



Determination of sound absorption and class in a reverberation room according to SFS EN ISO 354-2003 and SFS EN ISO 11654-1997



FINAS
Finnish Accreditation Service
T001 (EN ISO/IEC 17025)

Requested by: Polar-Moos Oy

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Viinikantie 48
90480 Hailuoto

Order Markku Sipola, Order VTT-O-140308-13 dated 31.1.2013

Contact person **VTT Expert Services Ltd**
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Assignment **Determination of sound absorption and class in a reverberation room**

Specimen The customer supplied samples to the laboratory on 28.10.2013. The following information of the samples was reported by the customer:

- Natural moss element refined from forest litters
- Thickness of the natural moss element is 40...70 mm, measured weight per square meters were 6470 g/m² measured weight correspond the weight in relative humidity over 50%.
- Element has been dye with water-dilutable dye solution and salted with magnesium chloride solution.
- After dyeing, the moss (thickness 40...70 mm) is glued with starch and acrylic-based binder made of an adhesive to 2 mm thick polypropylene needle felt.

Date and place of testing Samples were tested on 5.11.2013 at VTT Expert Services Ltd research hall 1.

Installation and measuring The tested samples were installed in the reverberation chamber floor, the back surface of directly on the floor.
Tests were performed by the VTT Expert Services Ltd Technical Expert Veijo Sivonen.

Method and equipment The sound absorption coefficient, α_s was measured according to the standard SFS EN ISO 354-2003 [1] and the rating of sound absorption (calculation of α_w) was determined according to the standard SFS EN ISO 11654-1997 [2]
Reverberation room dimensions and measuring equipment are presented in Appendix 2.

Result

The sound absorption coefficient α_s in one-third-octave bands and the practical sound absorption coefficient α_p in octave bands are presented in Appendix 1. The weighted sound absorption coefficient α_w and the sound absorption class are presented also in Table 1.

Table 1. Weighted sound absorption coefficient α_w and sound absorption class

Product name / thickness	Weighted sound absorption coefficient α_w	Sound absorption class
Natural moss / 40...70 mm	0,45	D

Espoo, 27.11.2013



Pekka Sipari
Senior Expert



Veijo Sivonen
Technical Expert

VTT Expert Services Ltd is notified body No. NB 0809

FINAS Finnish Accreditation Service has accredited our laboratory (T001, VTT Expert Services Ltd) to perform measurements according to SFS EN ISO 354-2003 and SFS EN ISO 11654-1997.

References

- [1] SFS EN ISO 354-2003, Acoustics - Measurement of sound absorption in a reverberation room.
- [2] SFS EN ISO 11654-1997, Acoustics - Sound absorbers for use in buildings – Rating of sound absorption

Appendices

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Distribution

Customer
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Determination of sound absorption coefficient α_s and class

Requested by: Polar-Moos Oy
Viinikantie 48, 90480 Hailuoto

Order: Markku Sipola

Test lab.: VTT Expert Servisec Oy

Task: Determination of sound absorption (ISO 354-2003)
Determination of s. absorption class (ISO 11654-1997)

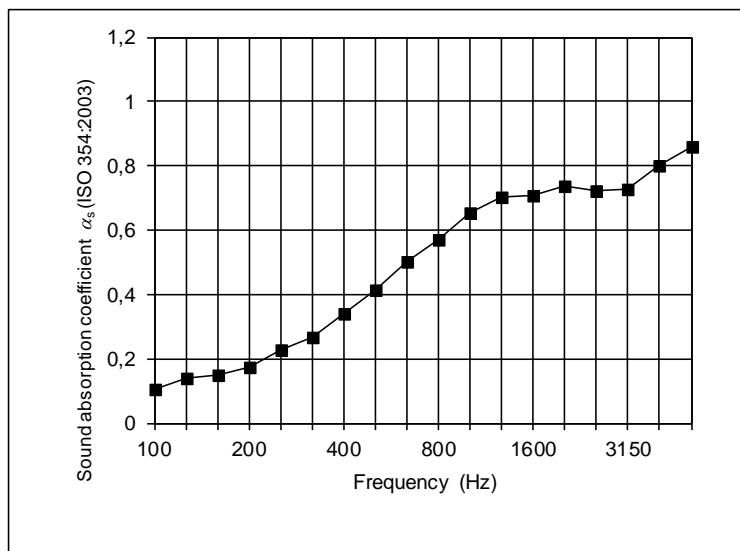
Test date: 5.11.2013

Specimen: Natural moss

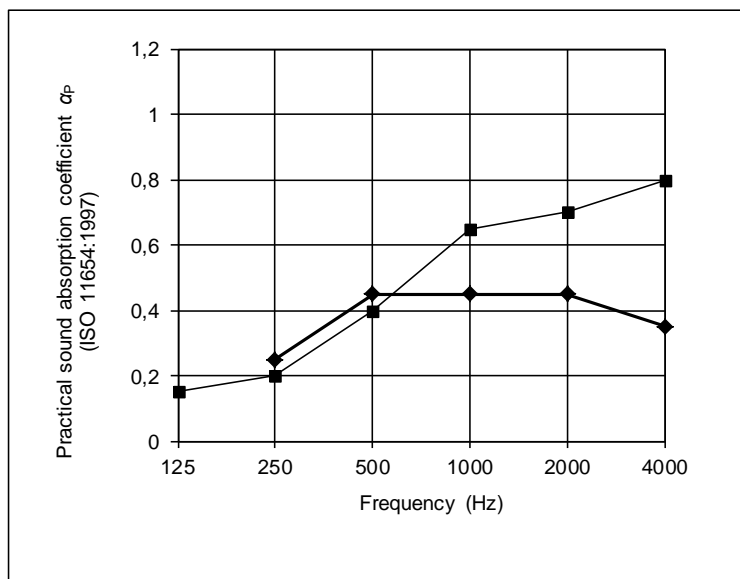
Slab dimens.: 500 x 400 mm x 40...70 mm (thickness)

Density: 6470 g/m³

Volume of rev. Room: 201 m³
Surface area: 209 m²
Area of test specimen: 11,7 m²
Area of diffusors: 26 m²
Temperature and relative humidity:
Empty: 21 °C 50 %
Sample 21 °C 50 %



Freq. (Hz)	T ₁ (s)	T ₂ (s)	α_s
100	4,46	3,82	0,10
125	5,11	4,07	0,14
160	5,28	4,11	0,15
200	5,11	3,87	0,17
250	5,49	3,77	0,23
315	5,68	3,66	0,27
400	5,10	3,14	0,34
500	4,81	2,79	0,42
630	5,07	2,64	0,50
800	5,21	2,51	0,57
1000	5,17	2,33	0,65
1250	4,85	2,17	0,70
1600	4,27	2,04	0,71
2000	3,89	1,91	0,74
2500	3,54	1,84	0,72
3150	3,01	1,68	0,73
4000	2,53	1,46	0,80
5000	2,10	1,27	0,86



Values in octave bands and classification of sound absorbers

Freq. (Hz)	Ref. curve	α_p
125		0,15
250	0,25	0,20
500	0,45	0,40
1000	0,45	0,65
2000	0,45	0,70
4000	0,35	0,80

Weighted sound absorption coefficient, α_w : 0,45 (H)

Sound absorption class: D

Absorption classes: A, B, C, D, E and no classification

The test results relate only to the sample tested.

Measuring equipment	Name
Condenser microphone	B&K (Brüel&Kjær) 4134
Microphone preamplifier	B&K 2660
Rotating microphone boom	B&K 3923
Power amplifier	Peavey PV 2600
Loudspeakers	Sinmarc V121L
Real-time analyser	Norsonic 830
Sound calibrator	B&K 4228

	Floor	Height	Volume
Reverberation room dimensions	5.95 m x 7.20 m	4.70 m	201 m ³

Thickness of the concrete walls, floors and ceilings of the reverberation rooms is 0.25 m

The test results relate only to the sample tested.