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Notified body No. NB 2253

TEST REPORT No. GLA-1493/ 20 E

Sponsor:

Scandinavian Print Group Polska Sp. z o.o.
ul. Pomorska 112
70-812 Szczecin

Manufacturer:

Scandinavian Print Group Polska Sp. z o.o.
ul. Pomorska 112
70-812 Szczecin

Test specimen:

Akustik lærred – decorative panels

Specimen delivered by: Manufacturer

Delivery Date: **Test Date:**
12.02.2020 r.   12.02.2020 r.

Test method:

PN-EN ISO 354:2005 Acoustics: Measurement of sound absorption in a reverberation room

Tested parameters:

Sound absorption coefficient α_s.

Practical sound absorption coefficient α_p according to: PN-EN ISO 11654:1999 Acoustics.
                                                                                 Sound absorbers use in buildings. Rating of
Single rating α_w sound absorption

Copy No.
The test report consists of 7 pages.
The report was printed in 3 copies. Copies No. 1-2 - for the Client, copy 3 - a/a.

1.   TEST SPECIMEN

1.1   Descreption of test specimen:

The aim of acoustic test was measurement of sound absorption of the decorative panels "**Akustik lærred".**

A single decorative panel was built from a wooden frame filled with a sound absorbing material, 30 mm thickness (two layers of mineral woll "Rockfon Acoustic" 15 mm thick). The wooden frame was made of pine slats with a cross section of 40 x 27 mm and a length of 1000 mm. The frame was covered with acoustic canvas.

Technical data sheet of panel "Akustik lærred"

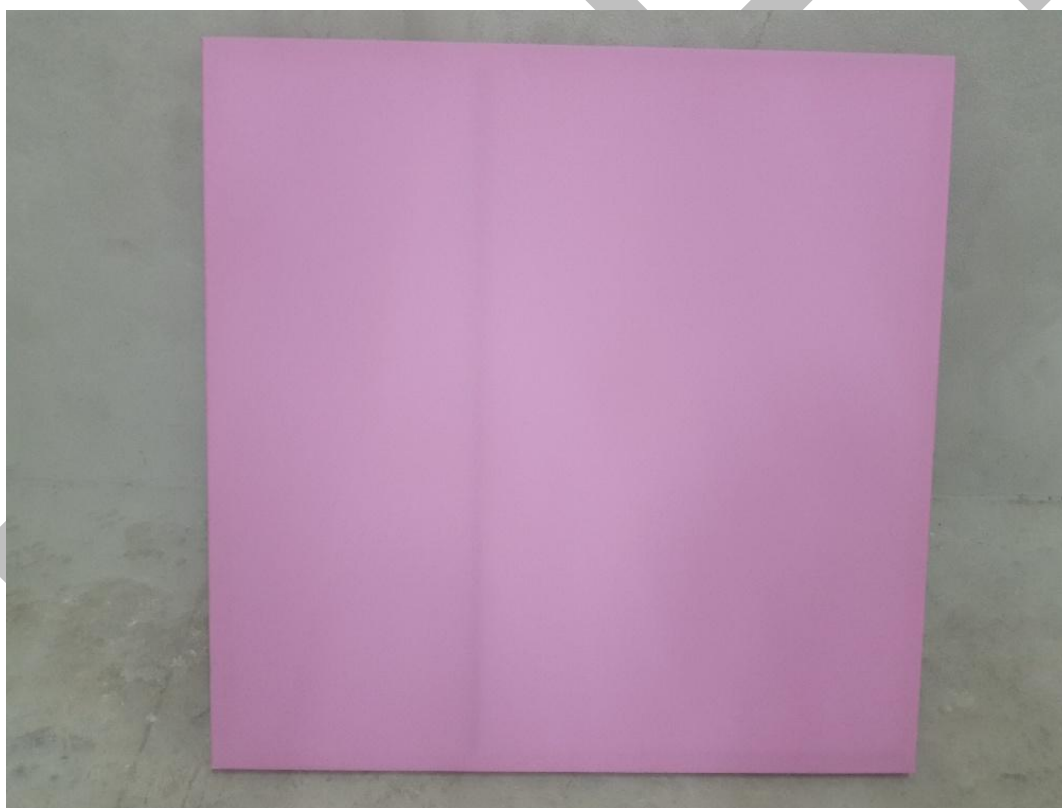| Core	Mineral wool: Rocfon Acoustic, thick 30 mm
Dimensions (length x wide)	1000 x 1000 mm
Thickness	40 mm
Decorative material	Acoustic canvas
Surface mass	is about 5 kg/ m^2

Figure. 1. The single of decorative panel

1.2   The area of testspecimen:
16 m^2 (the dimension of test specimen 4 m x 4 m).
16 decorative panel was used.

1.3 The way of mounting of the test specimen:

The test specimen was putted on the floor in the reverberation room. The mounting type A in accordance with Appendix B of standard PN-EN ISO 354:2005

Figure. 2. Photos are presented the way of mounting of test specimen in the reverberation room. (16 panels were used)

1.4 The measurement conditions:

The test specimen was positioned on the floor that any edge of test specimen were not close than 1 m from the wall of the reverberation room. The measurement conditions is shown in Figure 3.
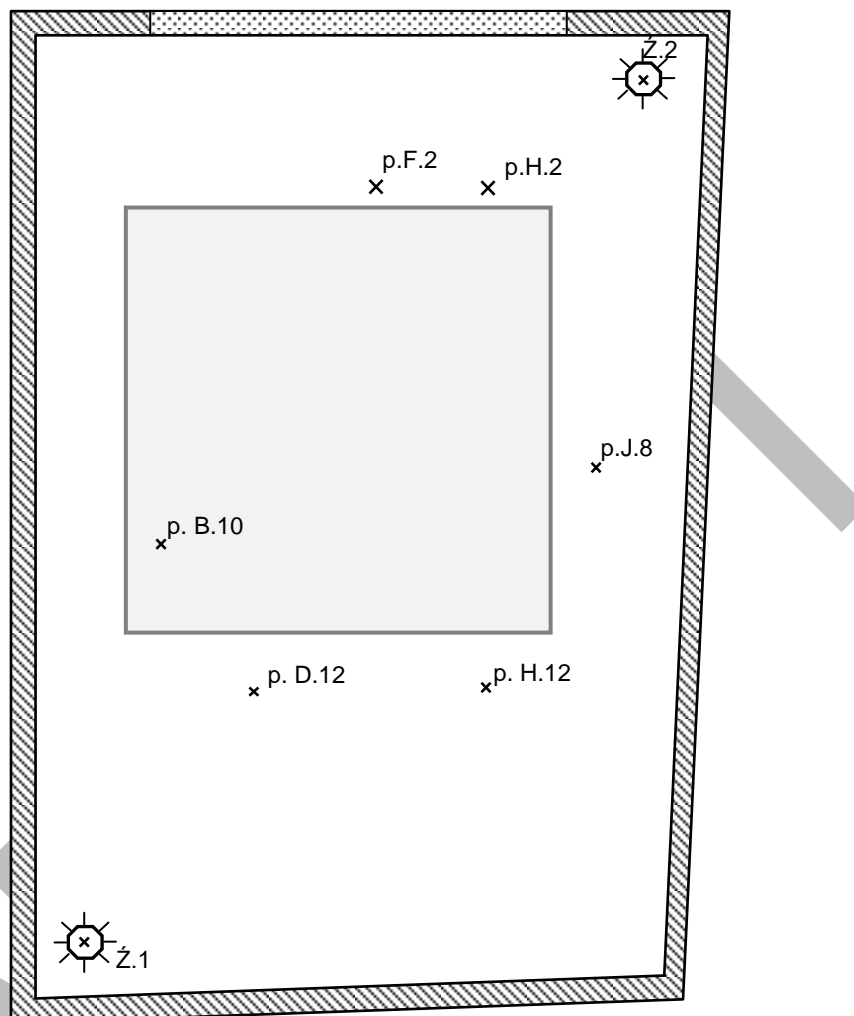

Figure. 3. The cross section of the reverberation room with the test specimen

2. REVERBERATION ROOM

Volume – $V = 324 \text{ m}^3$.

Total surface (walls, floor and ceiling) – $S_t = 291,5 \text{ m}^2$.

The reverberation chamber dimensions (length x width x height) – **9,6 x 6,7 x 5,5 m**.

No walls of the room are parallel to each other. Also the ceiling is not parallel to the floor.

3. TEST EQIPMENT

Microphone: condenser microphone type SV 22, serial no. 4012883, BSWA Technology.

Preamplifier: type SV 12L, serial no. 17873, producer Svantek.

Sound analyzer: type SVAN 948, serial no. 12641, producer Svantek.

Calibrator: type SV-35, serial no. 58156, producer Svantek.

Amplifier with noise generator: power amplifier type RMX3051, producer QSC Audio.

Sound source: omnidirectional sound source.

Thermohygrobarometer: type C4130 serial No. 149000370, producer Comet, PP-LA-122.

4. CERTIFICATES OF PERIODIC INSPECTION OF MEASUREMENT SYSTEM

Measurement system: Analyzer+ Preamplifiers + Microphones – calibration report No. 2178/2018; 2178/4/2018 in HAIK Laboratory.
Calibrator: – calibration report No. 43/01/2020 in Svantek laboratory.

5. MEASUREMENT RESULTS

The sound absorption coefficient α_s, was determined in one third-octave bands between 100 Hz and 5000 Hz according to PN-EN ISO 354:2005. (test results is shown in figure 5).
In addition to the sound absorption coefficient the following characteristic values were determined according to PN-EN ISO 11654:1999.

- Weighted sound absorption coefficient α_w, as single value,
- Practical sound absorption coefficient α_p, in octave bands,
- Class of absorption.

In the below table are sound absorption performance of decorative panels "**Akustik lærred"** manufactured by Scandinavian Print Group Polska Sp. z o.o.

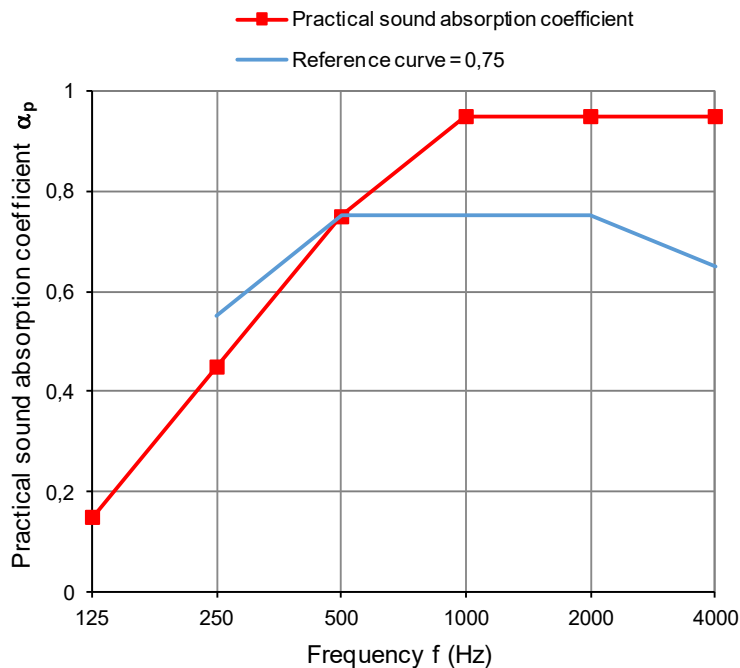| Practical sound absorption coefficient	Frequency (Hz)						Single rating
	125	250	500	1000	2000	4000	α_w
α_p	0,15	0,45	0,75	0,95	0,95	0,95	**0,75 (H)**

Sound absorption class: C

Figure 4 Practical sound absorption coefficient of test specimen No. GLA-1493/ 20.

Form indicators (L, M, H) according to PN-EN ISO 11654:1999

Each time a practical sound absorption coefficient exceeds the shifted reference curve by 0,25 or more form indicators (L, M, H) need to be added to the weighted sound absorption coefficient. The form indicators indicate that one or more octave bands the practical sound absorption coefficient is considerably higher than value of the shifted reference curve. The interested parties are invited to study the absorption characteristic in detail.

For the tested object (decorative panels Akustik lærred) value of practical sound absorption coefficient α_p was exceeded by 0,3 in the 4000 Hz band, and added the indicators "H"

Sound Absorption Coefficient

PN-EN ISO 354:2005 (EN ISO 354:2003) Measurement of sound absorption in a reverberation room

Client: **Scandinavian Print Group Polska Sp. z o.o.**   Measurement date: **12.02.2020**

Address: **ul. Pomorska 112,**
70-812 Szczecin

Test Specimen: **Akustik lærred - Decorative panel**

The panel built up wooden frame filled sound absorbing material Rockfon Acoustic, thickness 30 mm.

The wooden frame was covered the acoustic canvas.

Dimensions of panel: 1000 x 1000 x 40 mm (length x width x thickness)

Type of mounting the test specimen in the reverberation room : **A**

Reverberation room:

Volume of reverberation room   **V = 324 m³**

Surface of all partitions reverberation room **S$_t$ = 291,5m²**

Number of Diffusers: **5**

Test specimen area: **16 m²**

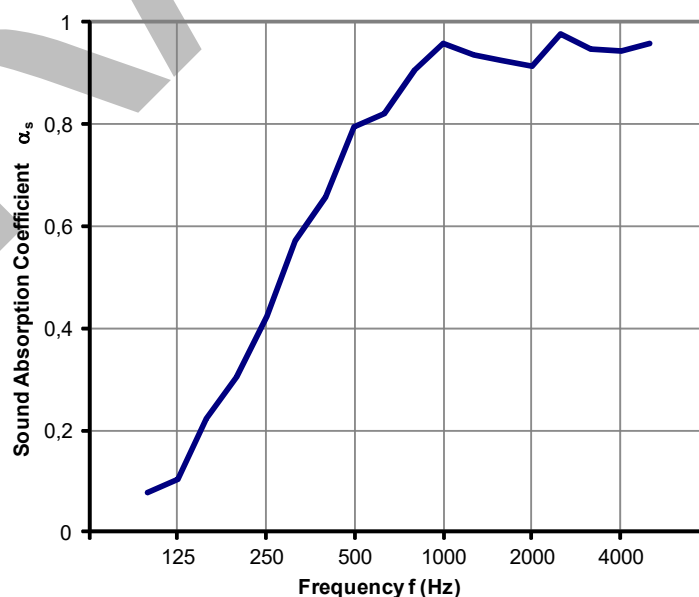Air temperature of empty room T$_1$:   **15,8 °C**

Air temperature of room with object :   **15,4 °C**

Relative humidity in empty room T$_1$:   **56 %**

Relative humidity; object in room T$_2$ **55 %**

Frequency	Reverberation time empty room	Reverberation time filled room	Sound Absorption Coefficient	
f	T1	T2	α_s	α_p
(Hz)	(s)	(s)		
100	6,80	5,86	0,08	
125	6,39	5,32	0,10	0,15
160	6,49	4,50	0,22	
200	6,80	4,17	0,31	
250	7,51	3,81	0,43	0,45
315	7,46	3,25	0,57	
400	7,25	2,96	0,66	
500	6,66	2,55	0,80	0,75
630	6,29	2,45	0,82	
800	6,14	2,28	0,91	
1000	5,78	2,16	0,96	0,95
1250	5,24	2,10	0,94	
1600	4,61	2,01	0,93	
2000	3,91	1,87	0,91	0,95
2500	3,25	1,65	0,98	
3150	2,73	1,53	0,95	
4000	2,22	1,36	0,94	0,95
5000	1,77	1,17	0,96	

PN-EN ISO 11654:1999

α_w= 0,75 (H)

Sound absorption class: C

GRYFITLAB Sp. z o.o. Laboratory of Acoustics

Date: 12.02.2020   Signature: Robert Dybicz

Figure. 5   Measurement results of the test specimen No. GLA-1493 / 20

6.   The precision of the measurement s

Accuracy of measurement reverberation time.

The standard deviation of reverberation time T_{20}, evaluated over a 20 dB decay range can be estimated by following formula (PN-EN ISO 354: 2005 – point 8.2.2).

$$\varepsilon_{20}(T) = T\sqrt{\frac{2{,}42 + 3{,}59/N}{fT}}$$

$\varepsilon_{20}(T)$ - The standard deviation of reverberation time T_{20},
T – the measured reverberation time; T_1 time for the empty room, T_2 time for the fitted room (s),
f – the centre frequency of one-third-octave band (Hz),
N – the number of decay curves evaluated.

Accuracy of measurement sound absorption coefficient.

The standard deviation of sound absorption coefficient $\varepsilon(\alpha)$, can be estimated by following formula

$$\varepsilon(\alpha) = \frac{55{,}3 \cdot V}{c \cdot S}\sqrt{\left(\frac{\partial \alpha}{\partial T_2}\varepsilon_{T2}\right)^2 + \left(\frac{\partial \alpha}{\partial T_1}\varepsilon_{T1}\right)^2} = \frac{55{,}3 \cdot V}{c \cdot S}\sqrt{\left(-\frac{1}{T_2^2}\varepsilon_{T2}\right)^2 + \left(-\frac{1}{T_1^2}\varepsilon_{T1}\right)^2}$$

V – the volume of reverberation room (m^3),
c – the speed of sound (m/s),
S – the area of test specimen (m^2).

Tab. 1 The standard deviation of sound absorption coefficient $\varepsilon(\alpha)$ for test specimen No. GLA-1493/20

f	Empty room		Fitted room		Accuracy
	T1	ε_{T1}	T2	ε_{T2}	$\varepsilon(\alpha)$
Hz	s		s		
100	6,80	0,41	5,86	0,38	0,05
125	6,39	0,36	5,32	0,33	0,05
160	6,49	0,32	4,50	0,27	0,05
200	6,80	0,29	4,17	0,23	0,05
250	7,51	0,28	3,81	0,20	0,05
315	7,46	0,24	3,25	0,16	0,05
400	7,25	0,21	2,96	0,14	0,05
500	6,66	0,18	2,55	0,11	0,06
630	6,29	0,16	2,45	0,10	0,06
800	6,14	0,14	2,28	0,08	0,05
1000	5,78	0,12	2,16	0,07	0,05
1250	5,24	0,10	2,10	0,07	0,05
1600	4,61	0,09	2,01	0,06	0,05
2000	3,91	0,07	1,87	0,05	0,05
2500	3,25	0,06	1,65	0,04	0,05
3150	2,73	0,05	1,53	0,03	0,05
4000	2,22	0,04	1,36	0,03	0,06
5000	1,77	0,03	1,17	0,02	0,07

Responsible for preparation of the test report:	Responsible for authorization of the test report:	Report issue date: 25. February 2020
Robert Dybicz, MSc	Krzysztof Mech, PhD	