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DETERMINATION OF ACOUSTIC ABSORPTION COEFFICIENT IN LABORATORY CONDITIONS



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DETERMINATION OF ACOUSTIC ABSORPTION COEFFICIENT IN LABORATORY CONDITIONS

1 Description of the commission

Client: Ewona Finland Oy, Jarmo Koivisto, tender 7.2.2014.
Test methods: Sound absorption test by ISO 354:2003
Classification by EN ISO 11654:1997
Test specimens: Two specimens were tested, see descriptions in Annex 1.

2 Results

The test results are presented in Annex 1.



Valtteri Hongisto
senior research scientist
Work Environment Development



Jarkko Hakala
laboratory engineer
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Annexes

Annex 1: Test results (2 pages)
Annex 2: Structure drawings (1 page)
Annex 3: Mounting of specimen (1 page)
Annex 4: Measurement arrangements (1 page)



Determination of acoustic absorption coefficient according to ISO 354:2003

Specimen: Ewona Compact 50 mm (24 kg/m³), no coating
Type E-200 mounting, (Air cavity 150 mm behind the specimen)

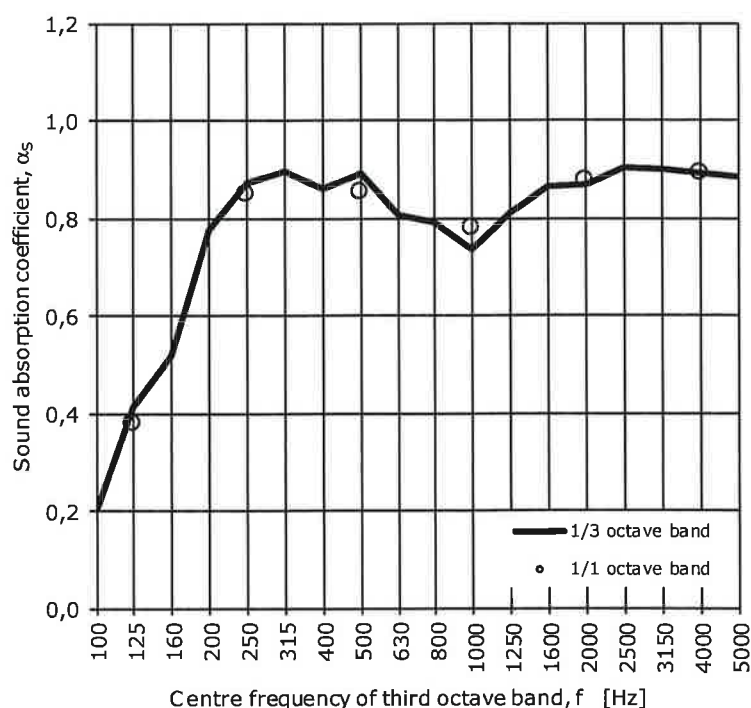
Manufacturer: Ewona Finland Oy

Client: Ewona Finland Oy/Jarmo Koivisto

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
Temperature of test room:	22 22 °C (without / with specimen)	Room boundary area:	179 m ²
Relative humidity:	69 63 % (without / with specimen)	Test date:	12.2.2014
Atmospheric pressure:	100 100 kPa (without / with specimen)	Test file identification:	t120214a

f (Hz)	1/3 α_s	1/1 α_s	1/1 α_p	
100	0,21			
125	0,41	0,38	0,40	**
160	0,52			**
200	0,77			
250	0,87	0,85	0,85	
315	0,90			
400	0,86			
500	0,89	0,85	0,85	
630	0,80			
800	0,79			
1000	0,74	0,78	0,80	
1250	0,81			
1600	0,86			
2000	0,87	0,88	0,90	
2500	0,90			
3150	0,90			
4000	0,89	0,89	0,90	
5000	0,88			

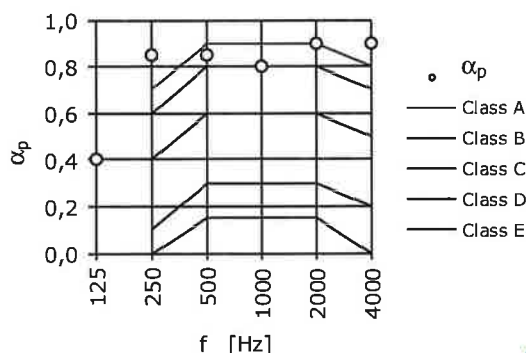


Absorption class (EN ISO 11654)

B

** 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.



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Finnish Accreditation Service
T013 (EN ISO/IEC 17025)

Jarkko Hakala

Jarkko Hakala
laboratory engineer, test performer



Determination of acoustic absorption coefficient according to ISO 354:2003

Specimen: Ewona Compact Acustica, 50 mm (24 kg/m³), no coating
Type E-200 mounting, (Air cavity 150 mm behind the specimen).

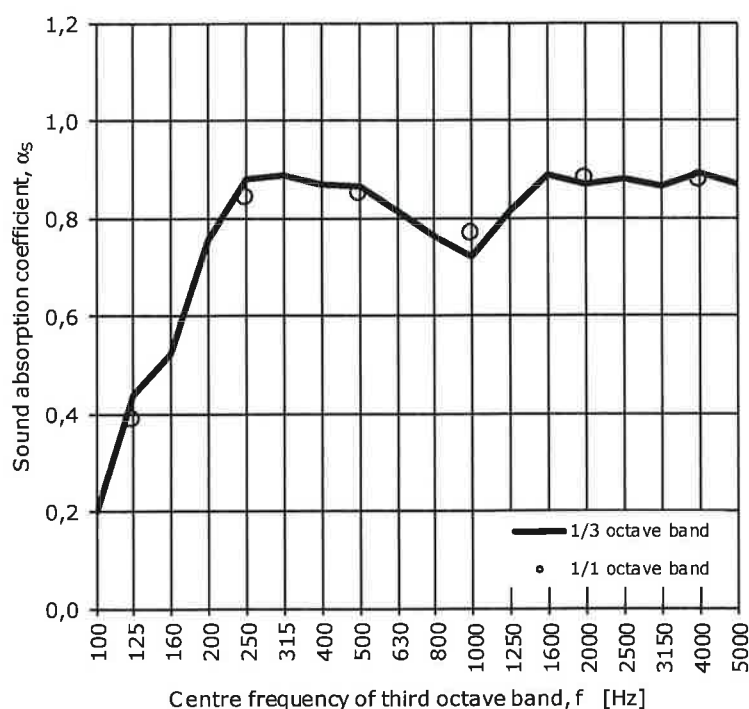
Manufacturer: Ewona Finland Oy

Client: Ewona Finland Oy/Jarmo Koivisto

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
Temperature of test room:	22 23 °C (without / with specimen)	Room boundary area:	179 m ²
Relative humidity:	69 60 % (without / with specimen)	Test date:	12.2.2014
Atmospheric pressure:	100 100 kPa (without / with specimen)	Test file identification:	t120214b

f (Hz)	1/3 α_s	1/1 α_s	1/1 α_p	
100	0,20			
125	0,44	0,39	0,40	**
160	0,52			**
200	0,76			
250	0,88	0,84	0,85	
315	0,89			
400	0,87			
500	0,86	0,85	0,85	
630	0,81			
800	0,76			
1000	0,72	0,77	0,75	
1250	0,82			
1600	0,89			
2000	0,87	0,88	0,90	
2500	0,88			
3150	0,86			
4000	0,89	0,87	0,85	
5000	0,87			

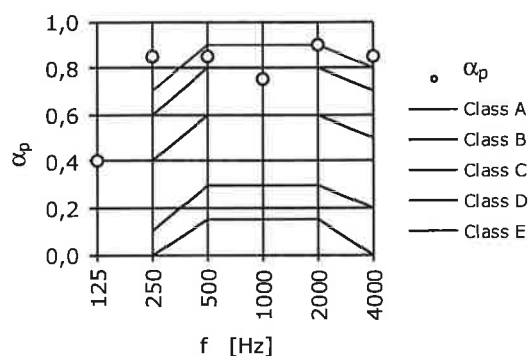


Absorption class (EN ISO 11654)

B

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

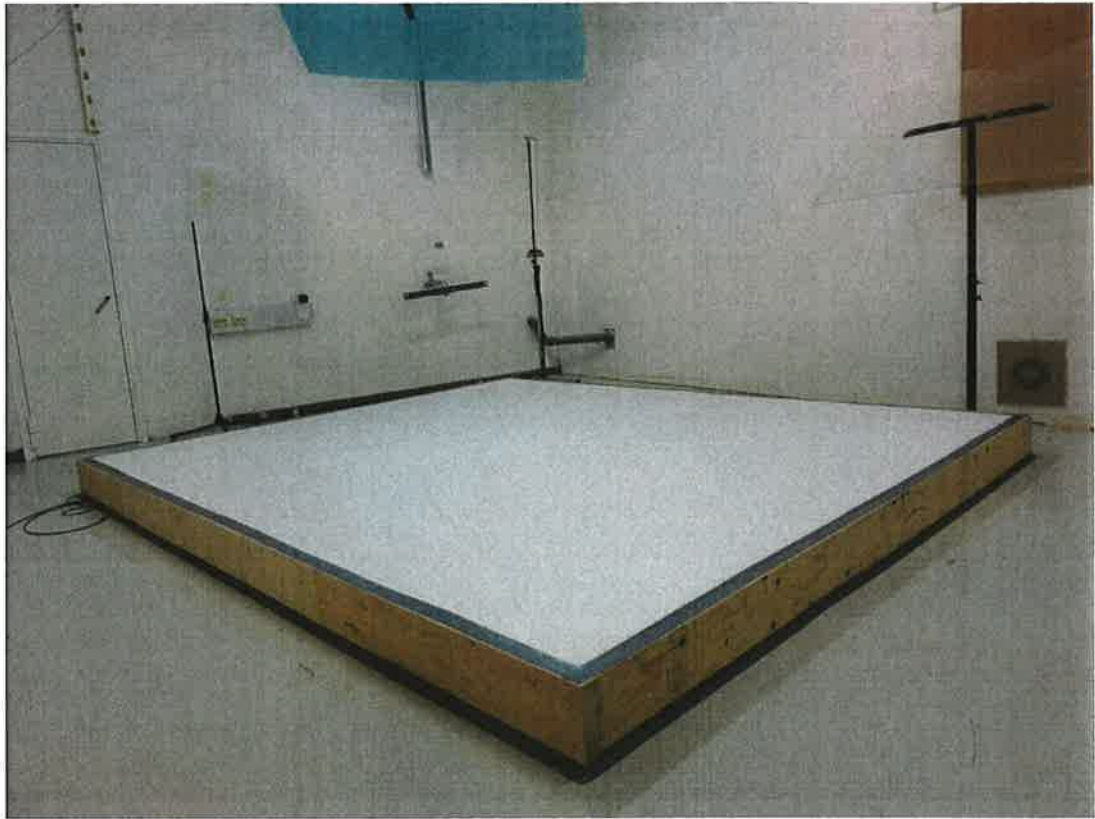
The uncertainty of the test result is higher than ISO 354 expects.



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The specimen was mounted on the floor of the reverberation room in conformance with ISO 354:2003 Annex B. The side edges of the specimen were covered with Kerto-S 51x200 mm. The height of the frame was 200 mm. The edges of the specimen and frame was sealed with duct tape.



Specimen in 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 (Norsonic 121) and amplified with terminal amplifier (QSC 1300 W USA). The sound pressure level in the reverberation room was measured with a condenser 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 (Norsonic 121) using 20 dB decay range. All frequency bands were measured using 2 sources simultaneously and 6 microphone locations. In every location, three decays were measured. The total number of reverberation time measurements was 36.

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

IEC 60651	Sound level meters	type 1
IEC 60804	Integrating sound level meters	type 1
IEC 61260	Octave-band and fractional-octave-band filters	class 1
IEC 60942	Sound level calibrators	class 1

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

2 Other measurements

The temperature, the ambient atmospheric pressure and the relative humidity of the measurement room were measured using an environmental measurement device (Thermo Recorder TR-73U). 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 m³ test room except for the third octave bands 160 and 200 Hz, where the reverberation time was at most 17 % below the minimum required reverberation time.

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 11654:1997 (E) Acoustics - Sound absorbers for use in buildings - Rating of sound absorption, International Organization for Standardization, 1997, Genève, Switzerland.