



AB 1241

CENTRUM TECHNIKI OKRĘTOWEJ S.A.

Ship Design and Research Centre S.A.

ZAKŁAD BADAWCZO-ROZWOJOWY



ZESPÓŁ LABORATORIÓW BADAŃ ŚRODOWISKOWYCH

LABORATORIUM BADAŃ WIBROAKUSTYCZNYCH



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NB 2434

MEASUREMENT REPORT

No RS-2018/B-185

The measurement of the sound absorption coefficient
of the soft, acoustic Fluffo Soft wall panels,
produced by „Paweł Sumiński Fabryka Miękkich Ścian”

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1. Basic data

Table 1. Summary of data and sample test parameters as described at CTO S.A.

Principal: Paweł Sumiński Fabryka Miękkich Ścian Ul. Głębczycka 37/3 02-424 Warszawa	Order (via e-mail) of: 21.01.2018 Internal CTO S.A. order no.: 8:446:04:223	
Name and type of tested product: <i>Fluffo Soft</i> soft, acoustic wall panels, of “Paweł Sumiński Fabryka Miękkich Ścian”	Date of acceptance of the object for testing: 29.01.2018 Date and place of measurement: 06.02.2018 Gdansk, Laboratory of Vibro-acoustic Testing, Environmental Laboratories Division	
Producer: Paweł Sumiński Fabryka Miękkich Ścian Ul. Głębczycka 37/3 02-424 Warszawa	Testing methodology and result analysis: In accordance with the documents: <ul style="list-style-type: none"> • PN-EN ISO 354:2005 standard • PN-EN ISO 11654:1997 standard 	
Sample labeling at CTO S.A.: LA965	Conditions for performing the test	(start / finish of the test)
	Relative humidity	Detailed results for the test shown in chapter 5.
	Air temperature	
Atmospheric pressure		
Measurement equipment:	Canal 1	Canal 2
Test leads	0SvankK3	1SvankK3
Measurement microphones	Norsonic type 1225 Serial no 284627	Norsonic type 1225 Serial no 285516
Preamplifier	Norsonic type 1209 Serial no 21138	Norsonic type 1209 Serial no 21137
Analyser	Norsonic Nor 140 serial no 1406930	Norsonic Nor 140 serial no 1406929
Calibrator	Larson Davis CAL200 serial no 11524	
Sound source	Larson Davis BAS001 serial no 1225-DIC08	
Thermo-hygro-barometer	LB-706BP, no 846 LB-701, no 3605	
Wind-up measuring tape	RS/0003	
Sound absorption measurement results:		
Measurand	Measured value	
α_s - sound absorption coefficient	$\alpha_w = 0,80$ (H)	
Sound absorption chart in the frequency function and other important information have been presented in accordance with PN-EN ISO 354:2005 standard in chapter no 5.		
Attention: The presented test results are valid only for the tested product.		

2. Testing Methodology

The measurement of sound absorption of the soft acoustic *Fluffo Soft* wall panels, produced by “Paweł Sumiński Fabryka Miękkich Ścian” was conducted in the reverberation chamber of 200m³ volume at the Laboratory of Vibro-acoustic Testing, Environmental Laboratories Division in Gdansk. Specifications of the chamber are stated in appendix no 1. The reverberation chamber has been tuned to the reverberation time required by PN-EN-ISO 354:2005 standard by placing 3 elements of sound absorbing – dispersing properties and 8 dispersing elements where the sound absorption surface was in line with Table 2.

Table 2. Equivalent fields of sound absorbent surface for sound absorption coefficient testing chamber of 200m³ capacity.

Frequency, Hz	100	125	160	200	250	315	400	500	630	800
A ₁ ,m ² - laboratory means	4,2	4,0	4,6	4,8	5,5	5,6	5,6	5,6	5,8	5,9
A ₁ maximum standard value	6,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5
Frequency, Hz			1000	1250	1600	2000	2500	3150	4000	5000
A ₁ ,m ² - laboratory means			6,1	6,3	6,7	7,1	8,0	9,4	11,1	13,6
A ₁ maximum standard value			7,0	7,5	8,0	9,5	10,5	12,0	13,0	14,0

The measurement was conducted with 12 settings of the microphone – source. The measurement of each of the 12 settings of the microphone – source was repeated 3 times in accordance with the PN-EN ISO 354:2005 standard requirement. The tested sample has been mounted directly on the floor of the measurement chamber, at a minimum 1000 mm distance from the wall, in accordance with type “A” assembly. Eight sound dispersing elements of 16m² total surface were hung in the chamber. The measurement was conducted with the use of Norsonic Nor 140, and the sound absorption analysis conducted with the use of “Nor 850 – Building Acoustics” program. The measurement was executed with the application of “Measurement of sound absorption in the reverberation chamber” research methodologies as per PN-EN ISO 354:2005 standard. Due to the intended use of the tested panels the side surface of the sample was included in the measurement.

3. Technical description of the *Fluffo Soft* wall panels

The test was conducted on *Fluffo Soft* soft, acoustic wall panels, produced by *Paweł Sumiński Fabryka Miękkich Ścian*.

Table 3. Technical description of the tested sample – summary

Name of the object	Symbol of the object	No of tested sample
<i>Fluffo Soft</i> soft, acoustic wall panels	LA965	B96502

Description of the tested sample

The tested *Fluffo Soft* soft, acoustic wall panels, marked as LA965, are produced from flexible polyurethane foam, covered with decorative layer of polyamide flock. The tested panels were 50 mm thick. The product is offered in numerous shapes and several dozen colours.

Purpose of the panels: *Fluffo Soft* soft, acoustic wall panels can be applied everywhere where there is a need for sound absorbent materials.

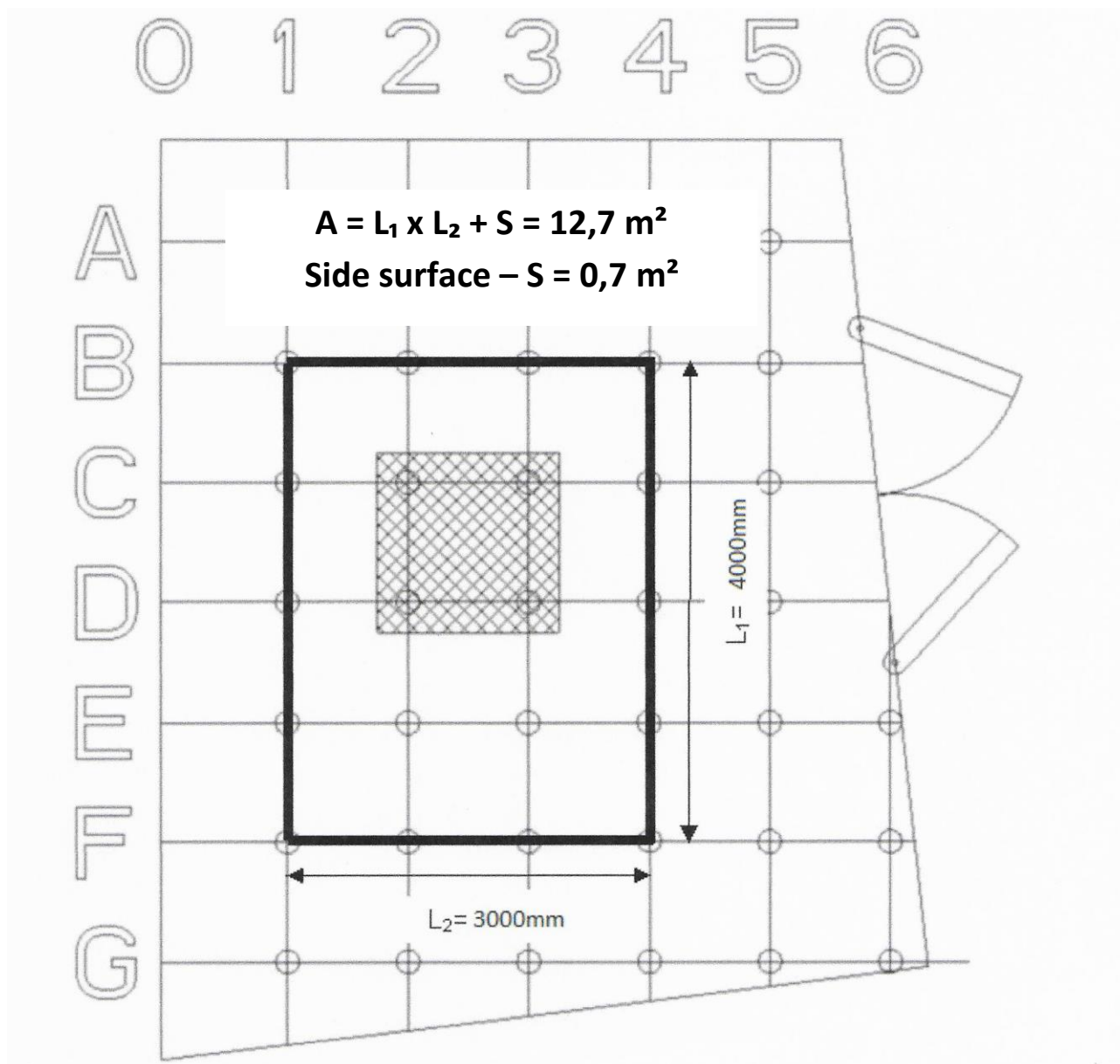
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Photograph of the *Fluffo Soft* soft, acoustic wall panel samples, produced by *Paweł Sumiński Fabryka Miękkich Ścian*, in the 200m² volume measuring chamber at the Laboratory of Vibro-acoustic Testing, Environmental Laboratories Division CTO S.A. presented in picture no 1.



Pic. 1. Photograph of sample LA679, *Fluffo Soft* soft, acoustic wall panels, in the reverberation chamber at the Laboratory of Vibro-acoustic Testing, Environmental CTO S.A.

Scheme of the arrangement of all tested *Fluffo Soft* soft, acoustic wall panel samples in the measurement chamber at CTO S.A. described in the Pic 3.



Pic. 3. Scheme of the arrangement of all tested samples of *Fluffo Soft* soft, acoustic wall panels in the measurement chamber at CTO S.A.

The tested sample, in the shape of a 4000mm x 3000mm rectangle, 50 mm thick, with side surface of 0,7m², of total sound absorption area of 12.7 m², has been placed on the floor of the chamber without adhesion. The panels have been placed closely together, with minimum distance from the wall of 1000mm in accordance with type A assembly described in the standard. The side surface of the tested samples has also taken part in the test. The maximum surface of the sample recommended by the standard is from 10 to 12m², nevertheless the tested surface amounted to 12.7m² due to the standard linear dimensions of the samples delivered by the producer.

Table 4 presents the time schedule of the work in regards to sample testing.

Table 4. Testing schedule

Object symbol	Operation	Date
LA965	Date of sample admission:	29.01.2018
	Sample seasoning time	01.02-06.02 - 2018
	Date of assembly of sample	01.02.2018
	Date of the measurement	06.02.2018
	Date of dismantling of sample	06.02.2018

The sample was seasoned for 6 days in a hall, with monitored environmental conditions (temperature and humidity).

Execution of the measurement

The measurement has been conducted in accordance with the PN-EN ISO 354:2005 standard. Before the execution of the measurement a calibration of the measuring lines was conducted and a description of the conditions within the reverberation chamber was characterized. The measurement was conducted with the use of two microphones arranged in 6 positions for 2 locations of sound source. For each of the configurations the measurement was repeated 3 times giving a total of 36 measurements.

4. Analysis and summary of the test results

After the measurement, the data from the meter was loaded into the “Nor 850 – Building Acoustics” program and analyzed. The effect of this analysis is the sound absorption chart in frequency band divided into thirds along with reverberation time, which has been detailed in table 5. The sound absorption coefficient and class have been defined in accordance with the PN-EN ISO 11654:1997 standard, as per table 5.

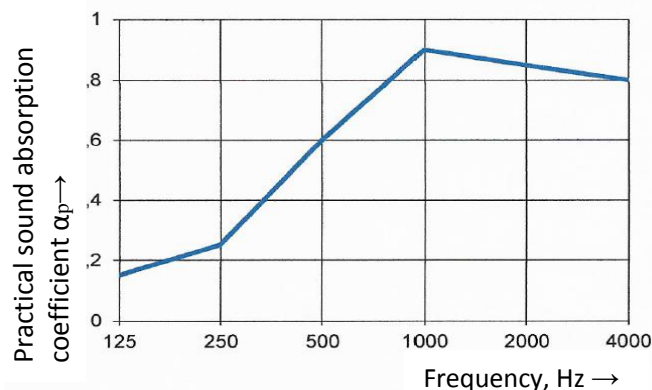
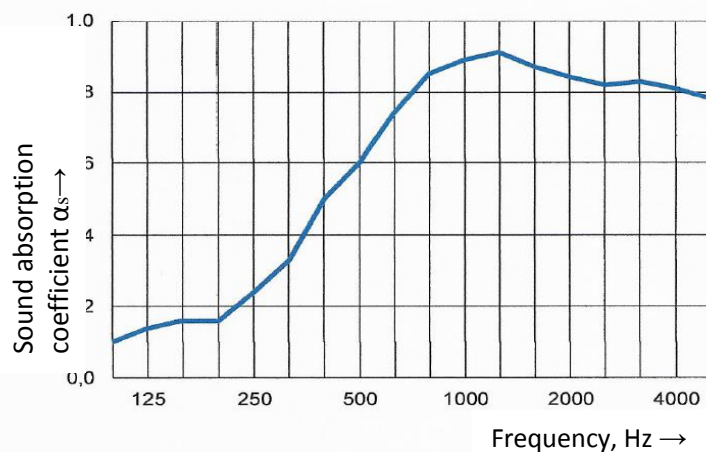
Table 5. The sample sound absorption measurement results at the Laboratory of Vibro-acoustic Testing, Environmental Laboratories Division CTO S.A., in accordance with the PN-EN ISO 354:2005 standard

Sound absorbency coefficient in accordance with PN-EN ISO 354:2005 standard
Measurement of sound absorption in reverberation chamber

Client: Paweł Sumiński Fabryka Miękkich Ścian, ul. Głubczycka 37/3 02-424 Warsaw **Date:** 06.02.2018
Research Laboratory: CTO S.A. Laboratory of Vibro-acoustic Testing, Environmental Laboratories Division
Sample No: LA965
Description: *Fluffo Soft* soft, acoustic wall panels. The panels are produced from flexible polyurethane foam (base material) covered with polyamide flock (top decorative layer). Tested directly on the floor of the chamber (48 units placed proportionally 6x8) without adhesion. Dimensions of the panels: 500x500x50mm. The side surface of the sample has been included in the measurement.

External surface of sample: Volume of measurement chamber:	12,7m ²	Empty reverberation chamber:	Reverberation chamber with sample:
		Relative humidity: 32,8 %	Relative humidity: 36,5 %
	200,0m ²	Air temperature: 21,0 °C	Air temperature: 20,9 °C
		Atmospheric pressure: 101,2 kPa	Atmospheric pressure: 101,3 kPa

Frequency f [Hz]	Empty T1 [s]	Sample T2 [s]	α_s	α_p
100	6,73	5,35	0,10	0,15
125	7,36	5,26	0,14	
160	6,20	4,46	0,16	
200	5,50	4,10	0,16	0,25
250	5,11	3,44	0,24	
315	5,06	3,09	0,33	
400	5,13	2,58	0,50	0,60
500	5,08	2,36	0,60	
630	4,90	2,06	0,74	
800	4,67	1,87	0,85	0,90
1000	4,34	1,77	0,89	
1250	4,24	1,72	0,91	
1600	4,00	1,71	0,87	0,85
2000	3,69	1,67	0,84	
2500	3,30	1,58	0,82	
3150	2,83	1,43	0,83	0,80
4000	2,38	1,28	0,81	
5000	1,98	1,12	0,78	



Sound absorption coefficient in accordance with PN-EN ISO 11654:1997

$\alpha_w = 0,80$ (H)

Sound absorption class: B

Measurement No: B96501

Date: 06.02.2018

Signature: Piotr Jakubowski

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There is 1 Attachment to this report

- **Attachment 1** – Shape of the measurement chamber

Project leader

Acoustics Specialist

Dr. Eng. Piotr Jakubowski

Autorized by

Manager of the Vibro-acoustic
Testing Laboratory

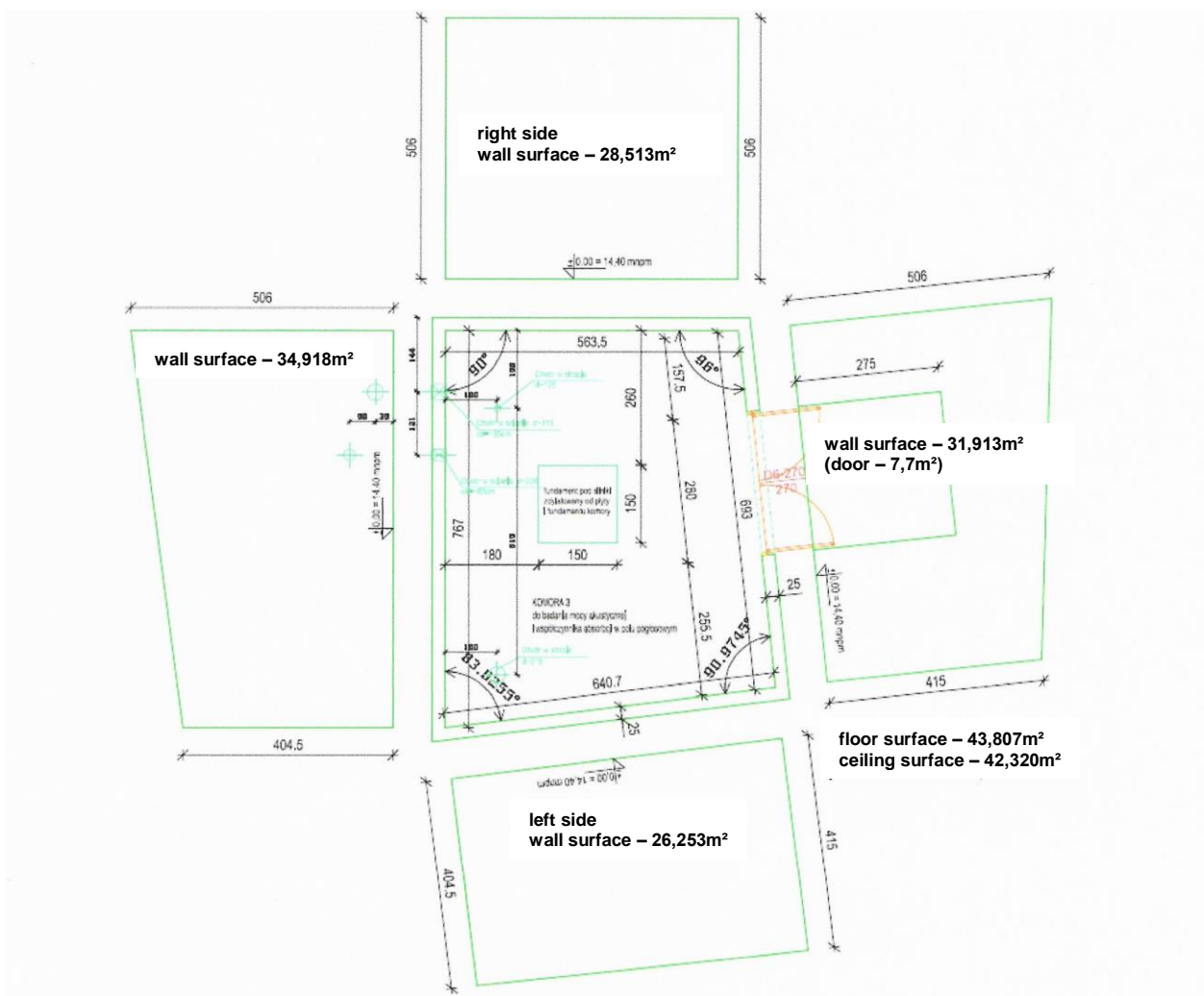
Dr. Eng. Piotr Jakubowski

Team Manager

Head of the Environmental
Research Laboratory Team

Dr. Eng. Mateusz Weryk

ATTACHMENT 1 – shape of the measurement chamber



Geometric dimensions of the reverberation chamber for the purpose of determination of the acoustic absorption coefficient α_s .

The volume and wall surfaces of Chamber No 3

	Chamber No. 3	
Volume	V [m³]	200,095
floor	S1 [m ²]	43,807
ceiling	S2 [m ²]	42,320
To the right of the door	S3 [m ²]	28,513
Wall with the door	S4 [m ²]	31,913
To the left of the door	S5 [m ²]	26,253
The wall opposite the door	S6 [m ²]	34,918
	Total vol. [m²]	207,724

Diagonals of the reverberation chamber No 3

Chamber No. 3
10,77
10,34
10,65
10,25

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