



Finnish Institute of
Occupational Health

TEST REPORT AR12-2012-200868a
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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: Martela Oyj, Kimmo Sunström, 1.6.2012.

Date of delivery: June 7, 2012.

Mounted by: Lassi Nieminen and Kari Raja-Aho.

2 Description of the specimen

Name: Face -screen

Type: Ewona 42 kg/m³

Manufacturer: Martela Oyj, Ojakkalantie 10, 03100 Nummela

3 Results

The acoustic absorption coefficient α_s was determined in conformance with ISO 354:2003. The weighted sound absorption coefficient α_w and the absorption class were determined in conformance with EN ISO 11654:1997. The weighted sound absorption coefficient α_w was 0.65 and the absorption class of the tested specimen was **C**.

Valtteri Hongisto
senior research scientist
Work Environment Development

Jarkko Hakala
laboratory engineer
Work Environment Development

Annexes

- Annex 1: Test results (1 page)
- 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: Face -screen (1600 x 1250 x 40)

Fabric Cara EJ104 (Camira) 220g/m², 100% Polyolefin, filling Ewona 42 kg/m³

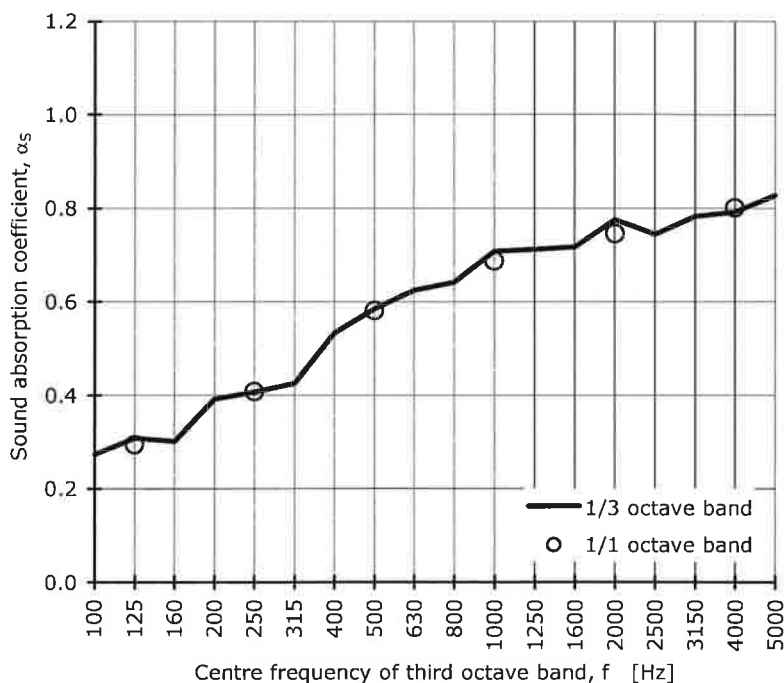
Manufacturer: Martela Oyj

Client: Martela Oyj / Lassi Nieminen

Laboratory: Finnish Institute of Occupational Health, Work Environment Development, Acoustics
Lemminkäisenkatu 14-18 B, FIN-20520 Turku, Finland

Specimen area:	12.0 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 69 % (without / with specimen)	Test date:	7.6.2012
Atmospheric pressure:	100 100 kPa (without / with specimen)	Test file identification:	T070612a
		Number of objects	3

f (Hz)	1/3	1/1	1/1	
	α_s	α_s	α_p	
100	0.27			
125	0.31	0.29	0.30	**
160	0.30			**
200	0.39			
250	0.41	0.41	0.40	
315	0.43			
400	0.53			
500	0.58	0.58	0.60	
630	0.62			
800	0.64			
1000	0.71	0.69	0.70	
1250	0.71			
1600	0.72			
2000	0.78	0.75	0.75	
2500	0.74			
3150	0.78			
4000	0.79	0.80	0.80	
5000	0.83			

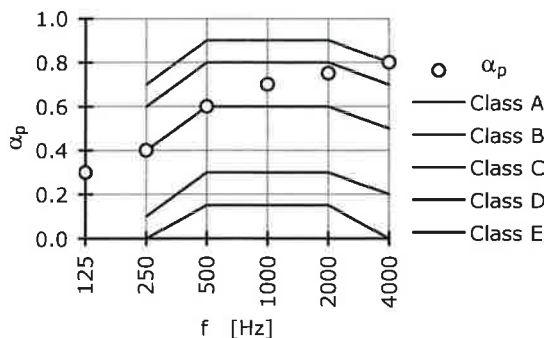


Absorption class (EN ISO 11654)

C

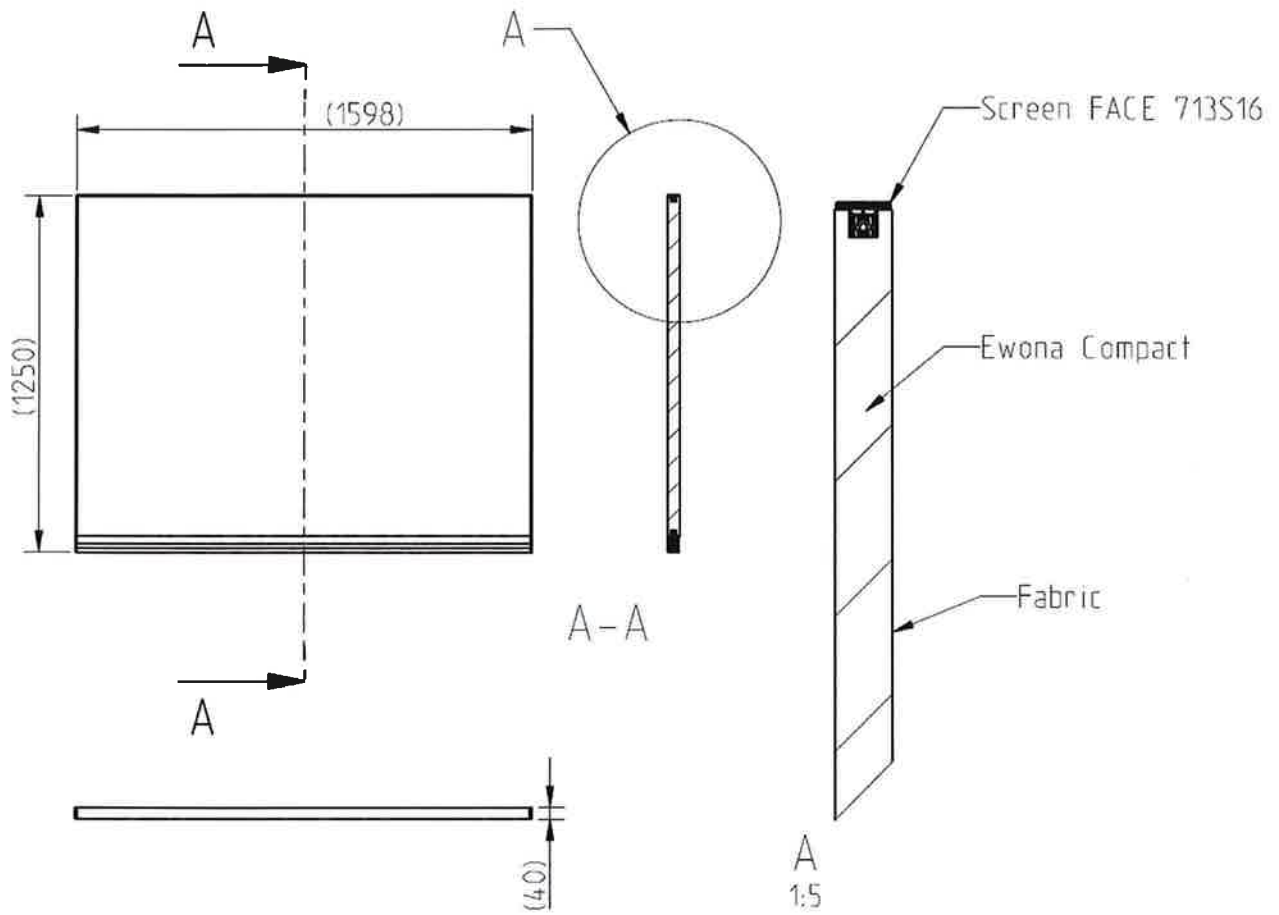
** Total absorption area of the empty test room is higher than ISO 354 requires.

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



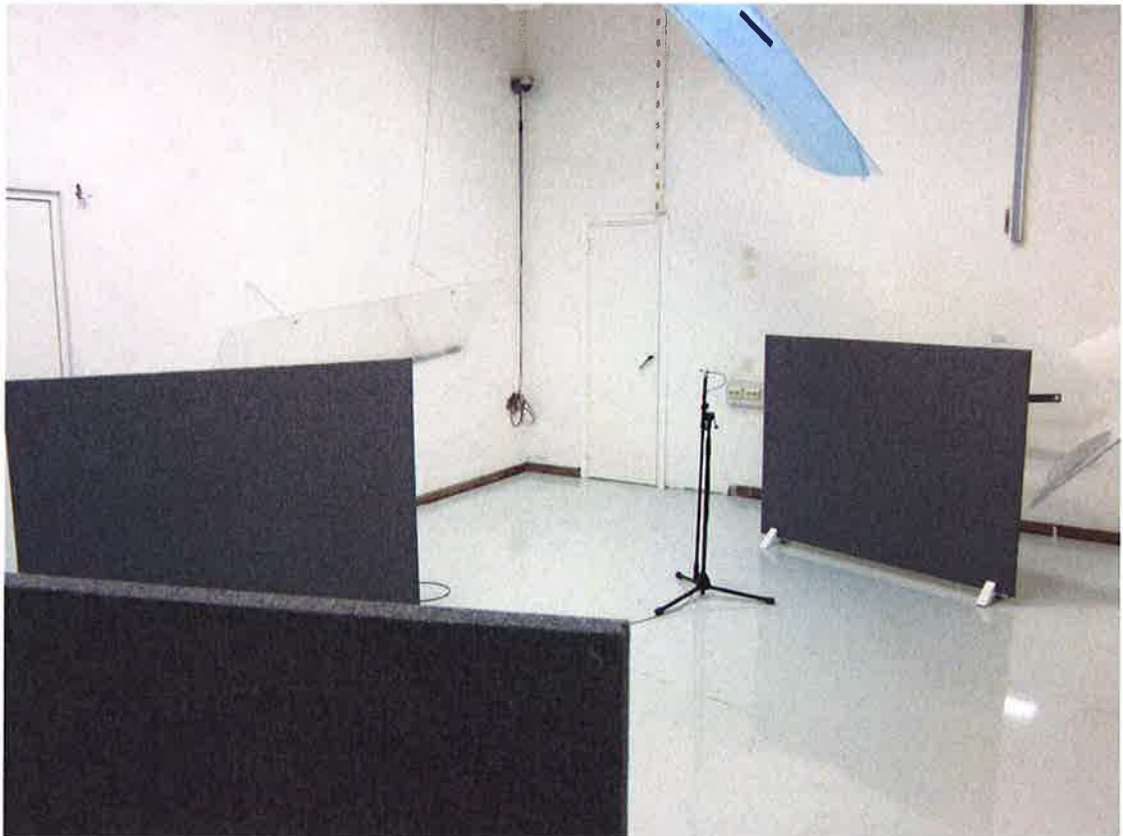
Jarkko Hakala

Jarkko Hakala
laboratory engineer, test performer



The specimen was mounted on the floor of the reverberation room in conformance with ISO 354:2003. The distance between the specimens and from specimens to any wall was at least 1 metre at minimum.

The screens were standing alone containing three pieces. The specimen was arranged so that none of the screen was parallel to each other or any of the walls in reverberation room.



Face - screens 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 an 3 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.