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UM TECHNIKI OKRĘTOWEJ S.A.
Advanced Research Centre

RESEARCH AND DEVELOPMENT DEPARTMENT
ENVIRONMENTAL LABORATORIES DIVISION
VIBROACOUSTIC TESTS LABORATORY



TEST REPORT

No RS-2023/B-026/E

Sound absorption coefficient test
LAMELIO wall panels from
Ars Longa Trade Daniel Turkowiak

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1. Basic data

Tab. 1. Summary of data and test parameters.

Customer: Ars Longa Trade Daniel Turkowiak Przyczyna Dolna 77 67-400 Wschowa	Order (e-mail): 27.12.2022 CTO S.A. order number: 8.441.05.223	
	Delivery date of test object: 03.01.2023	
Manufacturer: Ars Longa Trade Daniel Turkowiak Przyczyna Dolna 77 67-400 Wschowa	Date and place of measurements: Gdańsk, 03.01.2023 Ship Design And Research Centre Environmental Laboratories Division Vibroacoustic Tests Laboratory	
	The method of measurement and analysis of the results: According to the standards: <ul style="list-style-type: none"> Standard No.: PN-EN ISO 354:2005 	
Name and type of test object: LAMELIO wall panels made of polystyrene by <i>Ars Longa Trade Daniel Turkowiak</i> .	Measurement conditions: Air Temperature: 19,1 °C Relative Humidity: 42,3% Atmospheric Pressure: 101,2 kPa	
Designation of the test object in CTO S.A.: LA1895		
Measuring equipment:	Channel 1	Channel 2
microphone	Norsonic 1225 Serial no. 284627	Norsonic 1225 Serial no. 285516
preamplifier	Norsonic 1209 Serial no. 21138	Norsonic 1209 Serial no. 21137
thermo-hygro-barometer	EE02-FT01 Serial no 30092	EE02-FT01 Serial no 30094
sound source	Larson Davis, BAS001 nr 1225-DIC08 Larson Davis, BAS002 nr A036	
meter	Norsonic Nor 140 Serial no. 1406930	Norsonic Nor 140 serial no. 1406929
calibrator	Larson Davis CAL200, Serial No. 11524	
Sound absorption results:		
α_w - sound absorption coefficient	$\alpha_w = 0,10$	
Graph of sound absorption as a function of frequency and other relevant information is presented in a form compatible with the PN-EN ISO 354:2005 in chapter 5.		
Attention: Presented values are valid only for the tested object.		

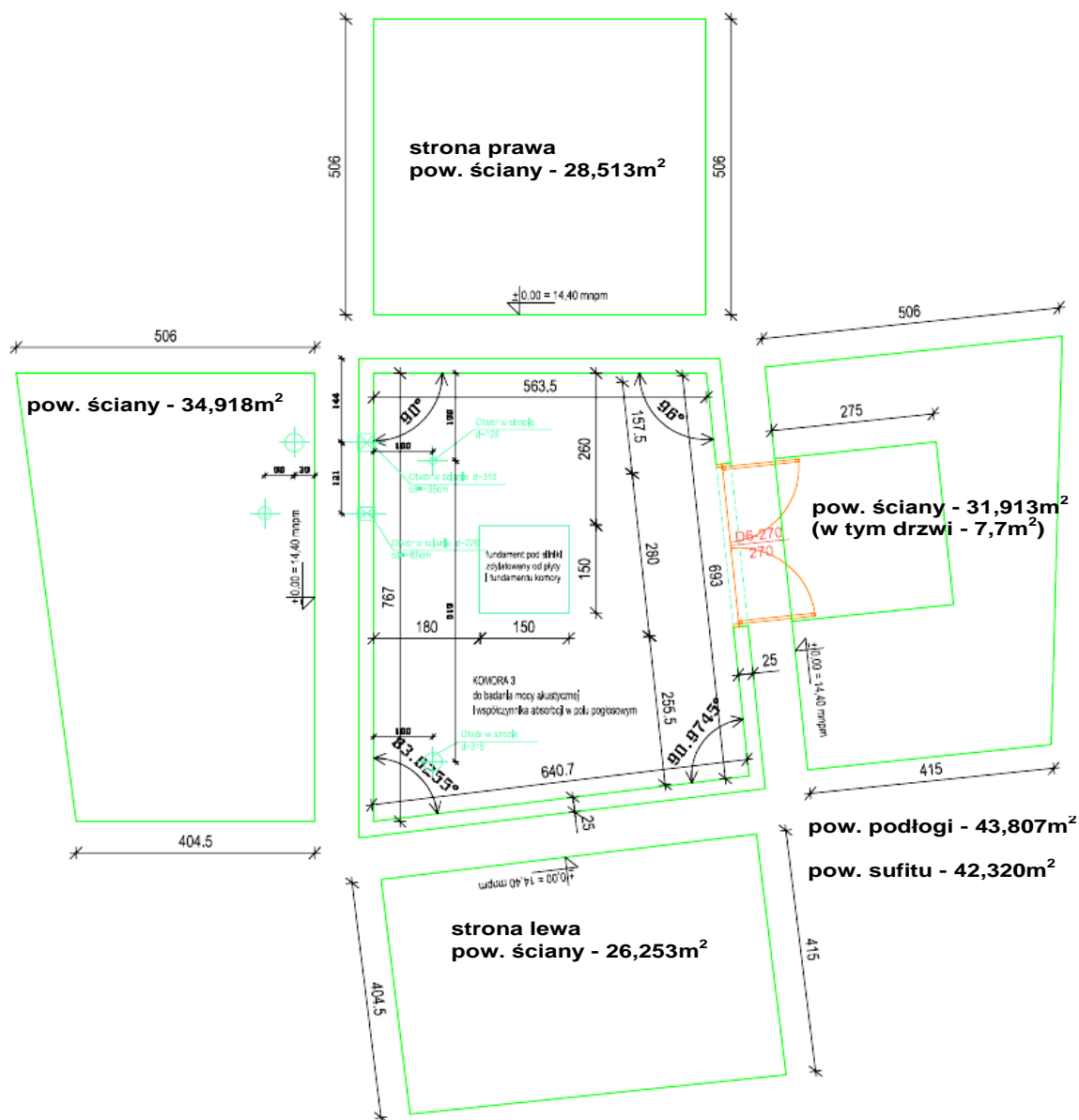
2. Test method

Measurement of sound absorption of LAMELIO wall panels from *Ars Longa Trade Daniel Turkowiak* designated as LA1895, was performed in performed in the Vibroacoustic Research Laboratory in the reverb chamber K3 volume 200 m³ and total area of 207,72 m². Chamber specifications are placed in appendix No. 1. Reverberation chamber was tuned to achieve reverberation time required by the PN-EN ISO 354:2005. This was achieved through setting up 3 attenuator – diffusers and 8 diffusers. Their sound absorption area comply with Tab. 2.

Tab. 2. Equivalent sound absorption areas for a 200 m³ reverberation chamber for sound absorption coefficient measurements.

Frequency, Hz	100	125	160	200	250	315	400	500	630	800
A ₁ , m ² - Value measured in laboratory	4,2	4,0	4,6	4,8	5,5	5,6	5,6	5,6	5,8	5,9
A ₁ Max value acc. to norm	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 - Value measured in laboratory	6,1	6,3	6,7	7,1	8,0	9,4	11,1	13,6		
A ₁ Max value acc. to norm	7,0	7,5	8,0	9,5	10,5	12,0	13,0	14,0		

Measurements were carried out in 12 microphone – sound source positions. Measurement in each position was repeated 3 times for two microphone heights, in accordance with requirements in PN-EN ISO 354:2005. The test sample was mounted directly on the floor of the measuring chamber, at a minimum distance of 1000 mm from the wall, according to the “A” mounting. The test was carried out using the Nor 140 meter from Norsonic, and the acoustic insulation of the object was analyzed using the Nor 850 – Building Acoustics program. The tests were carried out using the test methodology according to PN-EN ISO 354:2005 “Measurement of sound absorption in the reverberation chamber.” The chamber K3, a drawing with dimensions and a table with surfaces, is shown in Figure 1.



Geometric dimensions of the reverberation chamber

Volume and wall surfaces of Chamber No. 3			Diagonal echo chamber No. 3	
	Chamber	No. 3	Chamber No. 3 [m]	
volume	V [m³]	200,095	10,77	
floor	S1 [m²]	43,807	10,34	
ceiling	S2 [m²]	42,320	10,65	
on the right	S3 [m²]	28,513	10,25	
wall with door	S4 [m²]	31,913		
on the left	S5 [m²]	26,253		
opposite of the door	S6 [m²]	34,918		
	total area [m²]	207,724		

Figure 1. Plan, dimensions and surfaces of the reverb chamber K3

3. Description of the tested object

Technical description

The subject of the study were LAMELIO wall panels manufactured by Ars Longa Trade Daniel Turkowiak, made of polystyrene. The sample consisted of individual panels with a width of 120 mm, a height of 12 mm and a length of 2540 mm. The total area of the sample tested was 11,21 m² (CTO measurement).

Photo of Norac As ship ceiling in reverberation chamber with volume of 200 m³ in Vibroacoustic Tests Laboratory in CTO S.A., presented in fig. 2.



Fig. 2. Test object LA1895 photo LAMELIO wall panels, in reverberation chamber in Vibroacoustic Tests Laboratory in CTO S.A.

The diagram of the measuring chamber K3 in the Vibroacoustic Research Laboratory is shown in Figure 3.

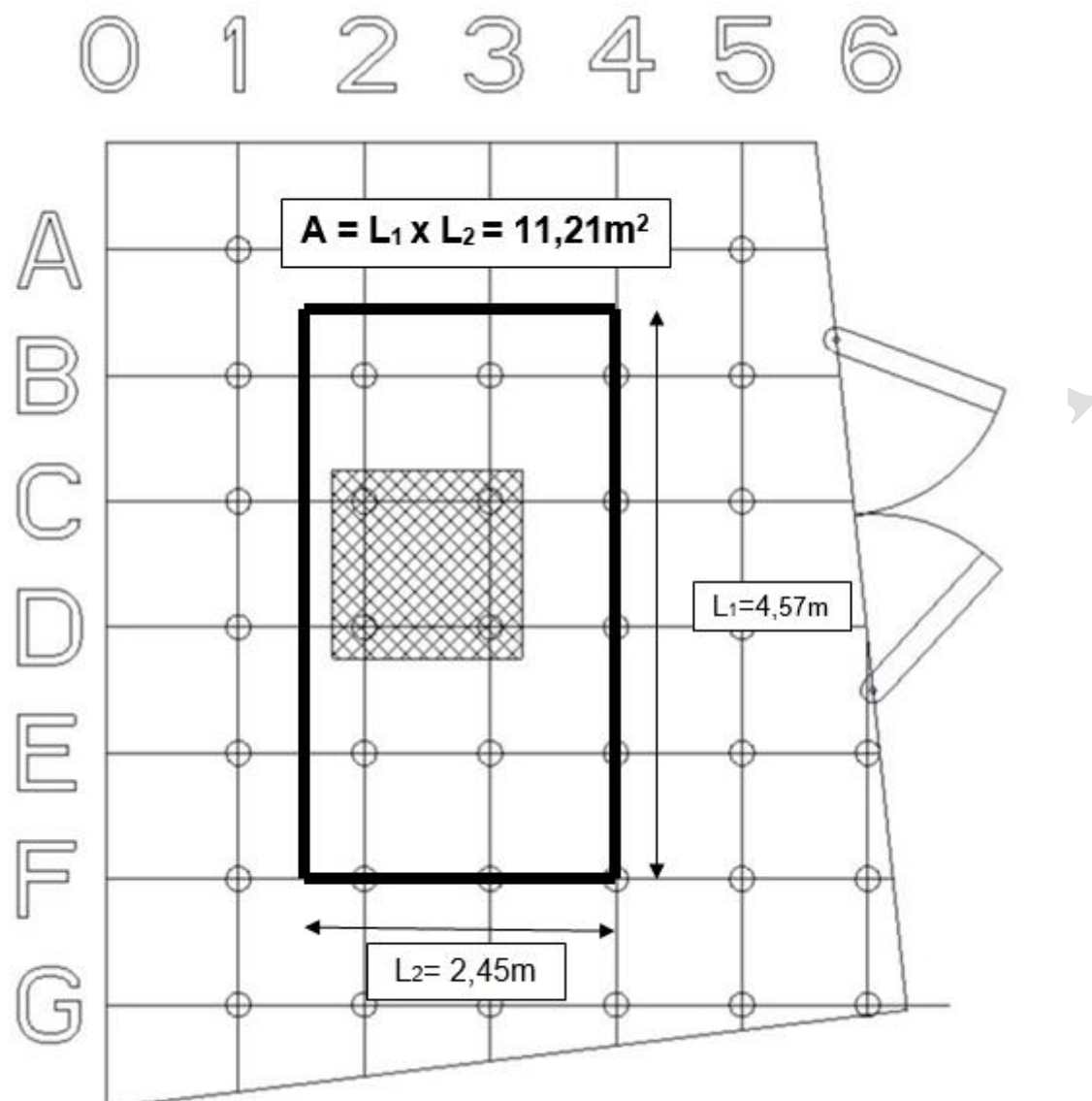


Fig. 3. Scheme of placing the sample in the measuring chamber at the Vibroacoustic Testing Laboratory CTO.

LAMELIO panels are installed directly on the floor of the reverberation chamber, without attachment, according to the manufacturer's recommendations. The panels were arranged parallel to the walls of the K3 measuring chamber, close to each other, at a minimum distance of 1000 mm from the wall according to the type "A" installation described in PN-EN ISO 354:2005. The area participating in the study was $11,21\text{ m}^2$.

Tab. 3 shows schedule of the study.

Tab. 3. Schedule of the test

No. test object	Step	Date
LA1895	Delivery date	03.01.2023
	Acclimatization	03.01.2023
	Mounting	03.01.2023
	Measurement	03.01.2023
	Removal of the test object	03.01.2023

Test object was acclimatized in reverberation chamber in accordance with procedure RS-11/R-06.

4. Measurement

Study was carried out in accordance with methodology described in PN-EN ISO 354:2005. Before the measurement, calibration of measuring channels was performed and conditions in reverberation chamber were written down. Test was done with two microphones in 6 positions for 2 heights and 2 positions of sound source. The measurement was repeated 3 times for each arrangement. A total of 72 measurements was done for the test.

5. Analysis and summary of the test results

After the test, data from the analyzer were uploaded to NorBuild application and analyzed. The analysis resulted with a graph showing sound absorption as a function of frequency in 1/3 octave band, together with reverberation time. The results are presented in tab. 4. Sound absorption coefficient in accordance with norm PN-EN ISO 354:2005 are also shown in tab. 4.

Tab. 5. Results of sound absorption measurements for test object LA1895 performed in Vibroacoustic Tests Laboratory in CTO S.A., in accordance with PN-EN ISO 354:2005.

Sound absorption coefficient according to norm PN-EN ISO 354:2005																																																																																																	
Sound absorption measurement in reverberation chamber.																																																																																																	
Client:	Ars Longa Trade Daniel Turkowiak, Przyczyna Dolna 77, 67-400 Wschowa			Date of test: 03.01.2023																																																																																													
Test room identification:	CTO S.A. Environmental Laboratories Division. Vibroacoustic Tests Laboratory																																																																																																
Test object designation:	LA1895																																																																																																
Description:	Lamelio wall panels made of polystyrene, 116 mm wide and 2540 mm long (dimensions for a single slat), total sample area 11. 21 m ²																																																																																																
Surface area of test object:	11,21 m ²	Empty reverberation chamber:	Relative humidity: 42,3 %	Reverberation chamber with test object:																																																																																													
Reverberation chamber volume:	200,0 m ³	Air temperature: 19,8 °C	Relative humidity: 42,3 %	Relative humidity: 42,3 %																																																																																													
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Date:	03.01.2023	Sign:	Piotr Jakubowski																																																																																														

1 appendices are attached to this test report (1 page):

- APPENDIX 1 - Technical documentation provided by the Client

Project leader
*Head of Vibroacoustic Research
Laboratory*

Authorised by
Senior Acoustics Specialist

Supervisor
*Head of the Environmental
Laboratories Division*

P.J.

END OF REPORT

