

TECHNICAL CERTIFICATION OF INSULATION ACOUSTIC TO IMPACT NOISE IN WOODEN BUILDING EXTENSION OF THE TIANA INSTITUTE

Report: AA22032-3. v1

HEADLINE: AMB – TIANA CITY COUNCIL
APPLICANT: MECHANICAL APPLICATIONS OF CAUCHO SA
LOCATION: AVENIDA EDUARD FONTSERÈ s/n, 08391 - TIANA
(BARCELONA)

Acoustic Consultant
Jesús Uriol Chavarriga
Industrial Technical Engineer, collegiate number 15.385L

July 18, 2022

This document concerns solely and exclusively the samples made. Ref: AA21032-3 v1 IMPACT INSULATION INTITUT TIANA
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INDEX

1. PREVIOUS DATA	3
1.1. APPLICANT DETAILS	3
1.2. ACTIVITY DATA	3
1.3. TECHNICIAN DETAILS	3
1.4. OBJECT	3
1.5. LOCATION	4
2. REGULATIONS	5
3. MEASUREMENT AND EVALUATION PROCEDURE	6
3.1. ACOUSTIC INSULATION TEST METHOD FOR IMPACT NOISE	6
3.1.1. Calculation of the normalized sound pressure level of impact noise $L'n$	6
3.1.2. Calculation of the standardized sound pressure level of impact noise $L'nT$	6
3.2. SPEAKER, SHOCKER AND MICROPHONE POSITIONS	7
4. TEST - PREVIOUS DATA	8
4.1. DAY AND TIME OF TEST	8
4.2. ENVIRONMENTAL CONDITIONS	8
4.3. DESCRIPTION OF THE DEPENDENCIES, PARTITIONS AND VOLUMES	9
4.4. MEASURING EQUIPMENT	eleven
5. TEST - RESULTS	12
5.1. ACOUSTIC INSULATION AGAINST IMPACT NOISE	12
5.1.1. Test 01: between classroom E11 in P.1 (large) and classroom E9 in P.1 (small)	12
5.1.2. Test 02: between classroom E9 in P.1 (small) and P.Baja dining room.	13
6. CONCLUSIONS	14
ANNEX 01. VERIFICATION CERTIFICATES	fifteen

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1. PREVIOUS DATA

1.1. APPLICANT DETAILS

Applicant: Mechanical Applications of Rubber SA
ID. / CIF: A-20101150
Tax residence: Industrialdea Zona A. Pab 35
20159 Asteasu (Gipuzkoa)

1.2. ACTIVITY DATA

Type of activity: Expansion of the Secondary Education Institute
Site: Avenida Eduard Fontserè s/n,
08391 Tiana (Barcelona)
Measurement date: July 14, 2022
File No.: --

1.3. TECHNICIAN DETAILS

Technical: Jesus Uriol Chavarriga
Collegiate: 15.385L
Direction: Lleida Agrifood Science and Technology Park
Parc de Gardeny, Building H2, 1st floor, office A3
25003 Lleida

1.4. OBJECT

At the request of Aplicaciones Mecánicas del Caucho SA, we carry out the acoustic insulation measurements and draw up this technical certificate.

The object is to obtain the acoustic insulation from the measurements that have been carried out between:

o Acoustic insulation against impact noise:

- Test 01: Between Classroom E9 on the 1st floor (large) and Classroom E11 on the 1st floor (small) located immediately next door.
Horizontally adjoining enclosures.
- Test 02: Between Classroom E11 on the 1st floor (small) and the dining room on the ground floor located immediately below the classroom.
Vertically adjoining enclosures.

1.5. LOCATION

The activity is located at:

Avenida Eduard Fontserè s/n,
08391 Tiana (Barcelona)

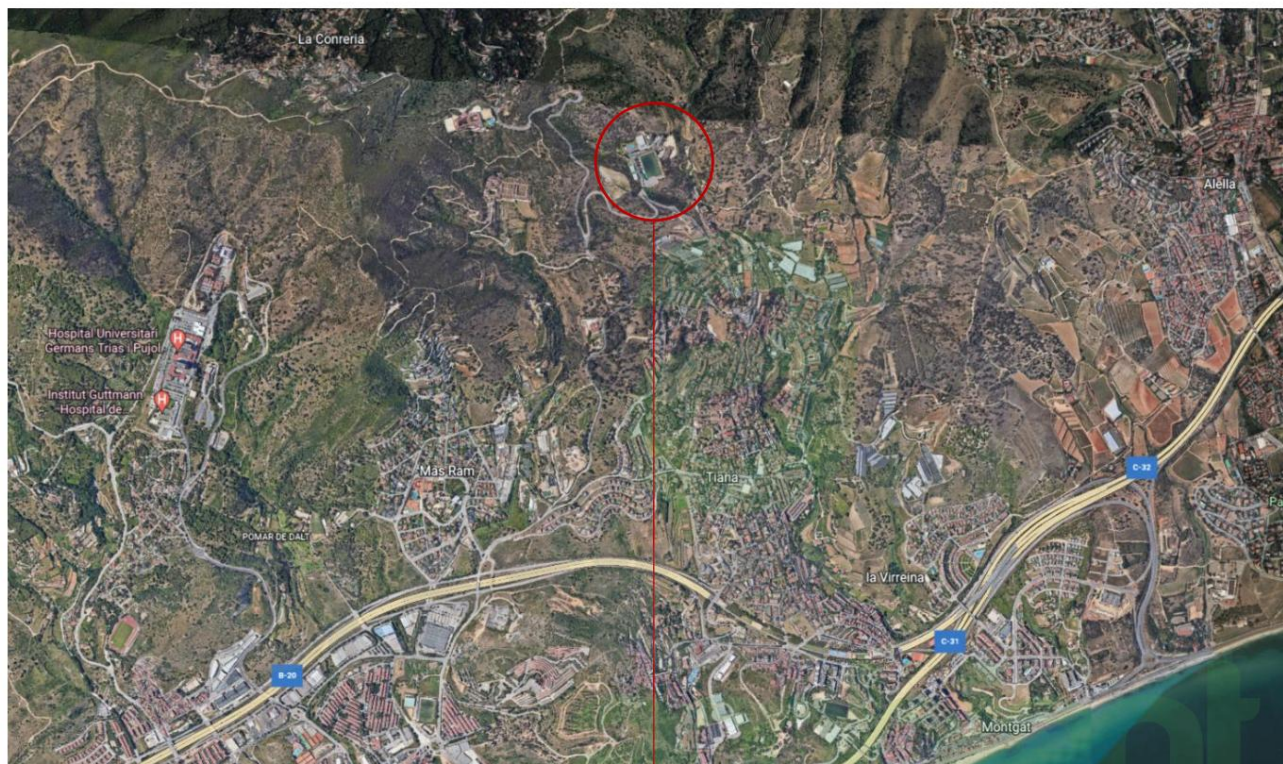


Image 1.5.1. General view location.

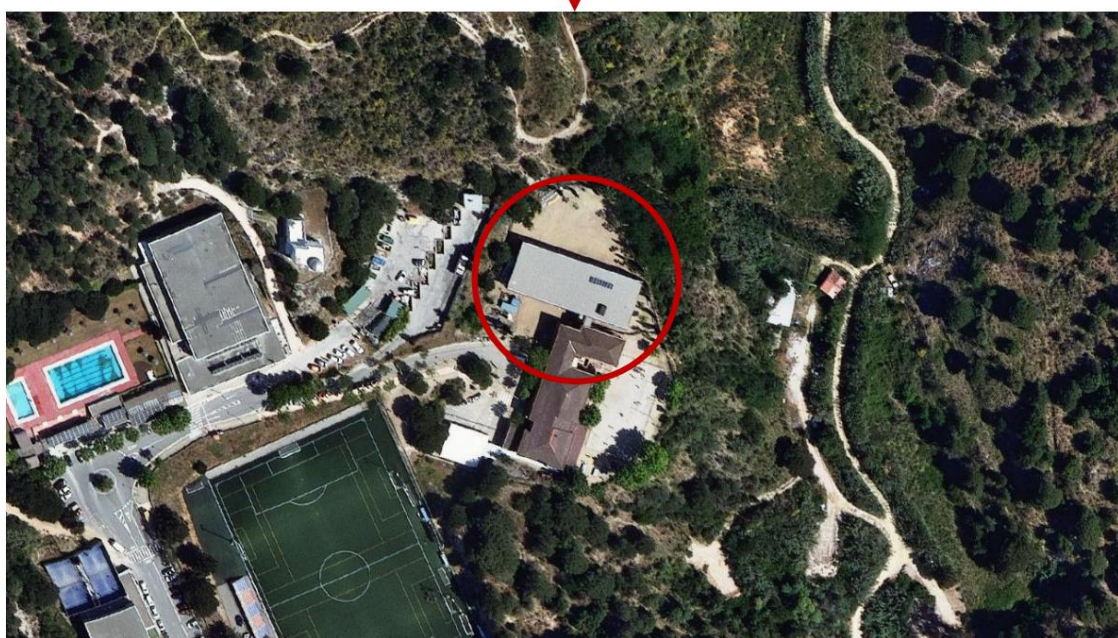


Image 1.5.2. Site.

2. REGULATIONS

This document complies with the following current regulations:

- Decree 176/2009 of November 10, which approves the Regulation of Law 16/2002, of June 28, on protection against noise pollution, and adapts the annexes.
- Royal Decree 1367/2007, of October 19, which develops Law 37/2003, of November 17, on Noise, in relation to acoustic zoning, quality objectives and acoustic emissions.
- Royal Decree 1371/2007, of October 19, which approves the basic document "DB-HR Protection against noise" of the Technical Building Code and modifies Royal Decree 314/2006, of March 17, with which the Technical Building Code is approved.
- UNE-EN ISO 16283-2. Measurement on site sound insulation in buildings and in the elements of construction. Part 2: Impact noise insulation
- UNE-EN ISO 717-2. Evaluation of acoustic insulation in buildings and of the elements of building. Part 2: Impact noise insulation
- UNE-EN ISO 3382-2: Measurement of acoustic parameters in venues. Part 2: Reverberation time in ordinary rooms.

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3. MEASUREMENT AND EVALUATION PROCEDURE

3.1. IMPACT NOISE SOUND INSULATION TEST METHOD

3.1.1. CALCULATION OF NORMALIZED SOUND PRESSURE LEVEL OF IMPACT NOISE L'n

Defined in ISO 16283 with the impact noise sound pressure level, L_i , increased by a correction expressed in decibels, equal to ten times the decimal logarithm of the quotient between the measured equivalent absorption area, A , of the receiving room, and the reference equivalent absorption area, A_0 , which is calculated using the following formula when the noise source is the impact machine:

$$L'n = L_i + 10 \log (A / A_0)$$

Where: A is the area absorption equivalent to the receiving room; A_0 is the reference equivalent absorption area; for houses, $A_0 = 10 \text{ m}^2$.

Once the normalized acoustic pressure level of impact noise $L'n$ has been calculated for each of the impact machine positions, the following calculation is carried out:

$$L'n = 10 \log [1 / m (\sum 10^{(L'n,j / 10)})]$$

Where: m is the number of impact machine positions; the normalized sound pressure level of impact noise for the j th position of the impact machine;

3.1.2. CALCULATION OF THE STANDARDIZED SOUND PRESSURE LEVEL OF IMPACT NOISE L'nT

Defined in ISO 16283 as the impact noise sound pressure level, L_i , reduced by a correction expressed in decibels, equal to ten times the decimal logarithm of the quotient of the measured reverberation time, T , and the reference reverberation time, T_0 , which is calculated with the following formula when the noise source is the impact machine:

$$L'nT = L_i + 10 \log (T / T_0)$$

Where: T is the reverberation time to the receiving room; T_0 is the reference reverberation time; for houses, $T_0 = 0.16 \text{ s}$.

Once the standardized acoustic pressure level of impact noise $L'nT$ has been calculated for each of the impact machine positions, the following calculation is carried out:

$$L'nT = 10 \log [1 / m (\sum 10^{(L'nT,j / 10)})]$$

Where: m is the number of impact machine positions; the standardized sound pressure level of impact hits; the j th machine position

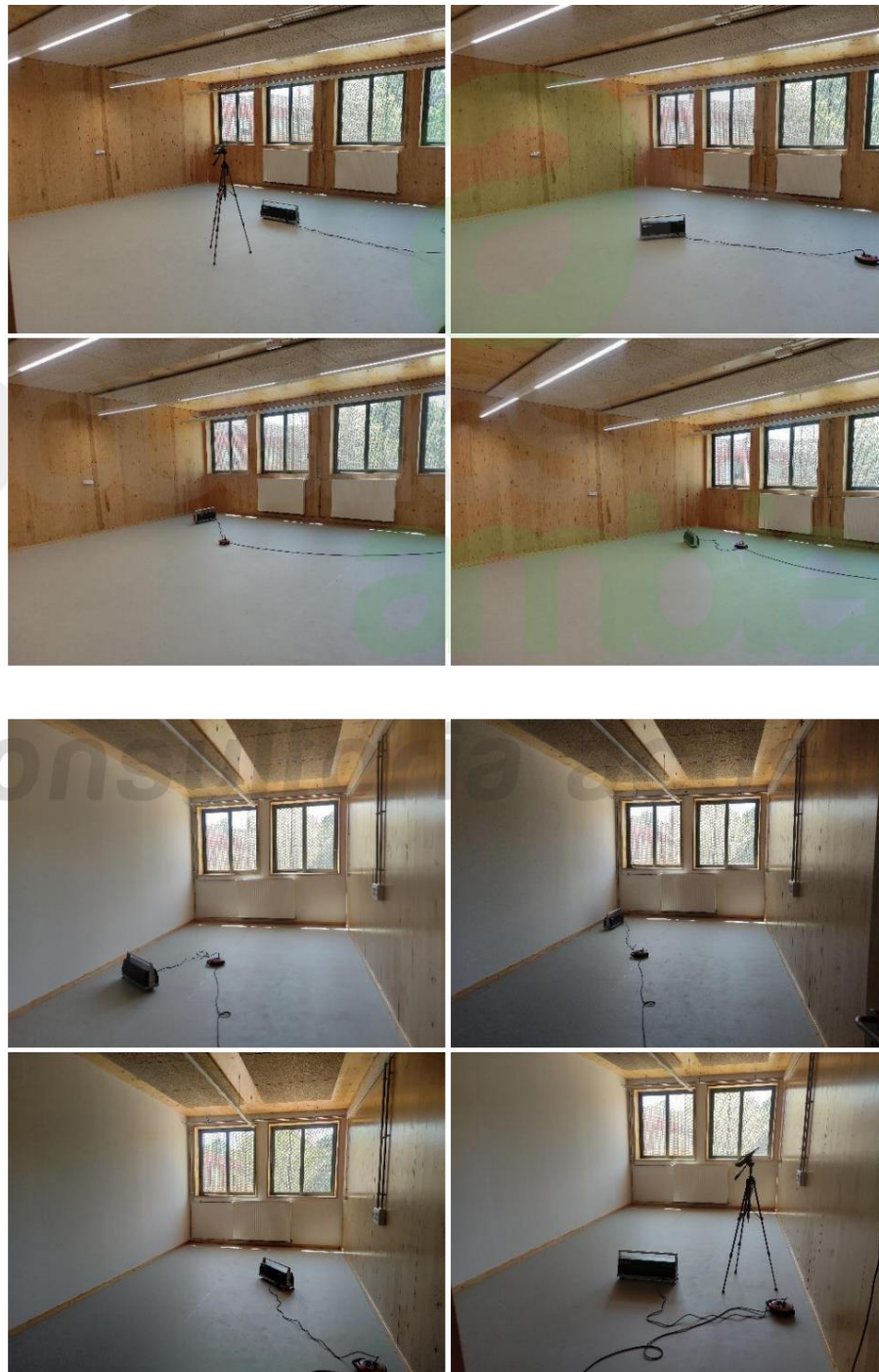
3.2. SPEAKER, SHOCKER AND MICROPHONE POSITIONS

Impact generating machine positions:

- At a distance of at least 0.5m from the limits of the enclosure. • Oriented at 45° with respect to the possible ribs of the unidirectional / reticular slabs.

Microphone positions:

- At a distance between positions of at least 0.7m. • At a distance of at least 0.5m from the limits of the enclosure.



4. TEST - PREVIOUS DATA

4.1. DAY AND TIME OF THE TEST

The measurement date and period are defined below:

Date: July 14, 2022

Schedule: 12:40 p.m. to 1:40 p.m.

4.2. ENVIRONMENTAL CONDITIONS

The existing weather conditions on the day of the measurements were as follows. We can observe that the climatic conditions could not affect the results obtained.

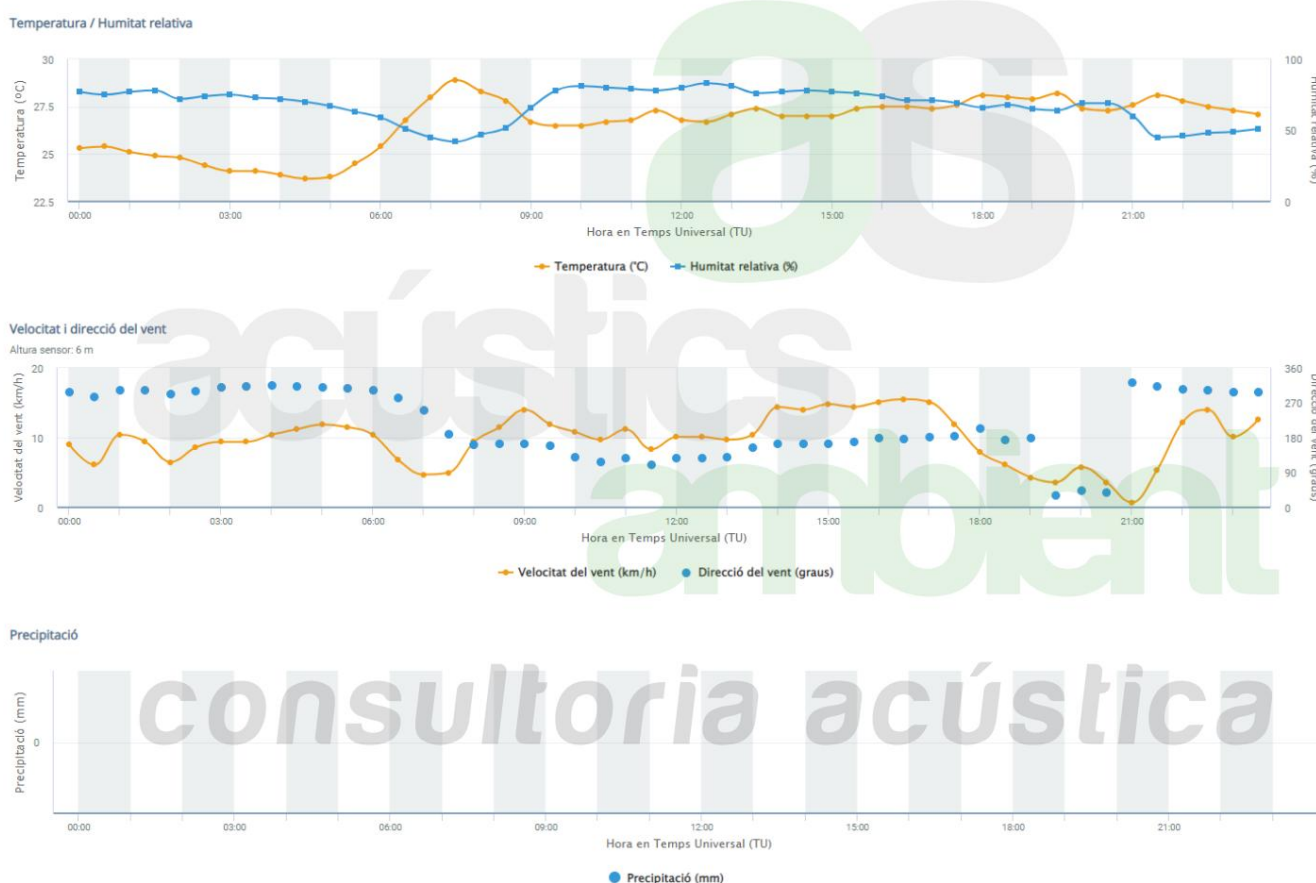


Image 4.2.1. Weather data on the day of the measurements (source: meteo.cat).

4.3. DESCRIPTION OF DEPENDENCIES, PARTITIONS AND VOLUMES

TEST 01: SOUND INSULATION TO IMPACT NOISE:

- Broadcast area 01:

o Corresponds to the interior of Classroom E11 (large) ÿ (First floor)

ÿ Surface: ÿ 55.00m²
 Volume: 165.90m³

- Receiving room 01:

o Corresponds to the interior of Classroom E9 (small) ÿ (First floor)

ÿ Surface: ÿ 26.60m²
 Volume: 80.30m³
 ÿ Partition area: 22.60m²

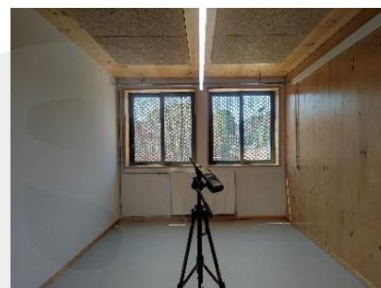


Image 4.3.1. First floor, emitting room (in red) and receiving room (in green).

TEST 02: SOUND INSULATION TO IMPACT NOISE:

• Broadcast area 02:

o Corresponds to the interior of Classroom E9 (small) (First floor)

• Surface: 26.60m²
 Volume: 80.30m³

• Receiving room 02:

o Corresponds to the interior of the dining room (Low level)

• Surface: 109.70m²
 Volume: 320.50m³
 • Partition area: 26.60m²

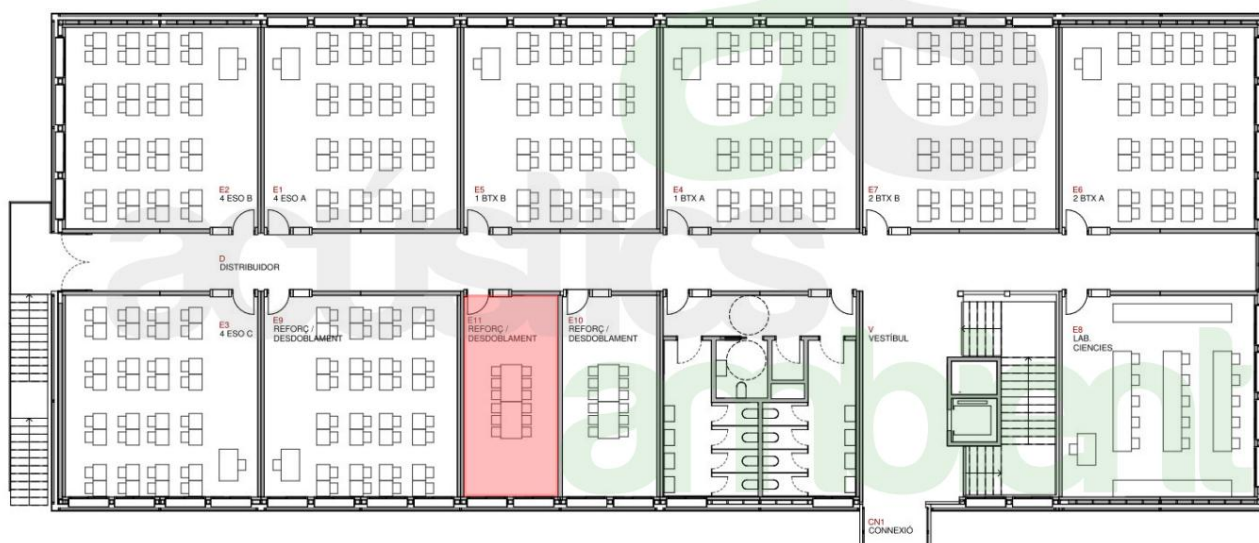
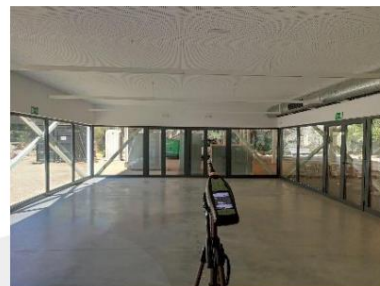


Image 4.3.2. First floor, issuing enclosure (in red).

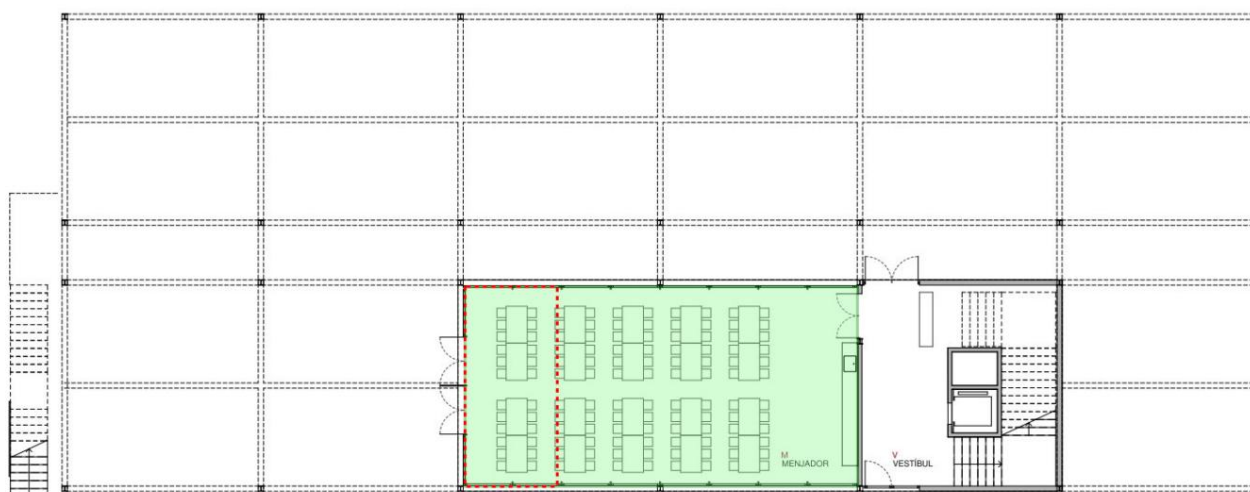


Image 4.3.3. Ground floor, reception room (in green).

4.4. MEASURING EQUIPMENT

Before and after the measurements, an acoustic verification of the measurement chain must be carried out using an acoustic calibrator that guarantees a deviation margin of no more than 0.5dB(A) with respect to the initial reference value, generally 94dB(A).

SOUND METER VERIFICATION		
Brand: Brüel & Kjær	Model: 2250	Serial No.: 3009506

INITIAL CALIBRATION	FINAL CALIBRATION
Reference level: 94.0dB(A)	Reference level: 94.0dB(A)
Date: 07/14/2022	Date: 07/14/2022
Time : 12:51 p.m.	Time : 1:37 p.m.
Result: 93.8dB(A)	Result: 93.8dB(A)

Table 4.4.1. Sound level meter verification

EQUIPMENT DESCRIPTION	PICTURE
Brüel & Kjær 2250 SONOMETER Integrating sound level meter and third-octave spectrum analyzer type 1: Brüel & Kjær: 2250 with integration and statistical functions, serial number 2473249 / 3009506.	
Brüel & Kjær 4189 MICROPHONE Microphone: Brand Brüel & Kjær, model 4189, with serial number 2650828 / 2469599.	
• IMPACT GENERATING MACHINE CESVA MI005 Impact generating machine: CESVA brand, model MI005, with serial number T224825.	
• Brüel & Kjær 4231 GAUGE Brüel & Kjær Sound Level Calibrator: 4231, with serial number 2466236.	
• ANEMOMETER Testo brand, model 410-1, with serial number 38412806/002.	
• DISTANCE METER DeWALT brand laser distance measurer, model DW03050, with serial number 1450362011.	
• ACCESSORIES Tape measure, tripod, windscreen...	

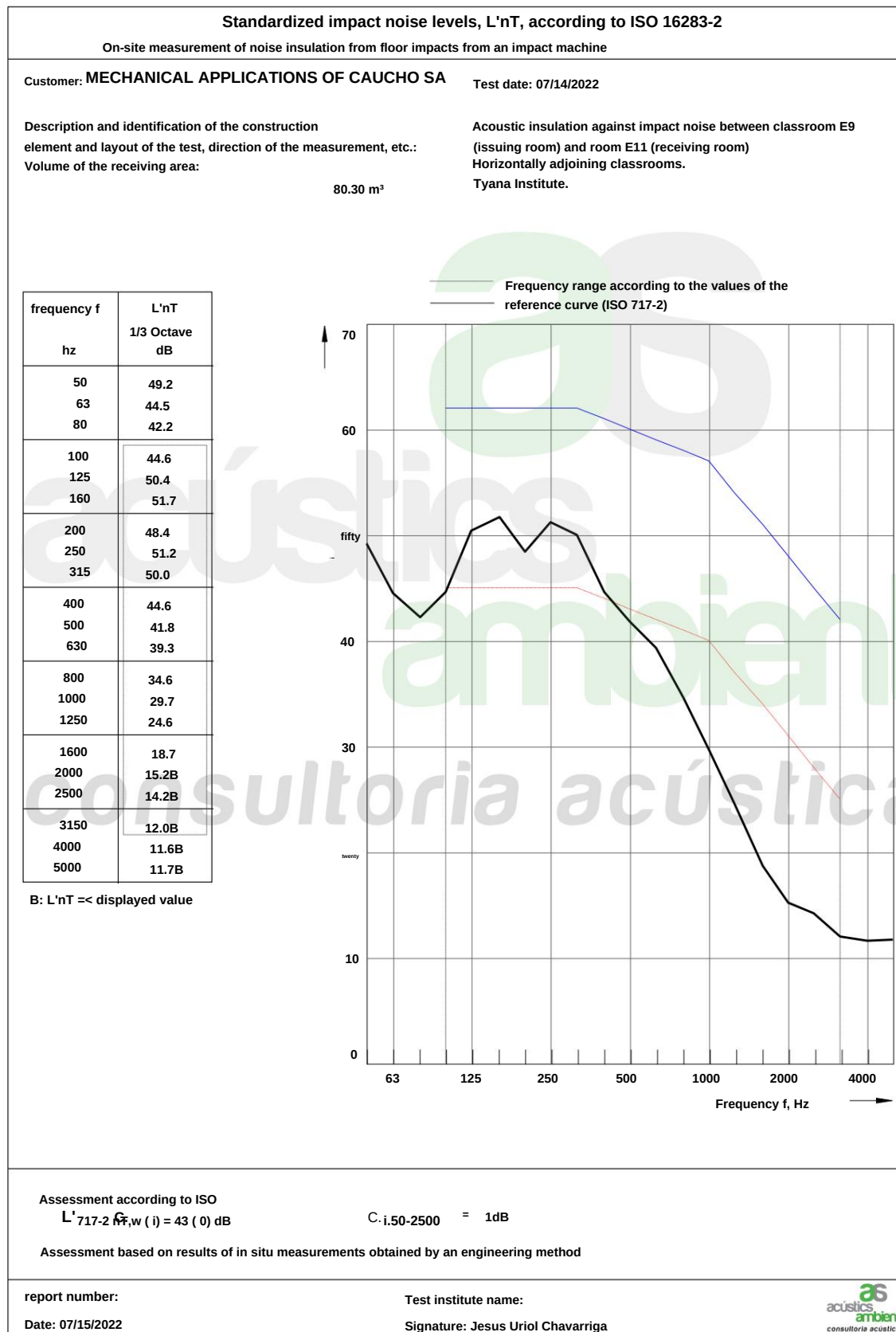
(*) The sound level meter and the calibrator have periodic verification in accordance with the criteria established in the order of September 25, 2007, of the Ministry of Public Works.

Table 4.4.2. measuring equipment

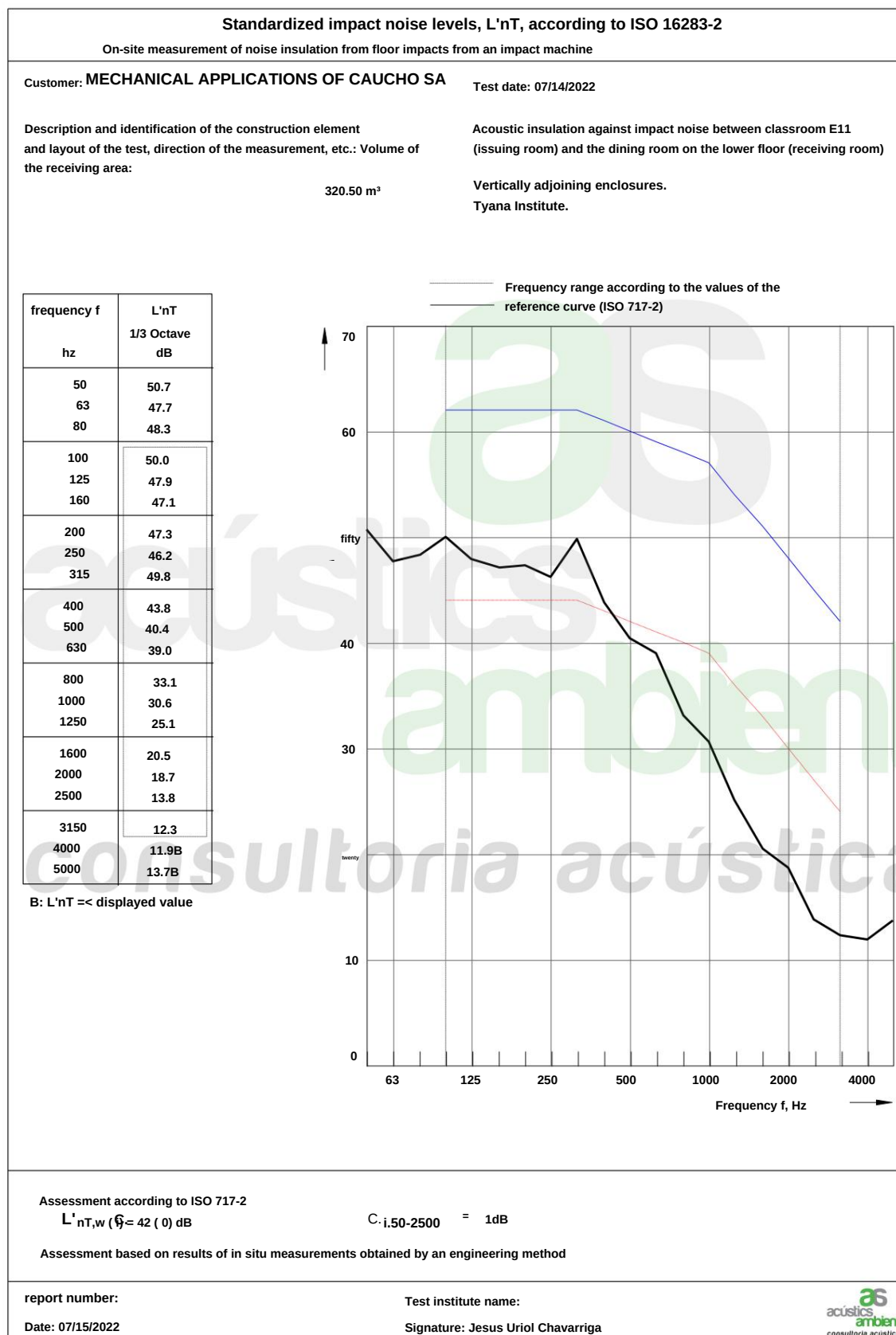
5. TEST - RESULTS

5.1. ACOUSTIC INSULATION FROM IMPACT NOISE

5.1.1. TEST 01: BETWEEN ROOM E11 ON P.1 (LARGE) AND ROOM E9 ON P.1 (SMALL)



5.1.2. TEST 02: BETWEEN ROOM E9 ON P.1 (SMALL) AND DINING ROOM LOW P.



6. CONCLUSIONS

With the tests carried out, we can conclude that:

Impact noise insulation, measured "**in situ**", reaches the following levels:

Rehearsal	L'nT,w (Ci)	L'nT,w required CTE DB-HR
Test 01: Between Classroom E9 on the 1st floor (large) and Classroom E11 on the 1st floor (small). Horizontally adjoining enclosures.	43(0)dB	
Test 01: Between Classroom E11 on the 1st floor (small) and Dining Room M on the ground floor. Vertically adjoining enclosures.	42(0)dB	y65dB _

Lleida, July 18, 2022.

APPLICANT:

MECHANICAL APPLICATIONS OF CAUCHO SA

TECHNICAL:

Acoustic Consultant
 Jesús Uriol Chavarriga
 Industrial Technical Engineer,
 collegiate number 15.385L

ANNEX 01. VERIFICATION CERTIFICATES

CERTIFICADO DE VERIFICACIÓN

Número 00503779-V
 Página 1 de 1



LGAI Technological Center, S.A. (APPLUS)
 OAVM nº 02-OV-0005

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 F +34 93 567 20 01
 metrologia@applus.com
 www.applus.com

INSTRUMENTO	SONÓMETRO		
SOLICITANTE	ACUSTICS AMBIENT, S.L.		
DIRECCIÓN	Parc Tecnologic de Gardeny, Ed. H2 of 1.3 25071 Lleida (Lleida)		
TIPO DE ACTUACIÓN	Ensayos de verificación periódica según Anexo XIV de la Orden ICT/155/ 2020, de 7 de febrero		
IDENTIFICACIÓN	Sonómetro	Micrófono	Preamplificador
	Marca	BRÜEL & KJÆR	BRÜEL & KJÆR
	Modelo	2250 (G4)	4189
	Número de serie	3009506	2469599
CARACTERÍSTICAS METROLÓGICAS	Tipo/Clase	1	Software 4.6.1
	Nivel de referencia	94,0 dB	Firmware --
	Rango de medida	26,5 - 140,7 dB	Checksum -
	Resolución	0,1 dB	
FECHAS	Verificación	Válido hasta	(si antes no hay una operación de reparación que obligue a superar una verificación después de reparación o modificación)
	2021-12-09	2022-12-09	
RESULTADO VERIFICACIÓN	FAVORABLE		
PRECINTADO	2, tornillo trasero y lateral entre carcassas		
	Entrada	--	--
	Salida	--	--

SIGNATARIO/S AUTORIZADO/S:
 Responsable Técnico

Inspector

Juanjo Sanz 09/12/2021 18:01:18
 Código Seguro de Verificación (CSV): 516884928CSB5

Jordi Messeguer Morales
 09/12/2021 15:12:22

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 metrologia@applus.com
 www.applus.com

INSTRUMENTO	CALIBRADOR ACÚSTICO		
SOLICITANTE	ACUSTICS AMBIENT, S.L.		
DIRECCIÓN	Parc Tecnologic de Gardeny, Ed. H2 of 1.3 25071 Lleida (Lleida)		
TIPO DE ACTUACIÓN	Ensayos de verificación periódica según Anexo XIV de la Orden ICT/155/ 2020, de 7 de febrero.		
IDENTIFICACIÓN	Marca	BRÜEL & KJAER	
	Modelo	4231	
	Número de serie	2466236	
CARACTERÍSTICAS METROLÓGICAS	Tipo/Clase	1	Software --
	Nivel/es nominal/es	94,0 / 114,0 dB	Finware --
	Frecuencia nominal	1000, Hz	Checksum -
FECHAS	Verificación	Válido hasta	(si antes no hay una operación de reparación que obligue a superar una verificación después de reparación o modificación)
	2021-12-09	2022-12-09	
RESULTADO VERIFICACIÓN	FAVORABLE		
PRECINTADO	2, 1 sobre tapa, 1 lateral		
	Entrada	07-OV-0031387 07-OV-0031388	
	Salida	07-OV-0031387 07-OV-0031388	

SIGNATARIO/S AUTORIZADO/S:
 Responsable Técnico

Inspector

Juanjo Sanz 09/12/2021 18:01:32
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Jordi Messeguer Morales
 09/12/2021 15:12:25

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