April 28, 2008

Marko Ståhlstedt
Soften Oy
Kauppakuja 2
FIN-21200 RAISIO
FINLAND

DETERMINATION OF ACOUSTIC ABSORPTION COEFFICIENT IN LABORATORY CONDITIONS

Description of the commission

Client: Soften Oy, Marko Ståhlstedt, November 4, 2007.
Date of delivery: November 10, 2007.

Description of the specimen

Name: Wallpanel, 550 mm x 550 mm x 55 mm
Manufacturer: Soften Oy, Kauppakuja 2, FIN-21200, Raisio, Finland

Results

The acoustic absorption coefficient α_s was determined in conformance with ISO 354:2003. The absorption class was determined in conformance with EN ISO 11654:1997. Summary of test results is presented in Table 1.

Table 1. The acoustic absorption coefficient and the absorption class.

		absorption coefficient at octave bands [Hz]							absorption class
specimen	file	63	125	250	500	1000	2000	4000	
Wallpanel	T101007A	0.04	0.13	0.35	0.60	0.82	0.94	0.82	C
Wallpanel+Ewona	T101007B	0.06	0.25	0.64	0.85	0.95	0.95	0.84	A

Annexes

Annex 1: Test results (1 pages)
Annex 2: Mounting of specimen (1 page)
Annex 3: Measurement arrangements (1 page)

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April 28, 2008

Determination of acoustic absorption coefficient according to ISO 354:2003

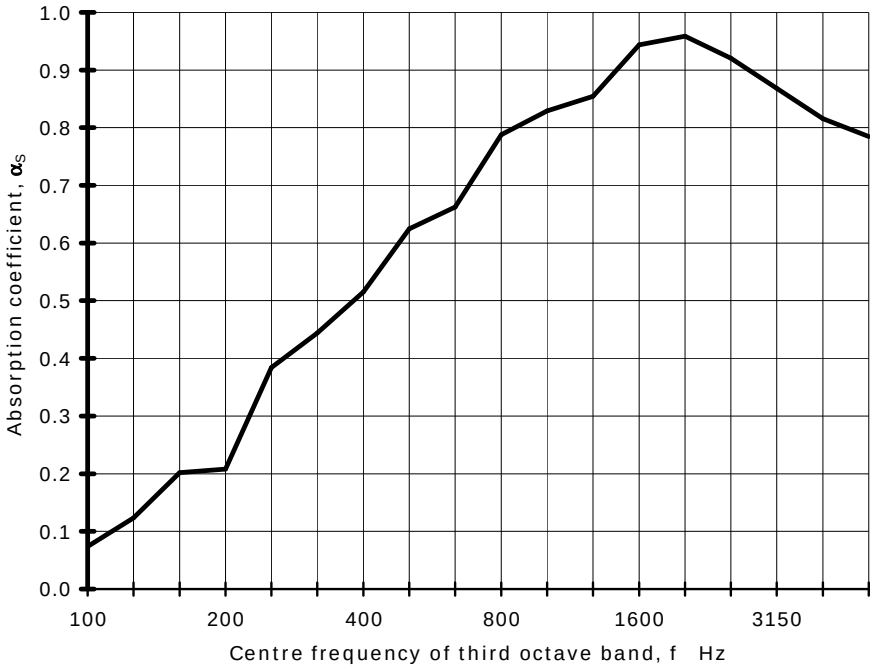
Specimen: Wallpanel 550x550x50

Manufacturer: Soften Oy
Client: Soften Oy, Marko Ståhlstedt, Kauppakuja 2, FIN-21200 Raisio, Finland
Laboratory: Finnish Institute of Occupational Health, Work Environment Development, Acoustics
Lemminkäisenkatu 14-18 B, FIN-20520 Turku, Finland

Specimen area:		10.6 m^2		Test room volume:	155 m^3
Surface mass:		1.5 kg/m^2		Area of room boundaries:	179 m^2
Temperature of test room:	21	21 °C	(without / with specimen)	Test date:	10.10.2007
Relative humidity:	61	61 %	(without / with specimen)	Test file identification:	T101007A
Atmospheric pressure:	102	102 kPa	(without / with specimen)		

Third octave band results:

f (Hz)	α_S (sab)	
100	0.07	
125	0.12	
160	0.20	**
200	0.21	**
250	0.38	
315	0.44	
400	0.52	
500	0.62	
630	0.66	
800	0.79	
1000	0.83	
1250	0.85	
1600	0.94	
2000	0.96	
2500	0.92	
3150	0.87	
4000	0.82	
5000	0.78	



Octave band results:

f (Hz)	α_S (sab)	
63	0.04	
125	0.13	**
250	0.35	**
500	0.60	
1000	0.82	
2000	0.94	
4000	0.82	

** Total absorption area of the empty test room is higher than ISO 354 requires.
The uncertainty of the test result is higher than ISO 354 expects.

FINAS
Finnish Accreditation Service
T013 (EN ISO/IEC 17025)

Jarkko Hakala
laboratory engineer
(Test performer)

NRC: 0.70
Absorption class: C (EN ISO 11654)

April 28, 2008

Determination of acoustic absorption coefficient according to ISO 354:2003

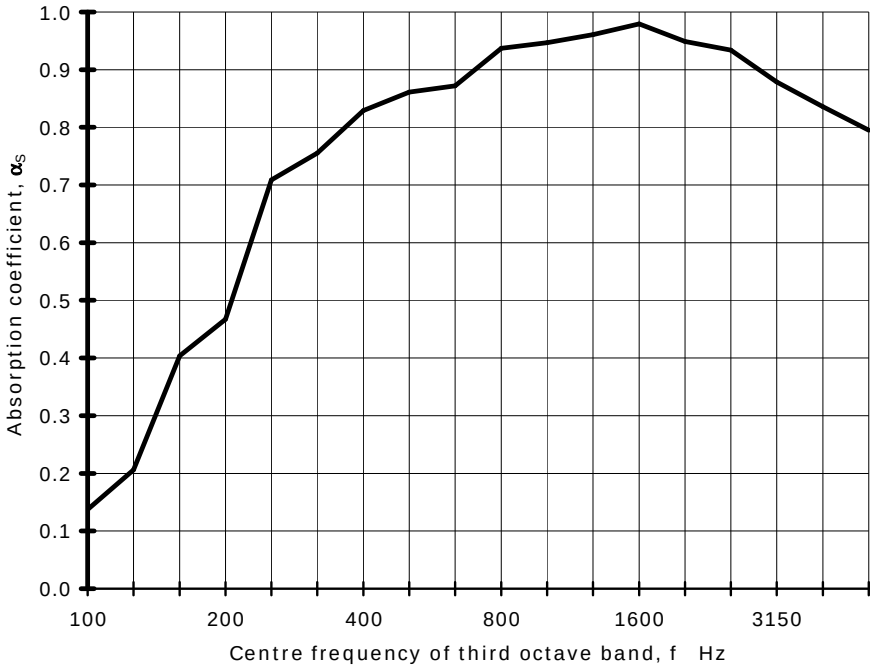
Specimen: Wallpanel 550x550x50
Ewona-wool 25 mm filling

Manufacturer: Soften Oy
Client: Soften Oy, Marko Ståhlstedt, Kauppakuja 2, FIN-21200 Raisio, Finland
Laboratory: Finnish Institute of Occupational Health, Work Environment Development, Acoustics
Lemminkäisenkatu 14-18 B, FIN-20520 Turku, Finland

Specimen area:		10.6	m^2		Test room volume:	155 m^3
Surface mass:		2.3	kg/m^2		Area of room boundaries:	179 m^2
Temperature of test room:	21	21	°C	(without / with specimen)	Test date:	10.10.2007
Relative humidity:	61	61	%	(without / with specimen)	Test file identification:	T101007B
Atmospheric pressure:	102	102	kPa	(without / with specimen)		

Third octave band results:

f (Hz)	α_S (sab)	
100	0.14	
125	0.21	
160	0.40	**
200	0.47	**
250	0.71	
315	0.76	
400	0.83	
500	0.86	
630	0.87	
800	0.94	
1000	0.95	
1250	0.96	
1600	0.98	
2000	0.95	
2500	0.93	
3150	0.88	
4000	0.84	
5000	0.80	



Octave band results:

f (Hz)	α_S (sab)	
63	0.06	
125	0.25	**
250	0.64	**
500	0.85	
1000	0.95	
2000	0.95	
4000	0.84	

** Total absorption area of the empty test room is higher than ISO 354 requires.
The uncertainty of the test result is higher than ISO 354 expects.

FINAS
Finnish Accreditation Service
T013 (EN ISO/IEC 17025)

Jarkko Hakala
laboratory engineer
(Test performer)

NRC: 0.85
Absorption class: A (EN ISO 11654)

Mounting of specimen

The specimen was mounted on the floor of the reverberation room in conformance with ISO 354:2003 Annex B. The specimen pieces was mounted so that a single row creates waveform.

Wall panels mounted on the floor of the reverberation room.

1 Acoustical measurements

The test signal was produced to the test room using three fixed omnidirectional loudspeakers (6 x Seas W12CY001). The test signal (pink noise) was produced by a real time analyzer (Bruel & Kjaer 2133) and amplified with terminal amplifier (QSC 1300 W USA). The sound pressure level in the reverberation room was measured with a condencer microphone on a tripod (Bruel&Kjaer 4190 equipped with a pre-amplifier Bruel&Kjaer 2669).

The reverberation time at third-octave bands was measured with the real time analyzer (Bruel & Kjaer 2133) using 20 dB decay range. All frequency bands were measured using 2 sources simultaneously and 4 microphone locations. In every location an ensemble average of 10 decays was measured. The total number of reverberation time measurements was 8.

The acoustical measurement equipment fullfilled the following IEC standards and grades of accuracy:

IEC 651	Sound level meters	type 1
IEC 804	Integrating sound level meters	type 1
IEC 1260	Octave-band and fractional-octave-band filters	class 1
IEC 942	Sound level calibrators	class 1

The test laboratory operates in conformance with EN/ISO/IEC 17025.

2 Other measurements

The temperature and the relative humidity of the measurement rooms were measured with a psykrometer (Casella London 5200). The ambient atmospheric pressure was measured with a barometer (Bruel & Kjaer UZ0001). The specimen was weighed with a 150 kg precision weighing machine (PM 150). The dimensions of the specimen were measured with a roll meter (K-Prof).

3 The test room

The reverberation room was equipped with six fixed diffuser panels. The positions were selected randomly in respect with altitude, angle and position. The amount of diffusers and their arrangement fulfills the requirements of Annex A in ISO 354. The reverberation time of the reverberation room fulfills the requirements of ISO 354 for 155 m^3 test room.

4 References to the ISO standards

Test: ISO 354:2003 (E) Acoustics - Measurement of sound absorption in a reverberation room, International Organization for Standardization, 2003, Genève, Switzerland.

SFS-EN ISO 11654 Acoustics - Sound absorbers for use in buildings - Rating of sound absorption, International Organization for Standardization, 1997, Genève, Switzerland.