



Determination of sound absorption and class of
Yeseco Acoustic Panels 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: Yeseco Oy

Requested by	Yeseco Oy Paljekatu 6 38200 Sastamala, Finland
Order	Ari Heikkinen 8.6.2016 (VTT-O-177941-16)
Contact person	VTT Expert Services Ltd Senior Expert Pekka Sipari E-mail: pekka.sipari@vtt.fi PL 1001, 02044 VTT Puh. 020 722 6931 Faksi 020 722 7003

Assignment	Determination of sound absorption and class of Yeseco acoustic panels in a reverberation room
Specimen	The customer supplied samples to the laboratory on 4.7.2016. The information of the samples was reported by the customer and are presented in Appendix 3.
Date and place of testing	The samples were tested on 4.7.2016 at VTT Expert Services Ltd research hall 1 (Tekniikantie 15 A, 02150 Espoo).
Installation and Measuring	The tested samples were installed to the floor that surface was upward onto the reverberation chamber floor. Tests were performed by the VTT Expert Services Ltd Laboratory Technician Jukka Sulin.
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.

Test no.	Product name	Weighted sound absorption coefficient α_w	Sound absorption class
1.	Yeseco Still TK 30 Acoustic Panel upholstered with Convert 2000 fabric	0,80 (H)	B
2.	Yeseco Still TK Acoustic Panel upholstered with Convert 2000 fabric	0,95	A
3.	Yeseco Still T Acoustic Panel with a natural fibre surface and an image print	1,00	A
4.	Yeseco Still TK Acoustic Panel upholstered with OR fabric	0,95	A
5.	Yeseco Muffle 80 x 56 Acoustic Panel upholstered with Convert 2000 Fabric	0,90	A
6.	Yeseco Muffle 56 x 56 Acoustic Panel upholstered with OR Fabric	0,95	A

Espoo, 1.8.2016



Tero Jalkanen
Product Manager



Jukka Sulin
Laboratory Technician

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.



The test results relate only to the sample tested.

The use of the name of VTT Expert Services Ltd or the name VTT Technical Research Centre of Finland in advertising or publication in part of this report is only permissible with written authorisation from VTT Expert Services Ltd.

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

3

Distribution

Customer
Archive

Original
Original



The test results relate only to the sample tested.

The use of the name of VTT Expert Services Ltd or the name VTT Technical Research Centre of Finland in advertising or publication in part of this report is only permissible with written authorisation from VTT Expert Services Ltd.

Determination of sound absorption and classification

Client: Yeseco Oy
Paljekatu 6, 38200 Sastamala, Finland

Order: VTT-O-177941-16

Test place: VTT Expert Services Ltd TH1

Task: Determination of absorption coefficient (EN ISO 354)
Octaves valuation and classification (ISO 11654:1997)

Test date: 4.7.2016

Sample: 1. Yeseco Still TK 30 Acoustic Panel upholstered with Convert 2000 fabric

Board size: 800 x 1200 x 30 mm

Surface mass: 3,2 kg/m²

Arrangements: The sample surface in background position

Volume of the rev. room: 201 m³

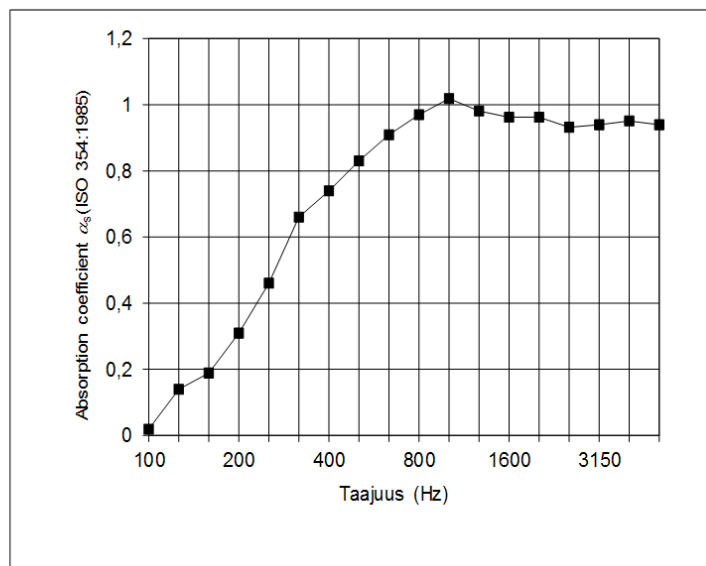
Area of the inner surf.: 209 m²

Sample size: 12 m²

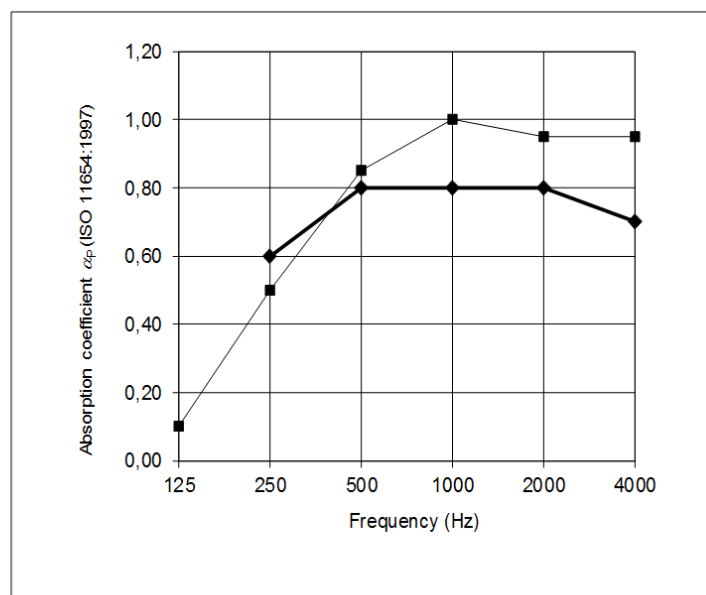
Temperature and relative humidity of rev. room

Empty: 21 °C 65 %

Sample: 21 °C 63 %



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α _s
100	4,13	3,98	0,02
125	4,87	3,87	0,14
160	5,27	3,83	0,19
200	5,09	3,21	0,31
250	5,30	2,78	0,46
315	5,30	2,30	0,66
400	4,68	2,05	0,74
500	4,65	1,91	0,83
630	4,91	1,85	0,91
800	4,92	1,78	0,97
1000	4,97	1,73	1,02
1250	4,70	1,74	0,98
1600	4,18	1,68	0,96
2000	3,87	1,63	0,96
2500	3,63	1,61	0,93
3150	3,23	1,52	0,94
4000	2,81	1,41	0,95
5000	2,44	1,31	0,94



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α _p
125		0,10
250	0,60	0,50
500	0,80	0,85
1000	0,80	1,00
2000	0,80	0,95
4000	0,70	0,95

Weighted
absorption coefficient, α_w: 0,8 (H)

Sound absorption class: B

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

The test results relate only to the sample tested.

Determination of sound absorption and classification

Client: Yeseco Oy
Paljekatu 6, 38200 Sastamala, Finland

Order: VTT-O-177941-16

Test place: VTT Expert Services Ltd TH1

Task: Determination of absorption coefficient (EN ISO 354)
Octaves valuation and classification (ISO 11654:1997)

Test date: 4.7.2016

Sample: 2. Yeseco Still TK Acoustic Panel upholstered with Convert 2000 fabric

Board size: 700 x 980 x 45 mm

Surface mass: 4,2 kg/m²

Arrangements: The sample surface in background position

Volume of the rev. room: 201 m³

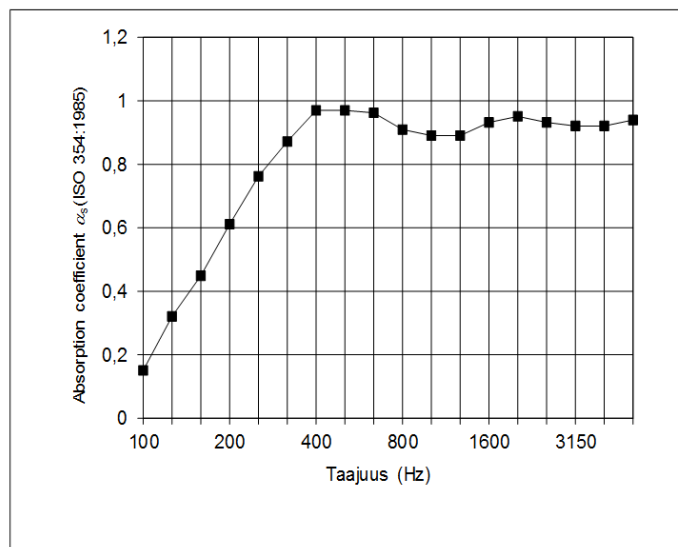
Area of the inner surf.: 209 m²

Sample size: 12 m²

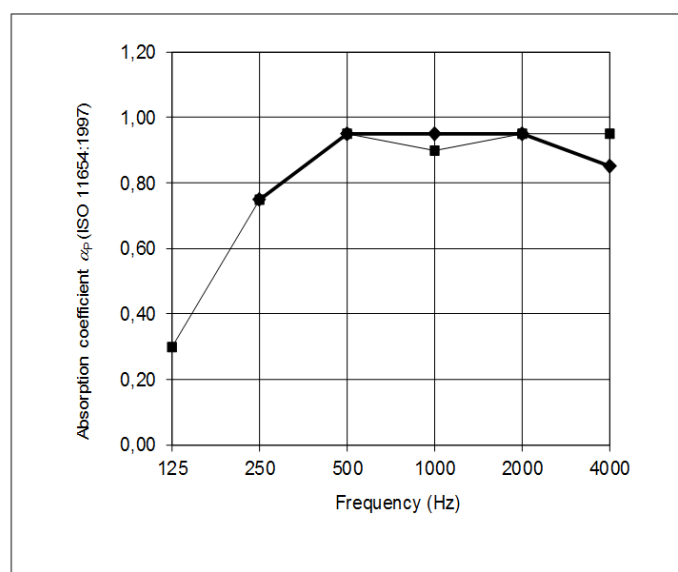
Temperature and relative humidity of rev. room

Empty: 21 °C 65 %

Sample: 21 °C 63 %



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α_s
100	4,13	3,37	0,15
125	4,87	3,10	0,32
160	5,27	2,80	0,45
200	5,09	2,37	0,61
250	5,30	2,13	0,76
315	5,30	1,95	0,87
400	4,68	1,74	0,97
500	4,65	1,74	0,97
630	4,91	1,79	0,96
800	4,92	1,85	0,91
1000	4,97	1,88	0,89
1250	4,70	1,84	0,89
1600	4,18	1,71	0,93
2000	3,87	1,64	0,95
2500	3,63	1,61	0,93
3150	3,23	1,53	0,92
4000	2,81	1,43	0,92
5000	2,44	1,31	0,94



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α_p
125		0,30
250	0,75	0,75
500	0,95	0,95
1000	0,95	0,90
2000	0,95	0,95
4000	0,85	0,95

Weighted absorption coefficient, α_w : 0,95

Sound absorption class: A

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

The test results relate only to the sample tested.

Determination of sound absorption and classification

Client: Yeseco Oy
Paljekatu 6, 38200 Sastamala, Finland

Order: VTT-O-177941-16

Test place: VTT Expert Services Ltd TH1

Task: Determination of absorption coefficient (EN ISO 354)
Octaves valuation and classification (ISO 11654:1997)

Test date: 4.7.2016

Sample: 3. Yeseco Still T Acoustic Panel with a natural fibre surface and an image print

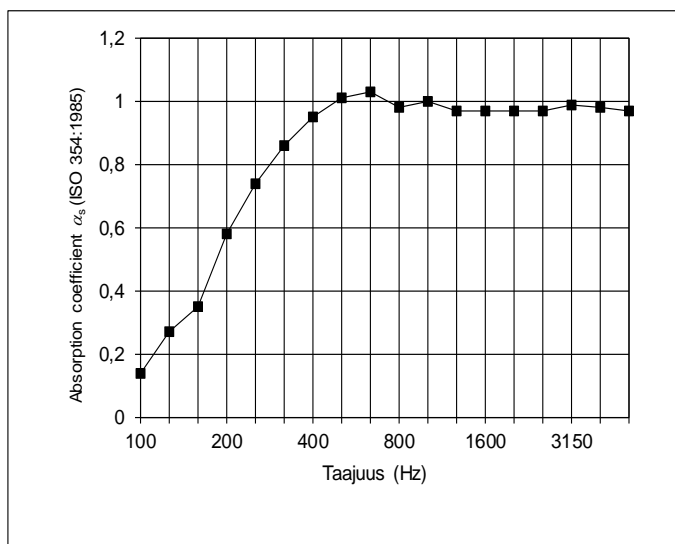
Board size: 760 x 1190,5 x 45 mm

Surface mass: 4,2 kg/m²

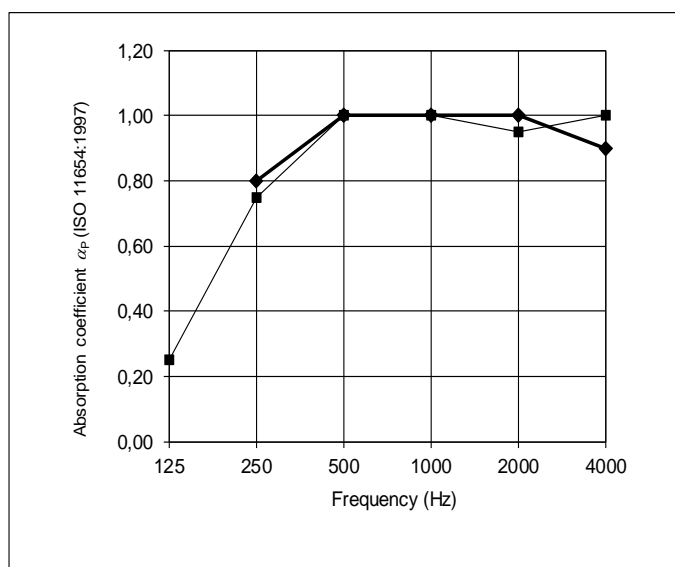
Arrangements: The sample surface in background position

Volume of the rev. room: 201 m³
Area of the inner surf.: 209 m²
Sample size: 12,1 m²

Temperature and relative humidity of rev. room
Empty: 21 °C 65 %
Sample: 21 °C 63 %



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α_s
100	4,13	3,41	0,14
125	4,87	3,26	0,27
160	5,27	3,13	0,35
200	5,09	2,41	0,58
250	5,30	2,14	0,74
315	5,30	1,96	0,86
400	4,68	1,76	0,95
500	4,65	1,69	1,01
630	4,91	1,70	1,03
800	4,92	1,75	0,98
1000	4,97	1,74	1,00
1250	4,70	1,74	0,97
1600	4,18	1,66	0,97
2000	3,87	1,61	0,97
2500	3,63	1,57	0,97
3150	3,23	1,47	0,99
4000	2,81	1,38	0,98
5000	2,44	1,29	0,97



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α_p
125		0,25
250	0,80	0,75
500	1,00	1,00
1000	1,00	1,00
2000	1,00	0,95
4000	0,90	1,00

Weighted absorption coefficient, α_w : 1

Sound absorption class: A

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

The test results relate only to the sample tested.

Determination of sound absorption and classification

Client: Yeseco Oy
Paljekatu 6, 38200 Sastamala, Finland

Order: VTT-O-177941-16

Test place: VTT Expert Services Ltd TH1

Task: Determination of absorption coefficient (EN ISO 354)
Octaves valuation and classification (ISO 11654:1997)

Test date: 4.7.2016

Sample: 4. Yeseco Still T Acoustic Panel upholstered with OR fabric

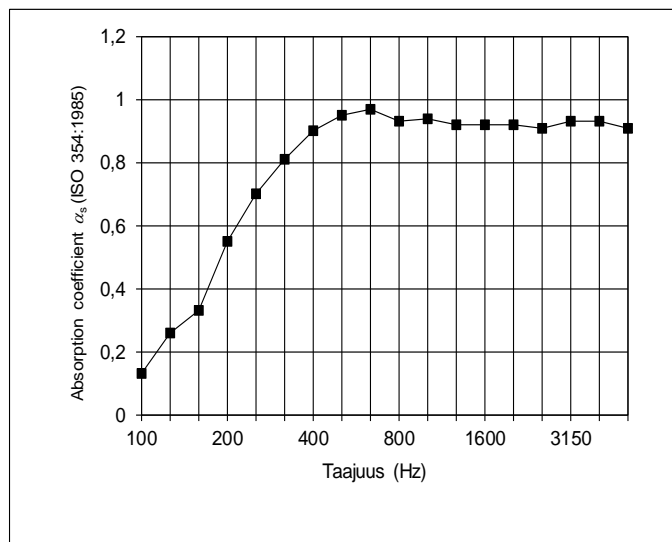
Board size: 800 x 1200 x 45 mm

Surface mass: 4,2 kg/m²

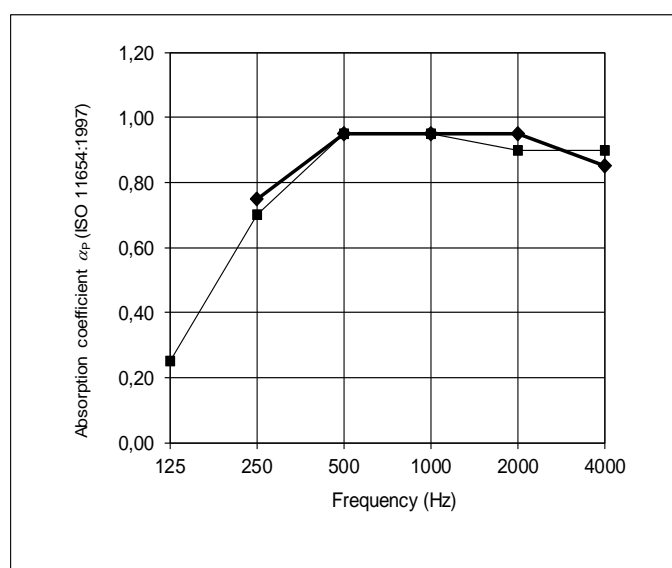
Arrangements: The sample surface in background position

Volume of the rev. room: 201 m³
Area of the inner surf.: 209 m²
Sample size: 12,8 m²

Temperature and relative humidity of rev. room
Empty: 21 °C 65 %
Sample: 21 °C 63 %



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α_s
100	4,13	3,41	0,13
125	4,87	3,26	0,26
160	5,27	3,13	0,33
200	5,09	2,41	0,55
250	5,30	2,14	0,70
315	5,30	1,96	0,81
400	4,68	1,76	0,90
500	4,65	1,69	0,95
630	4,91	1,70	0,97
800	4,92	1,75	0,93
1000	4,97	1,74	0,94
1250	4,70	1,74	0,92
1600	4,18	1,66	0,92
2000	3,87	1,61	0,92
2500	3,63	1,57	0,91
3150	3,23	1,47	0,93
4000	2,81	1,38	0,93
5000	2,44	1,29	0,91



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α_p
125		0,25
250	0,75	0,70
500	0,95	0,95
1000	0,95	0,95
2000	0,95	0,90
4000	0,85	0,90

Weighted absorption coefficient, α_w : 0,95

Sound absorption class: A

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

The test results relate only to the sample tested.

Determination of sound absorption and classification

Client: Yeseco Oy
Paljekatu 6, 38200 Sastamala, Finland

Order: VTT-O-177941-16

Volume of the rev. room: 201 m³

Area of the inner surf.: 209 m²

Test place: VTT Expert Services Ltd TH1

Sample size: 11,7 m²

Task: Determination of absorption coefficient (EN ISO 354)
Octaves valuation and classification (ISO 11654:1997)

Temperature and relative humidity of rev. room

Empty: 21 °C 65 %

Sample: 21 °C 63 %

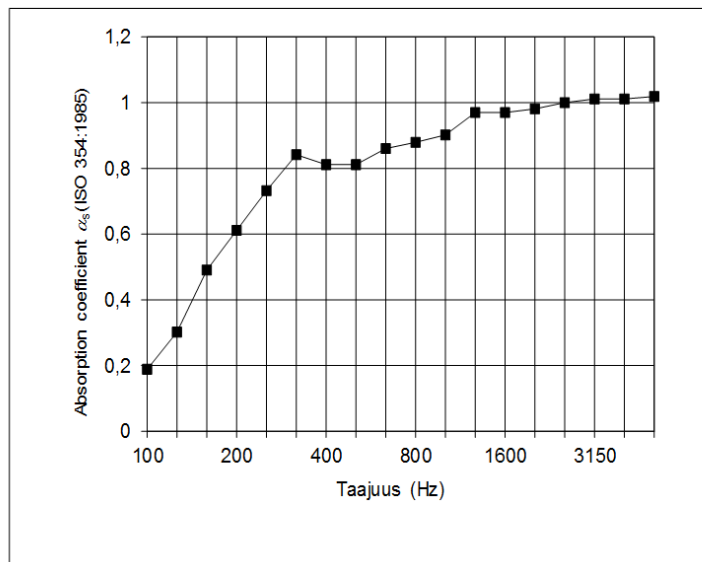
Test date: 4.7.2016

Sample: 5. Yeseco Muffle 80x56 Acoustic Panel upholstered with Convert 2000 fabric

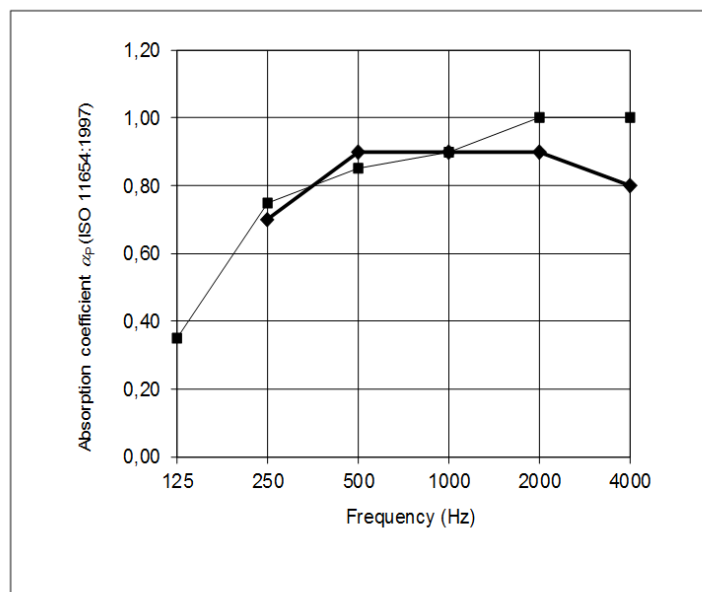
Board size: 800 x 560 x 60 mm

Surface mass: 4,2 kg/m²

Arrangements: The sample surface in background position



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α _s
100	4,13	3,22	0,19
125	4,87	3,18	0,30
160	5,27	2,72	0,49
200	5,09	2,40	0,61
250	5,30	2,21	0,73
315	5,30	2,03	0,84
400	4,68	1,97	0,81
500	4,65	1,97	0,81
630	4,91	1,94	0,86
800	4,92	1,92	0,88
1000	4,97	1,90	0,90
1250	4,70	1,78	0,97
1600	4,18	1,70	0,97
2000	3,87	1,63	0,98
2500	3,63	1,57	1,00
3150	3,23	1,48	1,01
4000	2,81	1,38	1,01
5000	2,44	1,28	1,02



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α _p
125		0,35
250	0,70	0,75
500	0,90	0,85
1000	0,90	0,90
2000	0,90	1,00
4000	0,80	1,00

Weighted absorption coefficient, α_w: 0,9

Sound absorption class: A

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

The test results relate only to the sample tested.

Determination of sound absorption and classification

Client: Yeseco Oy
Paljekatu 6, 38200 Sastamala, Finland

Order: VTT-O-177941-16

Volume of the rev. room: 201 m³

Area of the inner surf.: 209 m²

Test place: VTT Expert Services Ltd TH1

Sample size: 11,5 m²

Task: Determination of absorption coefficient (EN ISO 354)
Octaves valuation and classification (ISO 11654:1997)

Temperature and relative humidity of rev. room

Empty: 21 °C 65 %

Sample: 21 °C 63 %

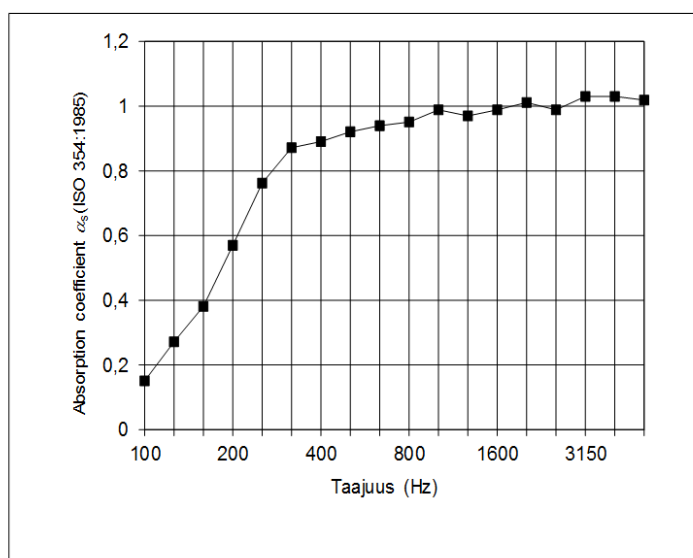
Test date: 4.7.2016

Sample: 6. Yeseco Muffle 56 x 56 Acoustic Panel upholstered with OR fabric

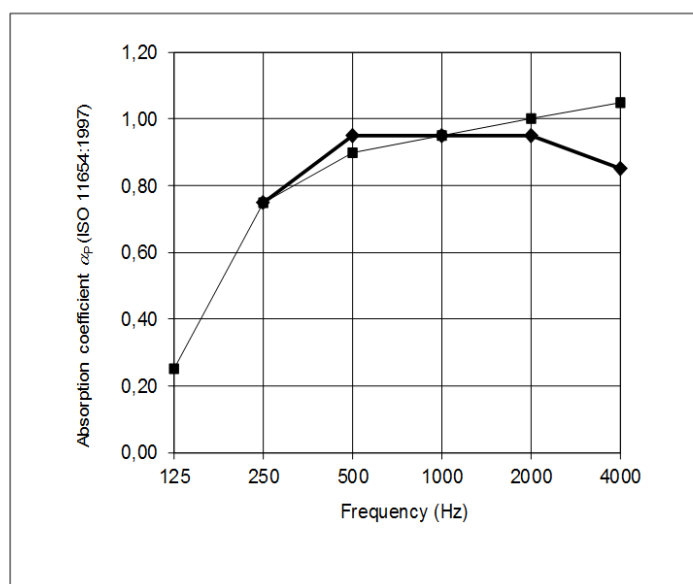
Board size: 560 x 560 x 60 mm

Surface mass: 5,9 kg/m²

Arrangements: The sample surface in background position



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α_s
100	4,13	3,37	0,15
125	4,87	3,31	0,27
160	5,27	3,07	0,38
200	5,09	2,50	0,57
250	5,30	2,18	0,76
315	5,30	2,01	0,87
400	4,68	1,89	0,89
500	4,65	1,85	0,92
630	4,91	1,86	0,94
800	4,92	1,85	0,95
1000	4,97	1,81	0,99
1250	4,70	1,79	0,97
1600	4,18	1,69	0,99
2000	3,87	1,62	1,01
2500	3,63	1,59	0,99
3150	3,23	1,48	1,03
4000	2,81	1,38	1,03
5000	2,44	1,29	1,02



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α_p
125		0,25
250	0,75	0,75
500	0,95	0,90
1000	0,95	0,95
2000	0,95	1,00
4000	0,85	1,05

Weighted absorption coefficient, α_w : 0,95

Sound absorption class: A

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

The test results relate only to the sample tested.

MEASURING ROOMS AND EQUIPMENT

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.

The use of the name of VTT Expert Services Ltd or the name VTT Technical Research Centre of Finland in any other form in advertising or publication in part of this report is only permissible with written authorisation from VTT Expert Services Ltd.

Samples information

Yeseco Still TK 30		
Materials	Weight (kg)	Density (kg/m ³)
Fabric	0,32	0,32
Cotton	0,12	0,04
Natural fibre	0,31	0,103
Cellulosic pulp	3,14	0,09
Natural fibre	0,31	0,103

Yeseco Still TK/T Acoustic Panel		
Materials	Weight (kg)	Density (kg/m ³)
Fabric	0,32	0,32
Cotton	0,12	0,040
Natural fibre	0,31	0,103
Cellulosic pulp	2,09	0,084
Natural fibre	0,31	0,103

Yeseco Muffle 80 x 56 / 56 x 56 Acoustic Panel		
Materials	Weight (kg)	Density (kg/m ³)
Fabric	0,32	0,32
Cotton	0,12	0,04
Natural fibre	0,31	0,103
Cellulosic pulp	3,14	0,897
Natural fibre	0,31	0,103

The test results relate only to the sample tested.

The construction of Yeseco's Muffle:

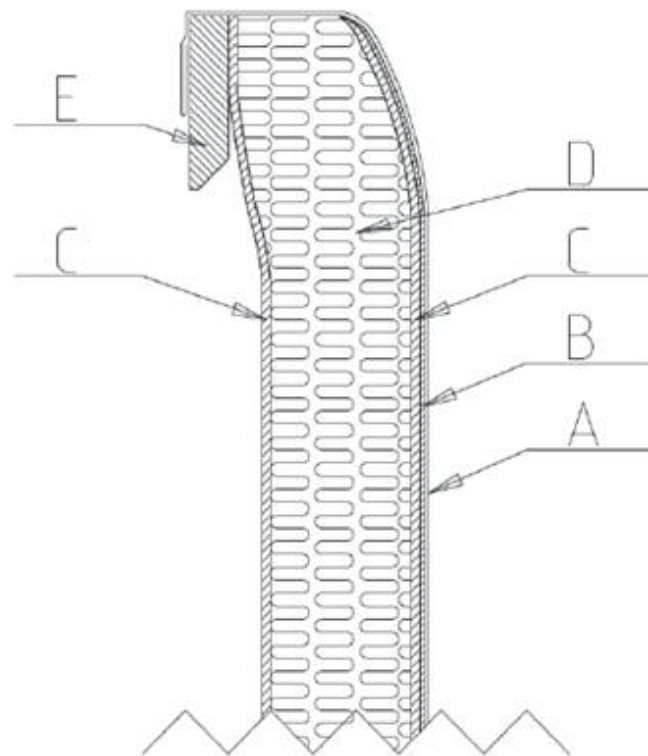
A = Acoustic canvas

B = Padding (PET)

C = Hemp and plastic fibres (PET)

D = Wood pulp

E = Laminated wood frame



The test results relate only to the sample tested.

The use of the name of VTT Expert Services Ltd or the name VTT Technical Research Centre of Finland in any other form in advertising or publication in part of this report is only permissible with written authorisation from VTT Expert Services Ltd.