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Determination of equivalent sound absorption area in a reverberation room according to ISO 354 and SS 25269

(1 appendix)

Client

Sounds Of Science Oü

Test object

Sound absorbents type Super chunk mounted individually were tested. The test object is listed in table 1 and further described in the enclosure.

Arrival of the test objects

September 17, 2014

Date of test

September 24, 2014

Results

The equivalent sound absorption area (A_{obj}) is given in enclosure 1. The equivalent sound absorption area (A_{obj}) in octave bands are given in table 1. Octave band values are calculated as arithmetic averages of the three third octave band values in the band of interest, according to EN 12354-6 and SS 25269.

Table 1 – Summary of results

Test object:	Equivalent sound absorption area per test object in octave bands, (A_{obj} m^2Sabine)						Enclosure
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	
Super chunk	0,4	1,9	2,7	2,6	2,3	2,0	1

The results are valid for tested objects only.

Measurement method

The measurements have been carried out according to ISO 354:2003, which is equivalent to EN ISO 354 and SS-EN ISO 354. The evaluation has been carried out according to ISO 354 and SS25269. 4 loudspeaker positions and 6 microphone positions have been used giving 24 different combinations for the reverberation time measurements. For empty room 3 decays have been used for averaging the time and for test objects 5 decays have been used, for each combination of loudspeaker and microphone.

The equivalent sound absorption area per object A_{obj} has been evaluated from:

$$A_{obj} = \frac{55.3\,V}{c \cdot n}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

where

V = Volume of the reverberation room (m^3)
n = Number of test objects
c = Speed of sound in air (m/s)
c = 331 + 0.6t
t = Temperature in the air (°C)
T_1 = Reverberation time of the room without test object (s)
T_2 = Reverberation time of the room with test object (s)

The measurements on single panels were made at three different positions in the reverberation room and the reverberation times were averaged.

Measurement uncertainty

From a world wide Round Robin[1)], in which SP took part, with 23 participating laboratories from 11 countries, the following measurement uncertainty for the absorption coefficient has been calculated

Frequencies (Hz)	Uncertainty
100-630	± 0,15
800-1250	± 0,10
1600-2500	± 0,15
3150-5000	± 0,20

No values for the uncertainty of the equivalent absorptions area of small test objects are available, but might be estimated from the uncertainty of the absorption coefficients.

[1)] The figures are calculated from twice the standard deviations, rounded to the nearest 0,05. The data from the Round Robin is documented in a letter from the ASTM to the participating laboratories.

Pictures of the test object

Picture 1- Three individual absorbents were tested.

Picture 2 – The test objects were mounted with spacers.

Test room

A reverberation room with the dimensions 7,64 m x 6,16 m x 4,25 m giving the volume 200 m³ and the total surface area 211 m² was used.

Mounting

Three individual absorbents were placed randomly in the room, at least one meter from the wall and objects in the reverberation room and about 2 m between the test objects.

Additional results

The following results are for information only and lies outside the accreditation. The results are determined in the same way as the results in enclosure 1 and table 1.

Test object: Super chunk

The test object is further described in enclosure 1.

Table 3 – Equivalent sound absorption area per object, for information only.

Frequency (Hz)	A_{obj} (m^2 Sabine)	
	1/3 octave bands	Octave bands
6300	1,9	
8000	1,9	1,9
10000	1,9	

List of instruments

Instrument	Manufacturer	Type	Serial no
Microphone	Brüel & Kjaer	4943	2749979
Microphone	Brüel & Kjaer	4943	2206273
Microphone	Brüel & Kjaer	4943	2206274
Microphone	Brüel & Kjaer	4943	2206276
Microphone	Brüel & Kjaer	4943	2206277
Microphone	Brüel & Kjaer	4943	2206278
Microphone Preamplifier	Brüel & Kjaer	2619	726624
Microphone Preamplifier	Brüel & Kjaer	2619	970865
Microphone Preamplifier	Brüel & Kjaer	2619	469905
Microphone Preamplifier	Brüel & Kjaer	2619	726792
Microphone Preamplifier	Brüel & Kjaer	2619	726818
Microphone Preamplifier	Brüel & Kjaer	2619	970968
Microphone Multiplexer	Norsonic	834	10050
Real-Time Analyzer	Norsonic	830	11533
Sound Level Calibrator	Brüel & Kjaer	4230	1411048
Programme	SP	Absorp 960627	
Power amplifier	PA1		
Noise generator	NG1 (white noise)		
Loudspeakers	SP	HGT2, HGT7, HGT4, HGTtak	
Hygrometer/ Temperature meter	Testo	615	502233

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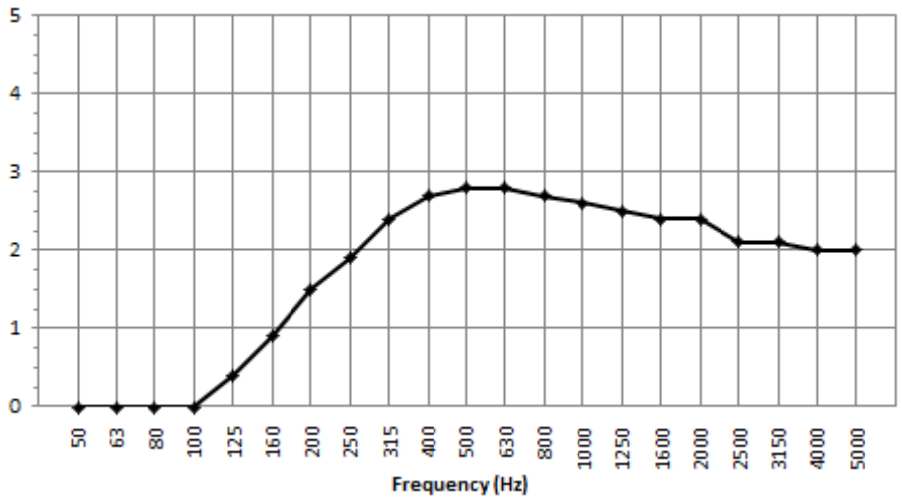
Appendix

Appendix 1

Measurement of sound absorption area

Test	Measurement of sound absorption area in a reverberation room according to EN ISO 354 and SS 25269
Client	Sounds of Science Oü Pontus Randén
Object	Super chunk Thickness: 63 mm Panel size: 1500 mm x 1000 mm Number of panels: 3 Structure: Frame out of wood 43 x 15 mm (depth x thickness) Polyester sheet 3225 g/m^2, thickness 43 mm (in frame) 2 x Polyester sheet 750 g/m^2, thickness 10 mm (on top) Panels were mounted individually.
Date of test	September 24, 2014
Conditions	Mounting depth: 113 mm Surface area: 4,5 m^2 Room volume: 200 m^3 Temperature at measurement on object/in empty room: 22/ 22 °C Relative humidity at measurement on object/in empty room: 82/ 84 %

Equivalent sound absorption area per object (m^2 Sabine)



Frequency (Hz)	A_{obj}
50	0,0
63	0,0
80	0,0
100	0,0
125	0,4
160	0,9
200	1,5
250	1,9
315	2,4
400	2,7
500	2,8
630	2,8
800	2,7
1000	2,6
1250	2,5
1600	2,4
2000	2,4
2500	2,1
3150	2,1
4000	2,0
5000	2,0