TEST REPORT No. B2023-LACUS-IN-195-8

CLIENT:	**ISINAC ACOUSTIC WORLD, S.L.** Calle López de Neira 3, 3º - Oficina 301 36203 VIGO
AIM:	**Laboratory measurement of airborne sound insulation**
STANDARD:	**EN ISO 10140-2:2021**
TEST SPECIMEN:	**Curtain *ISINAC CURTAIN IZZER*, with folded arrangement**
ISSUE DATE:	**03/03/2023**

Technical Consultant
Susana Lopez de Aretxaga

LAB_SERVICES

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- The results of the current report concern only and exclusively the test specimen.
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- Uncertainty related to the tests is available to the customer, if required.
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1. TEST SPECIMEN DESCRIPTION

The test specimen consists of a folded curtain, with the following description and test arrangement, according to the information provided by the client:

Description of the curtain:

Reference: ISINAC CURTAIN IZZER

Manufacturer: ISINAC ACOUSTIC WORLD, S.L

Composition: Each curtain panel is formed by 4 layers sewn around the perimeter:

- IZZER FABRIC 100% WOOL (~2 mm & 460 gr/m^2), in exposed layers
- PX210 FABRIC 100% CARBON FIBER (~3 mm & 210 gr/m^2), in inner layers

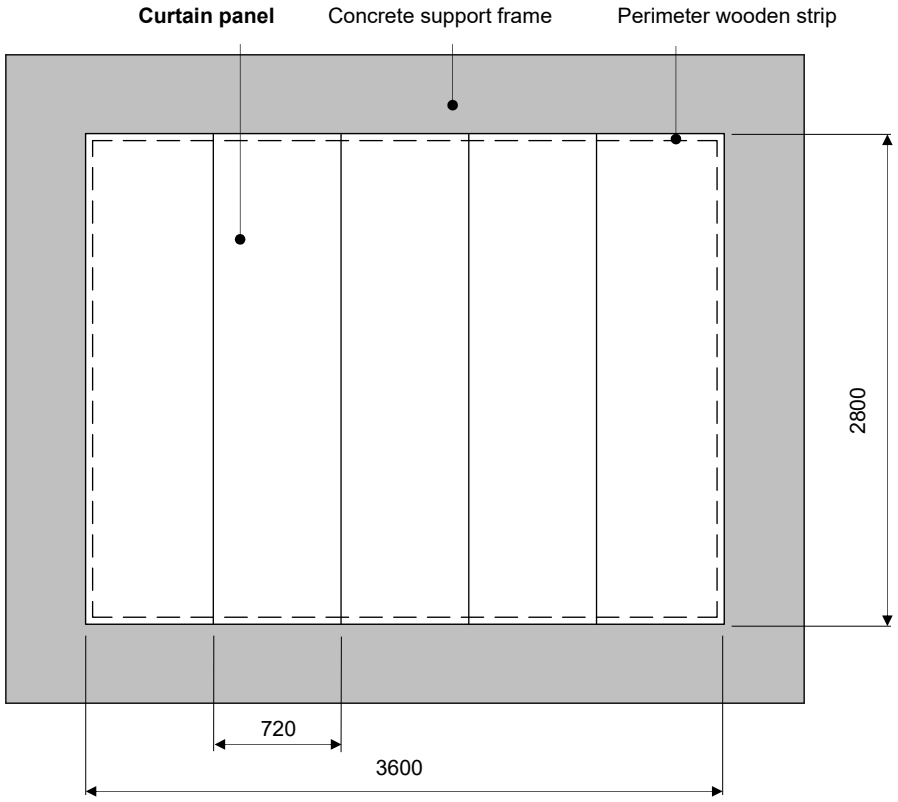
Test specimen thickness: ~8 mm.



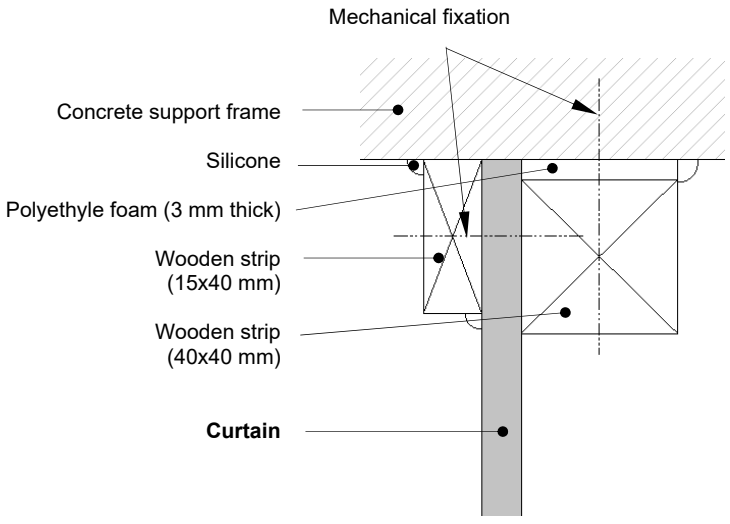

Arrangement of test specimen:

The test specimen is made of 5 panels of 1440 mm wide x 2800 mm high each one, joined between them by zipper, which form a curtain of exterior dimensions of 7200 mm wide x 2800 mm high, which folding covers an area of 3600 mm wide x 2800 mm high.

The sample was installed according to the following sketches, with the curtain stapled to the 40x40 mm wooden strips with closed cell polyethylene foam band adhered. These strips were mechanically fixed to a prefabricated concrete frame 30 cm thick and interior dimensions of 2,8 m high x 3,6 m long.



Elevation



Perimeter section

Sketches of test specimen (B2023-195-M958). Cotes in mm

Photo of assembly of test specimen

Photos of test specimen in the test rooms

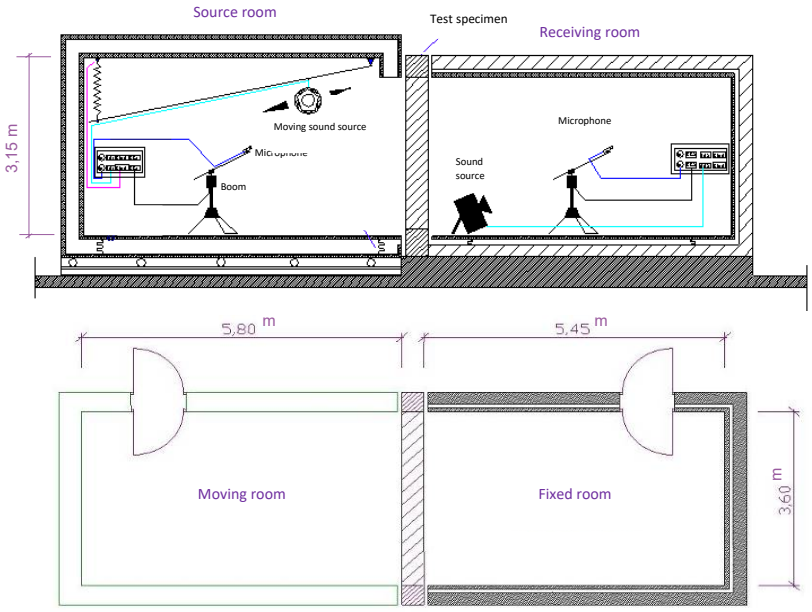
Curtain selected and delivered by: client

Assembly performed by: Tecnalia and Construcciones J.L. Iglesias

Date of end of mounting: 20th February 2023

2. LABORATORY TEST FACILITIES

The test is performed in the horizontal transmission rooms, composed of a source and a receiving room. The receiving room is composed of a double concrete box of twenty and ten centimeters of thickness each one, acoustically disconnected and the source room, forty centimeters thick, is composed of a double box of metal frame and gypsum board, acoustically disconnected. The mobility of the source room allows the mounting of the test specimen into a support frame outside, as well its subsequent installation between the test rooms. These rooms comply with the requirements of EN ISO 10140-5:2021.



Sketch of horizontal transmission rooms

3. EQUIPMENT AND TEST CONDITIONS

Microphones	Brüel&Kjær 4943; Serial No. 188436	Brüel&Kjær 4943; Serial No. 3188435
Preamplifiers	Brüel&Kjær 2669; Serial No. 948764	Brüel&Kjær 2669; Serial No. 2025844
Sound sources	Brüel&Kjær 4296; Serial No. 071420	CERWIN VEGA; Serial No. 012446
Booms	Brüel&Kjær 3923; Serial No. 036584	Brüel&Kjær 3923; Serial No. 2036591
Analyzer	Nor850-MF1; Serial No. 8501186	
Amplifier	LAB 300; Serial No. 970-967	
Equalizer	Sony, SRP-E100; Serial No. 400238	
Calibrator	Brüel&Kjær 4231; Serial No.2061477	
Atmospheric conditions meter	Source room: Rotronic BL-1D; Serial No. A21050029 Uncertainty: T (± 0,7 ºC), H (±4 %), P (±2 mbar)	Receiving room: Rotronic BL-1D; Serial No. A19060062 Uncertainty: T (± 0,5 ºC), H (±4 %), P (±2 mbar)
	T: air temperature; H: relative humidity; P: static pressure	

4. TEST PROCEDURE AND EVALUATION

The sound reduction index, R, for the one-third-octave band 100 Hz to 5 KHz is calculated according to EN ISO 10140-2:2021 according to the following formula:

$$R=L_1-L_2+10*\text{Log } S/A$$

- L_1: Average sound pressure level in the source room
- L_2: Average sound pressure level in the receiving room
- S: Test specimen area
- A: Equivalent sound absorption area in the receiving room

The measurement of the average sound pressure levels L_1 and L_2, is performed emitting an equalized white noise between 100 Hz and 5 kHz, with a moving omnidirectional sound source. The sound field in the source and receiving rooms is sampled using moving microphone with a sweep radius of 1 m and a traverse period of 16 s during 32 s of measure. Background noise is measured in the receiving room in the one-third-octave band 100 Hz to 5 kHz according to the same measurement process of sound field in the receiving room.

The equivalent sound absorption area between 100 Hz and 5 kHz, is evaluated from the reverberation time measured in the receiving room, using Sabine's formula:

$$A=0,16*V/T$$

- A: Equivalent sound absorption area in the receiving room
- T: Reverberation time in the receiving room
- V: Receiving room volume

Reverberation time in the receiving room is determined using two positions of the sound source and three fixed microphone positions for each source position, at 120º in the microphone path.

Measuring chain is verified just before and after the execution of the test.

The guidelines indicated in the applicable internal procedures have been followed:

- PE.CM-AA-61-E: "Procedure for the determination of the airborne sound insulation into the horizontal and vertical transmission rooms".
- PE.MC-AA-06-M: "Procedure to manage the test specimens for acoustic tests in laboratory".

5. RESULTS

The following results are presented for the test specimen:

- Sound reduction index, R, in third octave frequency bands from 100 to 5000 Hz, in table and graph.
- Weighted sound reduction index, R_w, calculated according to EN ISO 717-1:2020, from the sound reduction index, R.
- Spectrum adaptation terms from 100 to 3150 Hz, C and C_{tr}, calculated according to EN ISO 717-1:2020, which are the values, expressed in decibels, to be added to the

global magnitude value R_w to consider the characteristics of the pink noise spectrum (C) and traffic noise spectrum (C_{tr}), respectively.

- A-weighted sound reduction index, R_A, from 100 to 5000 Hz, expressed to one decimal place, calculated according to the expression of Documento Básico “DB-HR Protección frente al ruido” - Código Técnico de la Edificación (CTE), from the sound reduction index, R, obtained by laboratory measurement.

Airborne Sound Insulation according to EN ISO 10140-2:2021
Laboratory Measurements

CLIENT: **ISINAC ACOUSTIC WORLD, S.L.**

TEST DATE: 21st February 2023

RESULT No.: B2023-195-M958

TEST SPECIMEN: Curtain ***ISINAC CURTAIN IZZER,*** with folded arrangement.

Description: Each curtain panel is formed by 4 layers sewn around the perimeter:
- IZZER fabric 100% WOOL 460 gr/m^2, in exposed layers
- PX210 FABRIC 100% CARBON FIBER 210 gr/m^2, in inner layers

Folding: 7200 mm wide x 2800 mm high, which folding covers an area of 3600 mm wide x 2800 mm high.
Test arrangement: 5 panels joined by zipper, mechanically fixed to a perimeter wooden strip, with perimeter joint sealed by silicone.

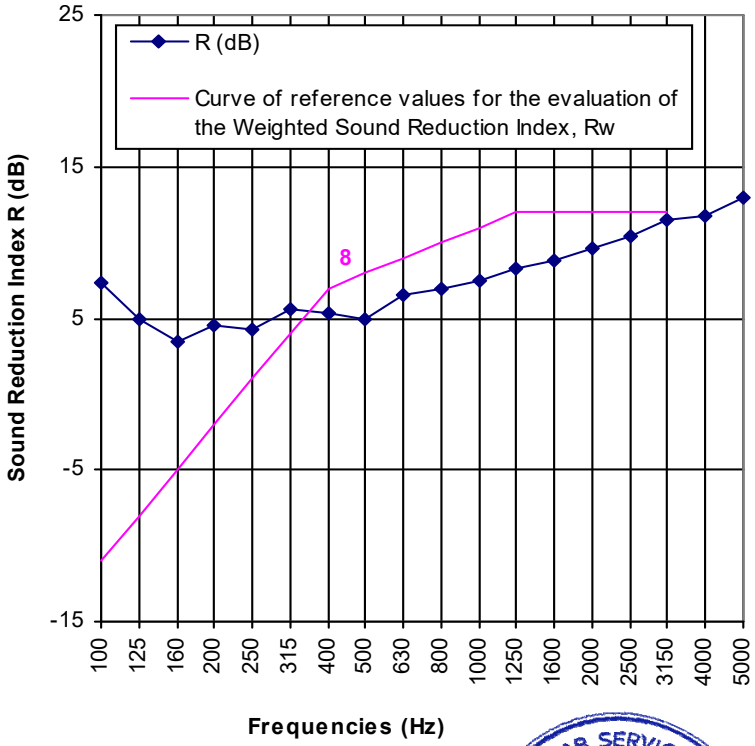
Area, S, test: 10,08 m^2

Estimated superficial mass: 2,7 kg/m^2

V_{src}: 66,8 m^3	V_{rec}: 55,6 m^3
T_{src}: 21,0 ºC	T_{rec}: 20,3 ºC
H_{src}: 35 %	H_{rec}: 37 %
P_{src}: 960 mbar	P_{rec}: 960 mbar

V: volume; src: source room; rec: reception room

f (Hz)	R (dB)
100	7,3
125	5,0
160	3,5
200	4,5
250	4,3
315	5,6
400	5,3
500	5,0
630	6,6
800	7,0
1000	7,5
1250	8,3
1600	8,8
2000	9,6
2500	10,4
3150	11,5
4000	11,8
5000	12,9



Rating according to EN ISO 717-1:2021:	R_w (C;C_{tr}):	8 (0; -1)	dB
Rating according to CTE DB-HR:	R_A:	8,6	dBA

Evaluation based on laboratory measurement obtained by an engineering method.