1	2,1	2,2	2,0	2,1	2,1
1000	5,1	2,1	2,1	2,1	2,1	2,0	2,1	2,0
1250	4,8	2,0	2,0	2,0	2,0	2,0	2,0	1,9
1600	4,4	2,0	1,9	1,9	1,9	1,9	1,9	1,9
2000	3,8	1,9	1,8	1,8	1,8	1,8	1,8	1,8
2500	3,3	1,7	1,7	1,7	1,6	1,7	1,6	1,6
3150	2,7	1,5	1,5	1,5	1,5	1,5	1,5	1,5
4000	2,1	1,4	1,3	1,3	1,3	1,3	1,3	1,3
5000	1,6	1,1	1,1	1,1	1,0	1,1	1,1	1,0

The absorption coefficient is calculated, based on the measured reverberation times, according to DS/EN ISO354:2003.

The calculated absorption coefficients are shown in the table on page 2.

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APPENDIX A: MEASUREMENT OF SOUND ABSORPTION COEFFICIENT

Client:	Søuld	Measurement no:	A1
	Nordre Fasanvej 186B, 1.th	Measurement dates	: 23-04-2021
	DK - 2000 Frederiksberg	Performed by:	SERA

Test object:

Søuld, 35 mm coated, fire protected acoustic panel, mounted directly on the floor. Surface weight of panels: 4.800 g/m^2 .





APPENDIX B: MEASUREMENT OF SOUND ABSORPTION COEFFICIENT

Client:	Søuld	Measurement no:	A2
	Nordre Fasanvej 186B, 1.th	Measurement date:	23-04-2021
	DK - 2000 Frederiksberg	Performed by:	SERA

Test object:

Søuld, 35 mm coated, fire protected acoustic panel, mounted on 12 mm MDF lists. Surface weight of panels: 4.800 g/m^2 .





APPENDIX C: MEASUREMENT OF SOUND ABSORPTION COEFFICIENT

Client:	Søuld	Measurement no:	A3
	Nordre Fasanvej 186B, 1.th	Measurement date:	23-04-2021
	DK - 2000 Frederiksberg	Performed by:	SERA

Test object:

Søuld, 35 mm coated, fire protected acoustic panel, mounted on 25 mm MDF lists. Surface weight of panels: 4.800 g/m^2 .





APPENDIX D: MEASUREMENT OF SOUND ABSORPTION COEFFICIENT

Client:	Søuld	Measurement no:	A4
	Nordre Fasanvej 186B, 1.th	Measurement date:	23-04-2021
	DK - 2000 Frederiksberg	Performed by:	SERA

Test object:

Søuld, 35 mm coated, fire protected acoustic panel, mounted on 40 mm MDF lists. Surface weight of panels: 4.800 g/m^2 .





APPENDIX E: MEASUREMENT OF SOUND ABSORPTION COEFFICIENT

Client:	Søuld	Measurement no:	A5
	Nordre Fasanvej 186B, 1.th	Measurement date:	23-04-2021
	DK - 2000 Frederiksberg	Performed by:	SERA

Test object:

Søuld, 40 mm uncoated acoustic panel, mounted directly on the floor. Surface weight of panels: 4.800 g/m².

The perimeter of the test object was covered by an acoustically reflective 16 mm wooden frame.



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APPENDIX F: MEASUREMENT OF SOUND ABSORPTION COEFFICIENT

Client:	Søuld	Measurement no:	A6
	Nordre Fasanvej 186B, 1.th	Measurement date:	23-04-2021
	DK - 2000 Frederiksberg	Performed by:	SERA

Test object:

Søuld, 40 mm uncoated acoustic panel, mounted on 12 mm MDF lists. Surface weight of panels: 4.800 g/m².





APPENDIX G: MEASUREMENT OF SOUND ABSORPTION COEFFICIENT

Client:	Søuld	Measurement no:	A7	
	Nordre Fasanvej 186B, 1.th	Measurement date: 23-04-2021		
	DK - 2000 Frederiksberg	Performed by:	SERA	

Test object:

Søuld, 35 mm coated, fire protected acoustic panel, mounted on 40 mm uncoated acoustic panel, directly on the floor.

Surface weight of panels: 9.600 g/m².

The perimeter of the test object was covered by an acoustically reflective 16 mm wooden frame.

Size of test object: Te 10,7 m² (3,00×3,56 m) 18,		nperature	:				Relati	ve hum	idity:				
		6°C				37%							
	Abso	urptionskoet	fficient		1				-	+			1
Frekv. [Hz]	1/3-okt.	1/1-okt.	Refkurve	¥									
100	0.55			cier	0.8		_	·					
125	0,73	0,75		effi		K .							
160	0,93			Isko	0.6								
200	0,93			tior	0.0								
250	0,96	0,95	0,80	sorp									
315	0,96	1		labs	0.4	<u> </u>			+				
400	1,09			lyd									
500	1,04	1,00	1,00	ttisk	0.2								
630	1,07	1		Fak									
800	1,10				0								
1000	1,14	1,00	1,00		0	25	250		500	1000	2000	40	00
1250	1,10	1			'	20	200			1000	Erek	40 vens [Hz]	00
1600	1,11			1.4 👝									
2000	1,09	1,00	1,00										
2500	1,09]											
3150	1,09			1.2									
4000	1,07	1,00	0,90										-
5000	1,09			1.0					•				
				skoefficien 8'0 "				-					
				Absorption: 9.0	•								
α _w = 1,00 NRC = 1, SAA = 0, ⁹	00 99			0.4									
NRC = 1, SAA = 0, Sound al	00 99 osorptior	n class A	L.	0.2	1	25	250		500	1000	2000		40

Frekvens [Hz]

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APPENDIX H: MEASUREMENT EQUIPMENT

Designation	Make	Туре	ACA no.	Latest check	Next check
Sound level meter	Brüel & Kjær	2250	678	25-03-2020	25-03-2022
Microphone 1/2"	Brüel & Kjær	4165	556	26-03-2020	26-03-2022
Calibrator	Brüel & Kjær	4231	563	14-01-2021	14-01-2022
Omni directional speaker (active)	01dB	LS01	446	07-11-2019	07-11-2021