

Areco Profiles Oy
Kasper Siintola
Tehdastie 17
31400 Somero
kasper.siintola@areco.fi



DETERMINATION OF AIRBORNE SOUND INSULATION IN LABORATORY CONDITIONS

1 CLIENT

Areco Profiles Oy, Kasper Siintola. Tender November 13, 2024. Order November 13, 2024.

2 DESCRIPTION OF THE COMMISSION

Sound reduction index R was measured for specimen within 100-5000 Hz according to ISO 10140-2:2022. Weighted sound reduction index was determined according to ISO 717-1:2020.

3 RESULTS

The test results are summarized in Table 1. Detailed results are presented in Annex 1.

Table 1.

Specimen	R_w [dB]
Seinäraakenne 1	29
Seinäraakenne 2	29
Seinäraakenne 3	43
Seinäraakenne 4	29
Seinäraakenne 5	43

4 SIGNATURES



Valtteri Hongisto
Research Group Leader



Johann Laukka
Researcher

Turku University of Applied Sciences
Acoustics laboratory

ANNEXES

- Annex 1 – Test results (5 page)
- Annex 2 – Structure drawings (5 pages)
- Annex 3 – Mounting of specimen (3 pages)
- Annex 4 – Measurement arrangements (3 pages)

Determination of airborne sound insulation according to ISO 10140-2:2022 in laboratory conditions

Specimen id: Seinärakenne 1
ASP240-L sandwich panel element 240 mm (steel 0.5 mm, mineral wool 70 kg/m³, steel 0.5 mm)

Manufacturer: Areco Profiles Oy

Client: Areco Profiles Oy

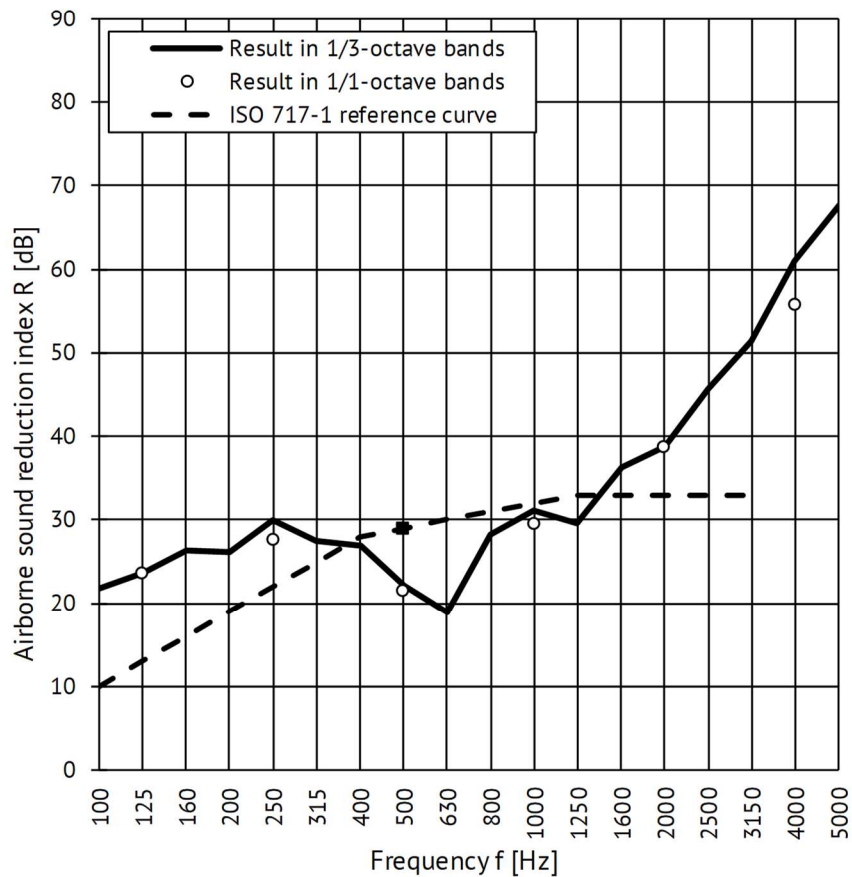
Contact person: Kasper Siintola

Mounting by: Aurabo Oy

Test laboratory: Turku University of Applied Sciences, Acoustic laboratory
Joukahaisenkatu 7, 20520 Turku, Finland.
<https://akustiikka.turkuamk.fi/>

Room temperature: 21 °C Area of test element, S: 2.5 m²
Relative humidity: 47.6 % Mass per unit area: 27 kg/m²
Source room volume: 200.7 m³ Test date: Nov 27, 2024
Receiving room volume: 72.2 m³ Test file: R271124a

f [Hz]	R [dB]	R [dB]
50	16.0	
63	30.2	18.4
80	17.6	
100	21.7	
125	23.6	23.5
160	26.3	
200	26.1	
250	30.0	27.5
315	27.4	
400	27.0	
500	22.1	21.5
630	18.8	
800	28.3	
1000	31.1	29.5
1250	29.6	
1600	36.2	
2000	38.8	38.8
2500	45.6	
3150	51.5	
4000	61.0	55.7
5000	67.6	



Single-number quantities according to ISO 717-1

R_w	29 dB
R_{w+C}	28 dB
$R_{w+C_{tr}}$	26 dB
$R_{w+C_{100-5000}}$	29 dB
$R_{w+C_{50-3150}}$	28 dB
$R_{w+C_{50-5000}}$	29 dB
$R_{w+C_{tr,100-5000}}$	26 dB
$R_{w+C_{tr,50-3150}}$	26 dB
$R_{w+C_{tr,50-5000}}$	26 dB

Signs F and B indicate that the declared result is an underestimate in this frequency band. The true value is larger.



Johann Laukka

Johann Laukka
researcher
test performer

Determination of airborne sound insulation according to ISO 10140-2:2022 in laboratory conditions

Specimen id: Seinärakenne 2
ASP240-T sandwich panel element 240 mm (steel 0.5 mm, mineral wool 85 kg/m³, steel 0.5 mm)

Manufacturer: Areco Profiles Oy

Client: Areco Profiles Oy

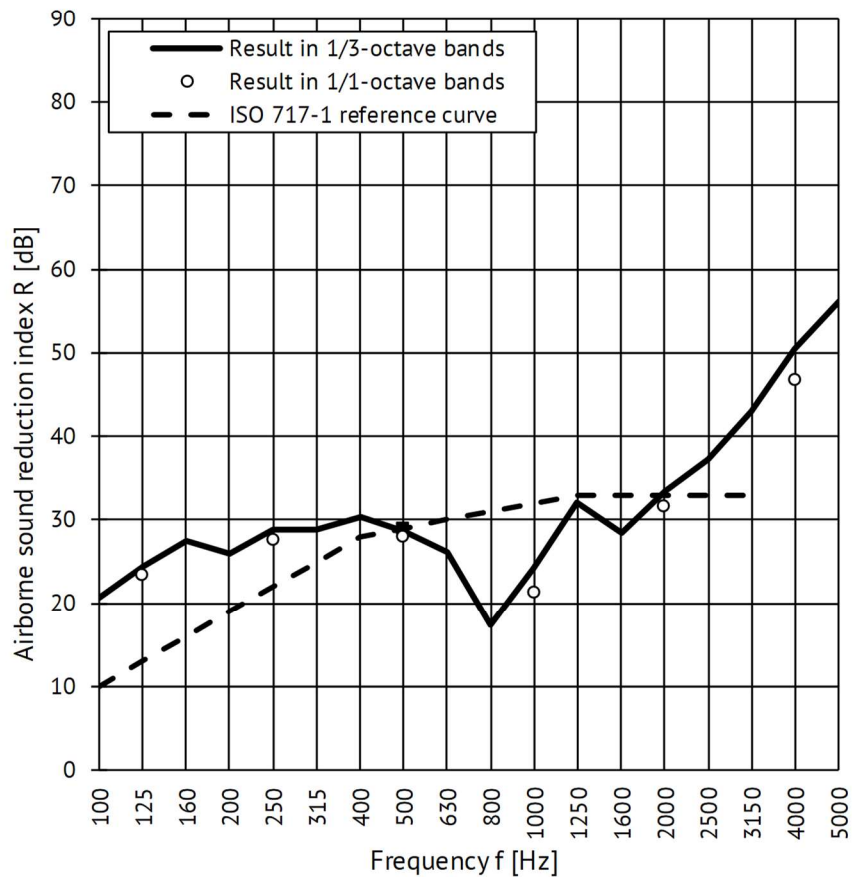
Contact person: Kasper Siintola

Mounting by: Aurabo Oy

Test laboratory: Turku University of Applied Sciences, Acoustic laboratory
Joukahaisenkatu 7, 20520 Turku, Finland.
<https://akustiikka.turkuamk.fi/>

Room temperature: 21.1 °C Area of test element, S: 2.5 m²
Relative humidity: 49.1 % Mass per unit area: 29 kg/m²
Source room volume: 200.7 m³ Test date: Nov 27, 2024
Receiving room volume: 72.2 m³ Test file: R271124b

f [Hz]	R [dB]	R [dB]
50	25.6	
63	26.0	19.3
80	15.2	
100	20.7	
125	24.4	23.3
160	27.5	
200	25.9	
250	28.8	27.6
315	28.8	
400	30.3	
500	28.7	28.0
630	26.1	
800	17.4	
1000	24.3	21.2
1250	32.0	
1600	28.5	
2000	33.4	31.6
2500	37.3	
3150	42.9	
4000	50.5	46.8
5000	56.1	



Single-number quantities according to ISO 717-1

R_w 29 dB
R_w+C 26 dB
R_w+C_{tr} 24 dB
R_w+C₁₀₀₋₅₀₀₀ 27 dB
R_w+C₅₀₋₃₁₅₀ 26 dB
R_w+C₅₀₋₅₀₀₀ 27 dB
R_w+C_{tr,100-5000} 24 dB
R_w+C_{tr,50-3150} 24 dB
R_w+C_{tr,50-5000} 24 dB

Signs F and B indicate that the declared result is an underestimate in this frequency band. The true value is larger.



Johann Laukka
Johann Laukka
researcher
test performer

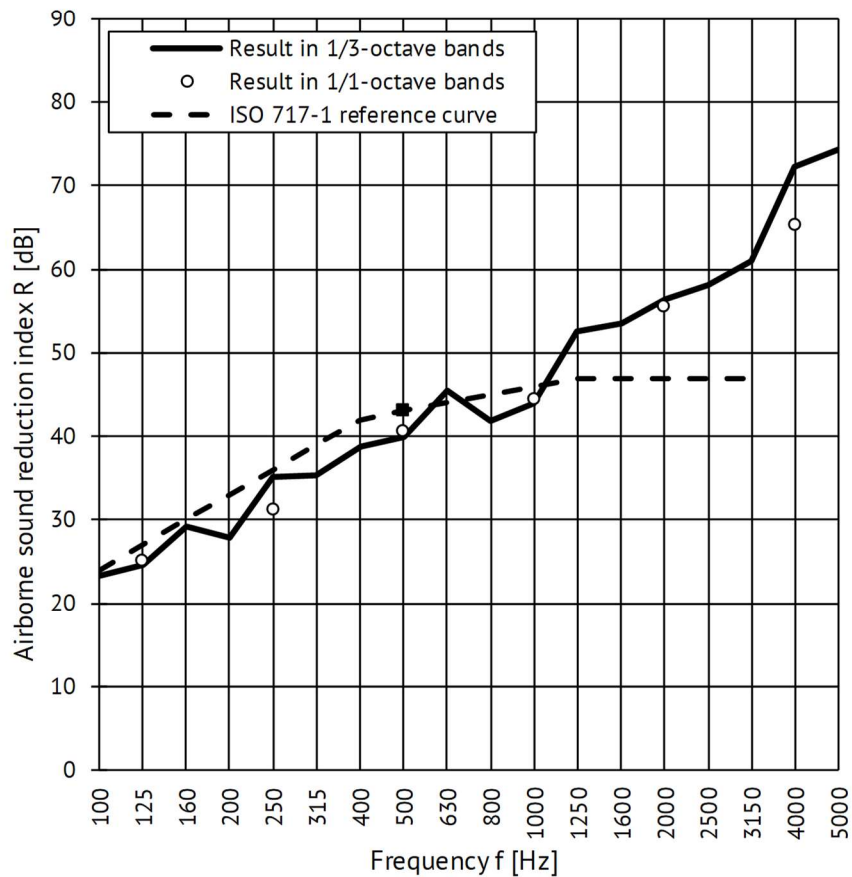
Determination of airborne sound insulation according to ISO 10140-2:2022 in laboratory conditions

Specimen id: Seinärakenne 3
ASP240-T sandwich panel element 240 mm (steel 0.5 mm, mineral wool 85 kg/m³, steel 0.5 mm)
+ metal hat profile 25 mm + 2x extra hard drywall Knauf KEK 13 mm

Manufacturer: Areco Profiles Oy
Client: Areco Profiles Oy
Contact person: Kasper Siintola
Mounting by: Aurabo Oy
Test laboratory: Turku University of Applied Sciences, Acoustic laboratory
Joukahaisenkatu 7, 20520 Turku, Finland.
<https://akustiikka.turkuamk.fi/>

Room temperature: 21.1 °C Area of test element, S: 2.5 m²
Relative humidity: 45.8 % Mass per unit area: 49.4 kg/m²
Source room volume: 200.7 m³ Test date: Nov 27, 2024
Receiving room volume: 71.8 m³ Test file: R271124c

f [Hz]	R [dB]	R [dB]
50	26.0	
63	32.9	22.7
80	18.8	
100	23.2	
125	24.7	25.1
160	29.3	
200	27.8	
250	35.1	31.2
315	35.3	
400	38.8	
500	40.0	40.6
630	45.5	
800	41.9	
1000	44.0	44.4
1250	52.5	
1600	53.5	
2000	56.4	55.6
2500	58.1	
3150	61.0	
4000	72.3	65.3
5000	74.3	



Single-number quantities
according to ISO 717-1

R_w	43 dB
R _w +C	42 dB
R _w +C _{tr}	37 dB
R _w +C ₁₀₀₋₅₀₀₀	43 dB
R _w +C ₅₀₋₃₁₅₀	41 dB
R _w +C ₅₀₋₅₀₀₀	42 dB
R _w +C _{tr,100-5000}	37 dB
R _w +C _{tr,50-3150}	35 dB
R _w +C _{tr,50-5000}	35 dB

Signs F and B indicate that the declared result is an underestimate
in this frequency band. The true value is larger.



Johann Laukka

Johann Laukka
researcher
test performer

Determination of airborne sound insulation according to ISO 10140-2:2022 in laboratory conditions

Specimen id: Seinärakenne 4
ASP150-T sandwich panel element 150 mm (steel 0.5 mm, mineral wool 85 kg/m³, steel 0.5 mm)

Manufacturer: Areco Profiles Oy

Client: Areco Profiles Oy

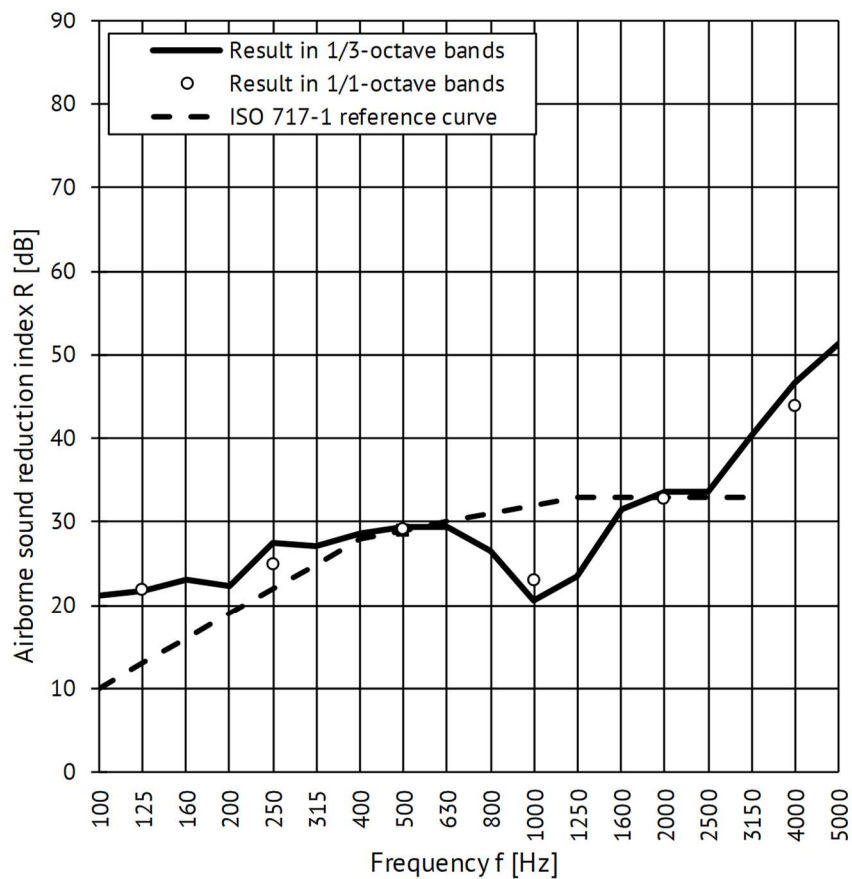
Contact person: Kasper Siintola

Mounting by: Aurabo Oy

Test laboratory: Turku University of Applied Sciences, Acoustic laboratory
Joukahaisenkatu 7, 20520 Turku, Finland.
<https://akustiikka.turkuamk.fi/>

Room temperature: 21.2 °C Area of test element, S: 2.5 m²
Relative humidity: 48.3 % Mass per unit area: 21.0 kg/m²
Source room volume: 200.7 m³ Test date: Nov 27, 2024
Receiving room volume: 72 m³ Test file: R271124d

f [Hz]	R [dB]	R [dB]
50	22.9	
63	24.0	15.7
80	11.4	
100	21.2	
125	21.7	21.9
160	23.1	
200	22.4	25.0
250	27.4	
315	27.2	
400	28.7	29.2
500	29.4	
630	29.4	
800	26.6	
1000	20.7	22.9
1250	23.4	
1600	31.6	32.8
2000	33.6	
2500	33.6	
3150	40.3	43.9
4000	46.6	
5000	51.5	



Single-number quantities according to ISO 717-1

R_w 29 dB
 R_w+C 27 dB
 R_w+C_{tr} 25 dB
 R_w+C₁₀₀₋₅₀₀₀ 28 dB
 R_w+C₅₀₋₃₁₅₀ 27 dB
 R_w+C₅₀₋₅₀₀₀ 28 dB
 R_w+C_{tr,100-5000} 25 dB
 R_w+C_{tr,50-3150} 24 dB
 R_w+C_{tr,50-5000} 24 dB

Signs F and B indicate that the declared result is an underestimate in this frequency band. The true value is larger.

FINAS
Finnish Accreditation Service
T293 (EN ISO/IEC 17025)

Johann Laukka

Johann Laukka
researcher
test performer

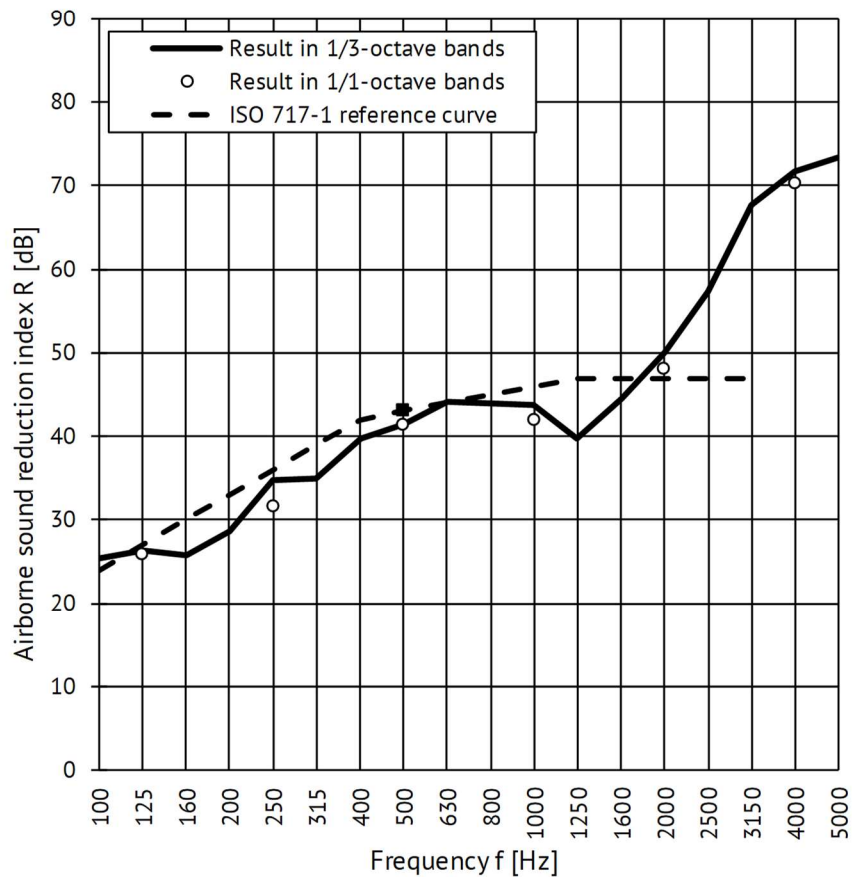
Determination of airborne sound insulation according to ISO 10140-2:2022 in laboratory conditions

Specimen id: Seinärakenne 5
ASP150-T sandwich panel element 150 mm (steel 0.5 mm, mineral wool 85 kg/m³, steel 0.5 mm) + Airgap 40mm + ASP80-T sandwich panel element 80 mm (steel 0.5 mm, mineral wool 85 kg/m³, steel 0.5 mm)

Manufacturer: Areco Profiles Oy
Client: Areco Profiles Oy
Contact person: Kasper Siintola
Mounting by: Aurabo Oy
Test laboratory: Turku University of Applied Sciences, Acoustic laboratory
Joukahaisenkatu 7, 20520 Turku, Finland.
<https://akustiikka.turkuamk.fi/>

Room temperature: 21.2 °C Area of test element, S: 2.5 m²
Relative humidity: 46.9 % Mass per unit area: 38 kg/m²
Source room volume: 200.7 m³ Test date: Nov 27, 2024
Receiving room volume: 71.7 m³ Test file: R271124e

f [Hz]	1/3		1/1	
	R	R	R	R
50	22.9			
63	25.9	18.3		
80	14.3			
100	25.4			
125	26.4	25.8		
160	25.7			
200	28.6			
250	34.7	31.7		
315	34.9			
400	39.7			
500	41.4	41.4		
630	44.2			
800	43.9			
1000	43.7	42.0		
1250	39.7			
1600	44.6			
2000	50.0	48.1		
2500	57.3			
3150	67.6		F	
4000	71.7	70.2	F	
5000	73.4		F	



Single-number quantities according to ISO 717-1

R_w 43 dB
R_w+C 41 dB
R_w+C_{tr} 37 dB
R_w+C₁₀₀₋₅₀₀₀ 42 dB
R_w+C₅₀₋₃₁₅₀ 40 dB
R_w+C₅₀₋₅₀₀₀ 41 dB
R_w+C_{tr,100-5000} 37 dB
R_w+C_{tr,50-3150} 33 dB
R_w+C_{tr,50-5000} 33 dB

Signs F and B indicate that the declared result is an underestimate in this frequency band. The true value is larger.

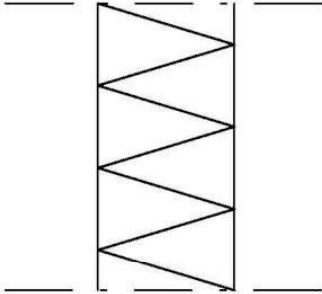


Johann Laukka


Johann Laukka
researcher
test performer

ANNEX 2 – STRUCTURE DRAWINGS

ASP240-L



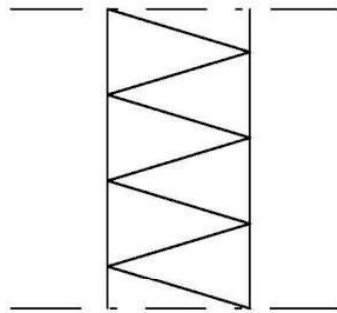
Pelti-villa-peltielementti 240 mm
pintalevy 0,5 mm ulkopuoli
ydin kivivilla 70 kg/m³
pintalevy 0,5 mm sisäpuoli

 Areco Profiles Oy Tehdastie 17 31400 Somero	PIRUSTUKSEN SISÄLTÖ		MITTA-AAVAT
	Ääneneristävyydesti, TUAMK Seinärakenne 1		1:10
SUUNNITTELIJA	PIIRIN NRO	MUUTOS	
Areco Profiles Oy	N1		

The structure drawing was provided by the client. Turku University of Applied Sciences has not verified the structure.

This test report or any part of it shall not be reproduced without the written approval of the Turku University of Applied Sciences. The test results are valid only for the tested items.

ASP240-T



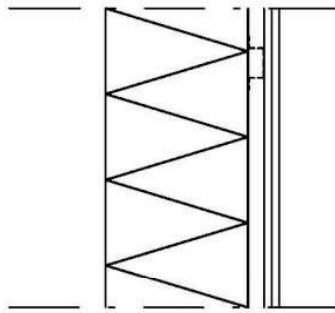
Pelti-villa-peltielementti 240 mm
pintalevy 0,5 mm ulkopuoli
ydin kivivilla 85 kg/m³
pintalevy 0,5 mm sisäpuoli

	Areco Profiles Oy Tehdastie 17 31400 Somero	PIIRUSTUKSEN SISÄLTÖ	MITTA-AAVAT	
		Ääneneristävyydesti, TUAMK Seinärakenne 2	1:10	
SUUNNITTELIJA Areco Profiles Oy		PIIR. NRO. N2	MUUTOS:	

The structure drawing was provided by the client. Turku University of Applied Sciences has not verified the structure.

This test report or any part of it shall not be reproduced without the written approval of the Turku University of Applied Sciences. The test results are valid only for the tested items.

ASP240-T + 2x kipsilevy



Pelti-villa-peltielementti 240 mm
pintalevy 0,5 mm ulkopuoli
ydin kivivilla 85 kg/m³
pintalevy 0,5 mm sisäpuoli
Peltihatturanka
paksuus 0,5-0,6 mm
korkeus 25mm
pysty (tai vaaka) asennus
Erikoiskova kipsilevy 2 kpl saumat limitetty
Knauf KEK 13 mm

areco
PROFILES

Areco Profiles Oy
Tehdastie 17
31400 Somero

PIIRUSTUKSEN SISÄLTÖ

Ääneneristävyydesti, TUAMK
Seinä rakenne 3

MITTAKAAVAT

1:10

SUUNN.

Areco Profiles Oy

PIIR. NRO.

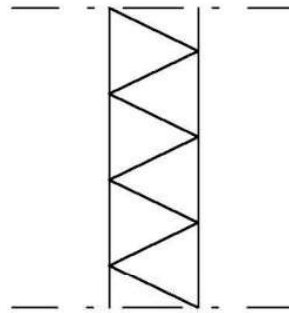
N3

MUUTOS.

The structure drawing was provided by the client. Turku University of Applied Sciences has not verified the structure.

This test report or any part of it shall not be reproduced without the written approval of the Turku University of Applied Sciences. The test results are valid only for the tested items.

ASP240-T



Pelti-villa-peltielementti 150 mm
pintalevy 0,5 mm ulkopuoli
ydin kivivilla 85 kg/m³
pintalevy 0,5 mm sisäpuoli

areco **PROFILES**

Areco Profiles Oy
Tehdastie 17
31400 Somero

PIIRUSTUKSEN SISÄLTÖ

Ääneneristävyydesti, TUAMK
Seinä rakenne 4

MITTAKAAVAT

1:10

SUUNN.

Areco Profiles Oy

PIIR. NRO.

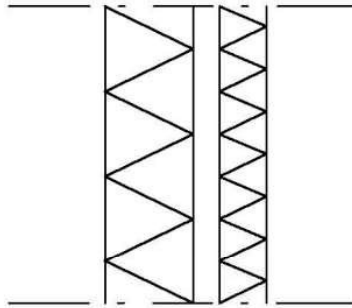
N4

MUUTOS

The structure drawing was provided by the client. Turku University of Applied Sciences has not verified the structure.

This test report or any part of it shall not be reproduced without the written approval of the Turku University of Applied Sciences. The test results are valid only for the tested items.

ASP150-T + ASP-T 80



Pelti-villa-peltielementti 150 mm
pintalevy 0,5 mm ulkopuoli
ydin kivivilla 85 kg/m³
pintalevy 0,5 mm sisäpuoli
Erotusilmaväli 40 mm
Pelti-villa-peltielementti 80 mm
pintalevy 0,5 mm ulkopuoli
ydin kivivilla 85 kg/m³
pintalevy 0,5 mm sisäpuoli

areco **PROFILES**

Areco Profiles Oy
Tehdastie 17
31400 Somero

PIIRUSTUKSEN SISÄLTÖ

Ääneneristävyydesti, TUAMK
Seinä rakenne 5

MITTA-AAVAT

1:10

SUUN.

Areco Profiles Oy

PIIR. NRO.

N5

MUUTOS

The structure drawing was provided by the client. Turku University of Applied Sciences has not verified the structure.

This test report or any part of it shall not be reproduced without the written approval of the Turku University of Applied Sciences. The test results are valid only for the tested items.

ANNEX 3 – MOUNTING OF SPECIMEN

The wall panels were mounted to the 2.6 m² test opening using 60 mm x 60 mm L-shaped steel trims (thickness 1.25 mm) and 20 x 20 mm wood laths. Cavities between test opening and specimen were filled with mineral wool. Masses of the wall panels are presented in Table A3.1.

Pictures of the mountings are presented in Table A3.2.

Table A3.1.

Specimen	Mass [kg]
Seinä rakenne 1	40.5
Seinä rakenne 2	43.5
Seinä rakenne 3	74.1
Seinä rakenne 4	31.5
Seinä rakenne 5	57.0

Table A3.2.



Seinärakenne 2 from the sending room



Seinärakenne 2 from the receiving room



Seinärakenne 3 from the sending room



Seinärakenne 3 from the receiving room



Seinärakenne 4 from the sending room



Seinärakenne 4 from the receiving room



Seinärakenne 5 from the sending room



Seinärakenne 1 from the receiving room



ANNEX 4 – MEASUREMENT ARRANGEMENTS

1 Acoustical measurements

The sound was produced in the source room using five different sound sources and with five uncorrelated pink noise generators (Behringer Ultra curve DEQ 2496). The loudspeaker signals were amplified with three terminal amplifiers (QSC RMX 850, 850, 2450). The sound pressure level in the source room was measured using the rotating microphone boom (Brüel&Kjær 3923, serialnr. 1357240), the condenser microphone and the preamplifier (Brüel&Kjær 4165 and Brüel&Kjær 2669, serialnr. 1829762). The sound pressure level in the receiving room was measured using the rotating microphone boom (Brüel&Kjær 3923, serialnr. 2036590), the condenser microphone (Brüel&Kjær 4165, serialnr. 1867292) and the preamplifier (Brüel&Kjær 2669, serialnr. 1866352). The radius of rotation was 100 cm in both rooms. The averaging time was 64 seconds. The level measurements were made simultaneously. The microphones and the measurement channels were calibrated before the measurements with the sound level calibrator (Brüel&Kjær 4231, serialnr. 2376479).

For the reverberation time measurement in the receiving room, the pink noise test signal was produced with the real time analyzer and amplified with the terminal amplifier (QSC 900 W USA). Two fixed loudspeaker positions were used, and the microphone was placed in three positions. The reverberation time was determined in conformance with ISO 3382-2:2008 using 2 averaged decay signals from the decay range of -5 to -25 dB in each measurement. The sound analysis was made with the two-channel real time analyzer (Norsonic 121, serialnr. 31416).

The acoustical measurement equipment does not fulfil the requirements of IEC 61672, because the manufacturer has not tested the real time analyzer in conformance with IEC 61672-1 and 2.

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

IEC 60651	Sound level meters (replaced by IEC 61672)	type 1
IEC 60804	Integrating sound level meters (replaced by IEC 61672)	type 1
IEC 61260	Octave-band and fractional-octave-band filters	class 1
IEC 60942	Sound level calibrators	class 1

2 Other measurements

The temperature and the relative humidity of the measurement rooms were measured using an environmental measurement device (Thermo Recorder TR-73U, serialnr. E00009). The specimen was weighed with a weighing machine (Vetek TI-500 SL, serialnr. 47359). The dimensions of the specimen were measured with a roll meter (Stanley Fat Max).

3 The uncertainty of sound insulation measurement

The uncertainty of reproducibility expresses the differences between the laboratories. The procedure to determine uncertainty of sound insulation in laboratory tests is defined in standard ISO 12999-1:2014. According to ISO 12999-1 the standard uncertainty for reproducibility of R varies within the measured frequency range (Figure below). The standard uncertainty for reproducibility of the weighted sound reduction index R_w is 1.2 dB.

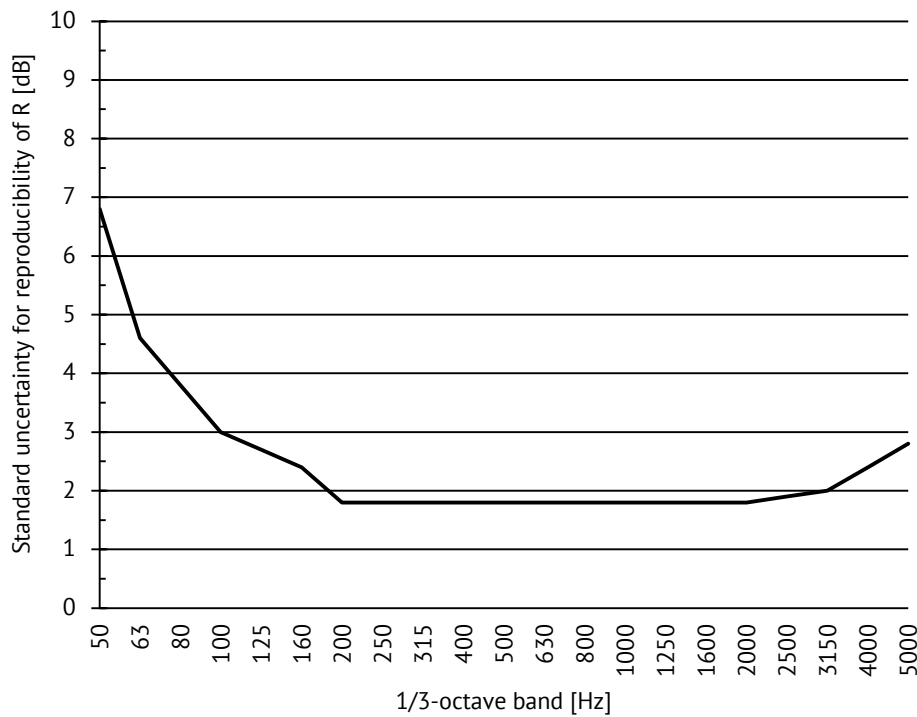


Figure. Standard uncertainty for reproducibility of sound reduction index R within 50–5000 Hz according to ISO 12999-1:2014.

4 References to the ISO standards

ISO 10140-2:2022 (E) Acoustics – Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation

ISO 717-1:2020 (E) Acoustics – Rating of sound insulation of building elements - Part 1: Airborne sound insulation

ISO 3382-2:2008 (E) Acoustics – Measurement of room acoustic parameters - Part 2: Reverberation time in ordinary rooms

ISO 12999-1:2014 (E) Acoustics – Determination and application of measurement uncertainties in building acoustics – Part 1: Sound insulation.