

TEST REPORT No. 110924-637 A-E

CLIENT: **SUSENSIONES ELÁSTICAS DEL NORTE, S.L. (SENOR)**
Polígono industrial El Garrotal, Parcela 10 - Módulos 4 y 5
14700 Palma del Río, Córdoba, España

AIM: **Laboratory measurement of airborne sound insulation**

STANDARD: **EN ISO 10140-2:2021**

TEST SPECIMEN: **ACOUSTIC PARTITION WITH MAXIMUM WATERTIGHTNESS**

ORIGINAL REPORT ISSUE DATE: **22/04/2025**

TRANSLATION DATE: **24/06/2025**

Technical Consultant
<i>[Signature]</i>
Susana Lopez de Aretxaga



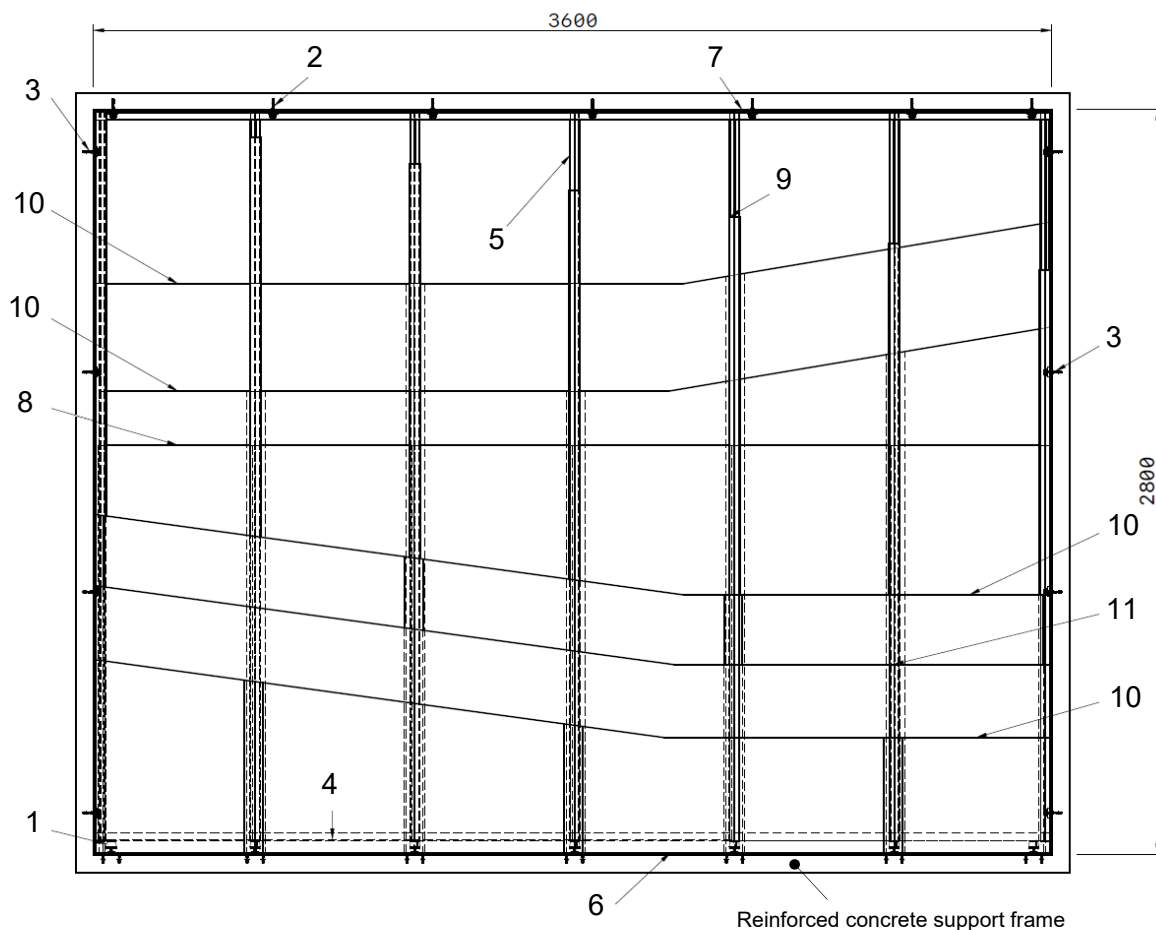
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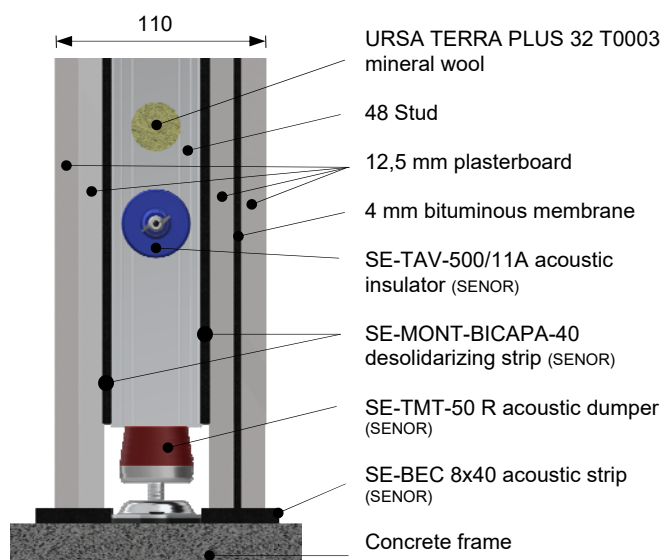
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- The results of the current report concern only and exclusively the test specimen.
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- Test specimen reference provided by the client. TECNALIA is not responsible for the information provided by the client. This information is not accredited.

1. TEST SPECIMEN DESCRIPTION

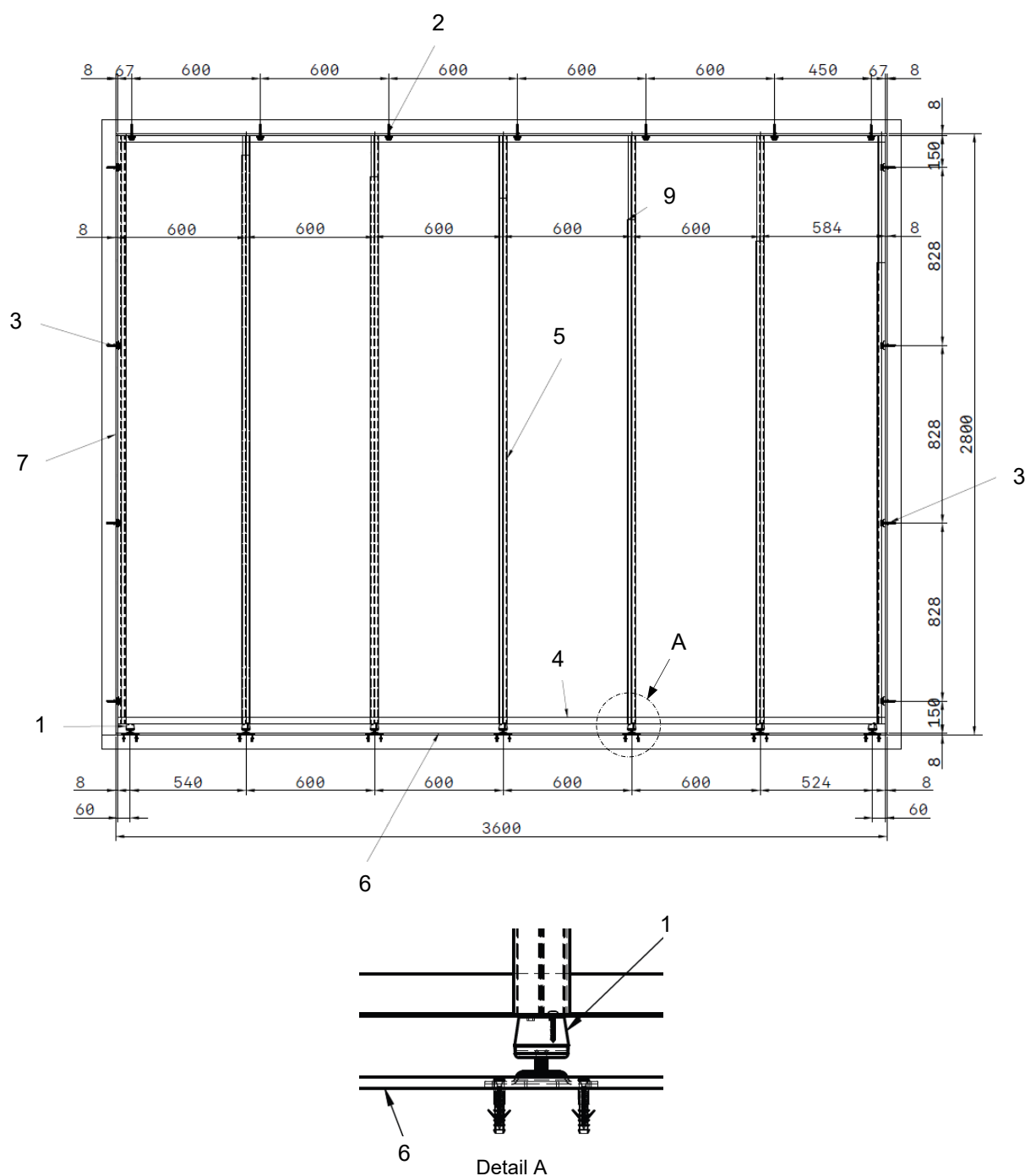
The test specimen consists of a self-supporting partition 12,5+12,5 / 48 / 12,5+4+12,5, with laminated gypsum board and mineral wool, with the following composition according to information provided by the client.



Sketch 1 - Elevation

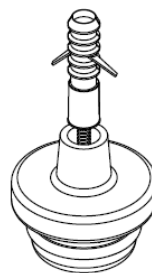
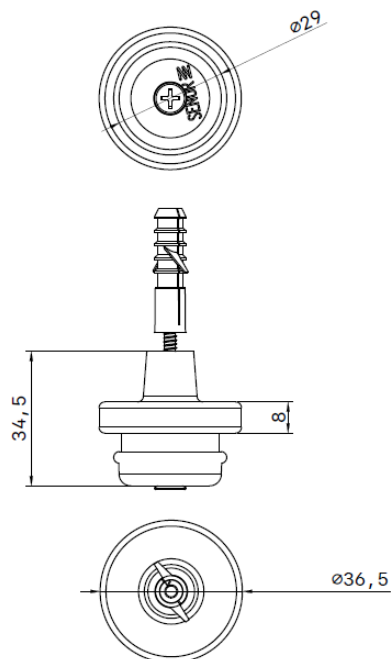


Sketch 2 - Vertical section

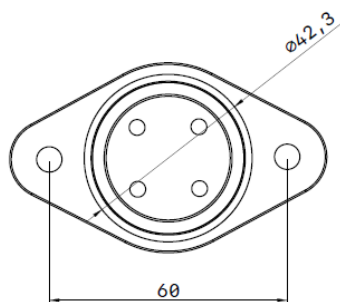
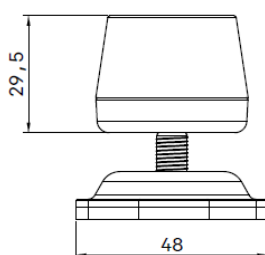
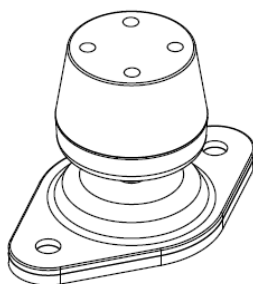
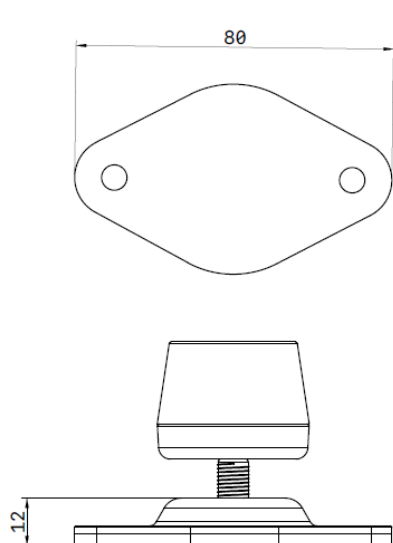


- SE-BEC-8x40 adhered to the lower side of the frame on both sides of the SE-TMT-50 R acoustic damper
- SE-BEC-8x120 adhered between the sides of the frame and studs, and between the upper channel and frame
- Studs inserted into channels and mechanically fixed at one point to the upper and lower channel
- SE-MONT-BICAPA-40 adhered to both sides of channels and studs
- URSA TERRA PLUS 32 T0003 mineral wool inserted between studs

Sketch 3 – Arrangement of structure and mineral wool



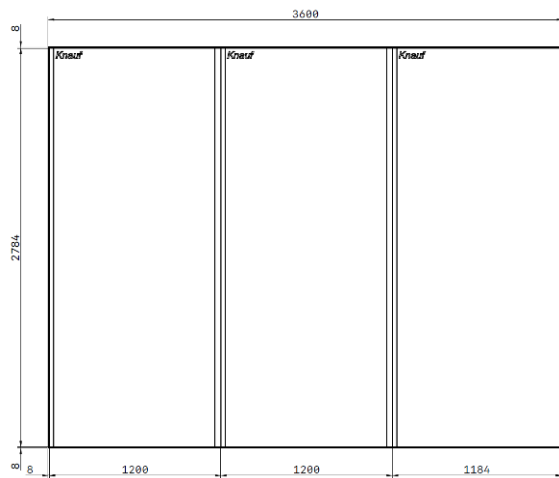
SE-TAV-500/11 R (red) and SE-TAV-500/11 A (blue) acoustic insulators



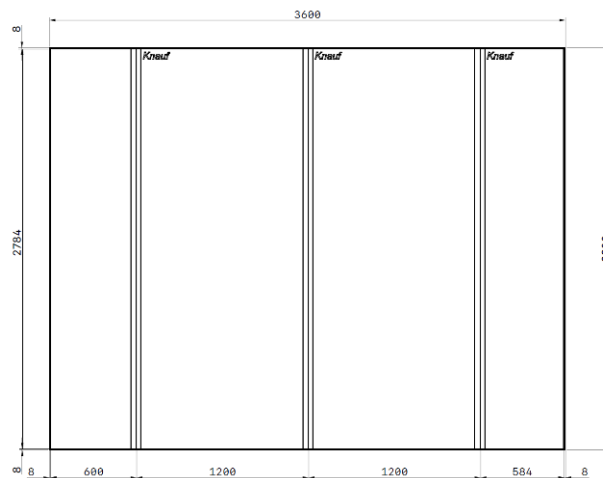
- a. KRAIBURG-TPE polymer
- b. Cold-formed steel structure with metric screw for levelling
- c. 3 mm EPDM CR-130/BEC strip

SE-TMT-50 R acoustic dumper

Sketch 4 – Description of acoustic insulators and dumper



Inner layers



Visible layers

- Each other butt jointed boards and against SE-BEC strip. Mechanically fixed to the profiles every 500 mm for interior layers (7 vertical fixings) and every 250 mm for visible layers (12 vertical fixings).
- Sealing for the 4 layers: joint tape and KNAUF Unik (30') joint compound between plasterboards and in the perimeter between plasterboards and SE-BEC strip.
- 4 mm bituminous membrane: each other butt jointed sections and against SE-BEC strip, with staggered joints to those of the plasterboards and adhered to the inner plasterboards with Absordan Glue adhesive.

Sketch 5 – Arrangement of plasterboards and membrane

Sketches of test specimen (110924-637). Cotes in mm



Description of materials:

1. SE-TMT-50 R (SENOR): Acoustic dumper for mechanical-elastic fixation of the lower channel to the floor
2. SE-TAV-500/11R (SENOR): Acoustic insulator for mechanical-elastic fixation of the upper channel to the frame
3. SE-TAV-500/11A (SENOR): Acoustic insulator for mechanical-elastic fixation of studs to the frame
4. 48/30 CHANNEL: Knauf channel of galvanized steel, 48x30 mm and 0,55 mm thick
5. 48/35 STUD: Knauf stud of galvanized steel, 46,8x36 mm and 0,6 mm thick
6. SE-BEC-8x40 (SENOR): EPDM CR-130 Microcellular self-adhesive acoustic strip, 8 mm thick x 40 mm wide
7. SE-BEC-8x120 (SENOR): EPDM CR-130 Microcellular self-adhesive acoustic strip, 8 mm thick x 120 mm wide
8. URSA TERRA PLUS 32 T0003 mineral wool: Mineral wool, 60 mm thick and 30 kg/m³
9. SE-MONT-BICAPA-40 (SENOR): Self-adhesive desolidarizing strip, 5,5 mm thick x 40 mm wide, composed of EPDM of 2,5 mm of thickness + cross-linked polyethylene of 3 mm of thickness
10. 12,5 mm plasterboard: Knauf Standard A laminated gypsum board, 12,5 mm thick and 8,2 kg/m²
11. 4 mm bituminous membrane: Bituminous sheet reinforced with mineral fillers, coated on its outer surfaces with a high-density polyethylene film, 4 mm thick and 6,5 kg/m², ref. M.A.D.4-Danosa.

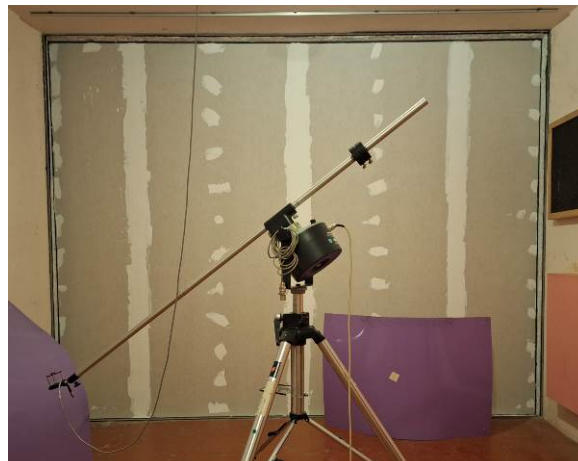






Photos of assembly of the test specimen





Photos of the test specimen in the test rooms

Material selected by: SENOR and URSA

Material delivered by: SENOR and URSA, each company its referenced material in the test specimen description, KNAUF, material for the lining (boards, profiles, joint tape and joint compound) and Danosa, the membrane.

Mounting of test specimen in the test opening:

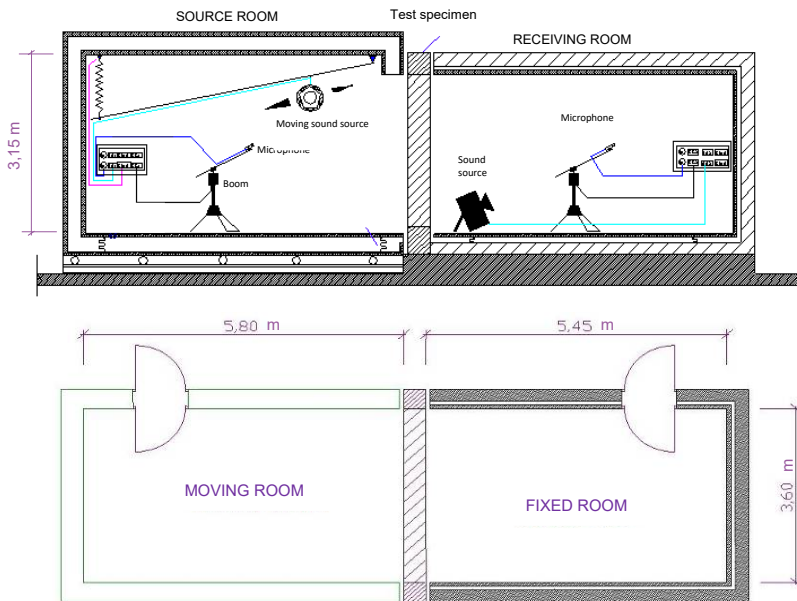
Test specimen installed in a prefabricated concrete frame, 40 cm thick and with internal dimensions of 2,8 m high x 3,6 m long.

Assembly performed by: SENOR

Assembly end date: 6th June 2024

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 formed by a concrete outer enclosure 20 cm thick and a concrete inner enclosure 10 cm thick, both acoustically disconnected. The source room, 40 cm of thickness, is formed by a double enclosure of metal profile and gypsum board, both acoustically disconnected. The mobility of the source room allows the assembly of the test specimens outside and its later movement into the test room. The rooms comply with the requirements of EN ISO 10140-5:2021.



Sketch of horizontal transmission acoustic rooms

3. EQUIPMENT AND TEST CONDITIONS

Microphones	Brüel&Kjær 4943; Serial No. 3188436	Brüel&Kjær 4943; Serial No. 3188435
Preamplifiers	Brüel&Kjær 2669; Serial No. 1948764	Brüel&Kjær 2669; Serial No. 2025844
Sound sources	Brüel&Kjær 4296; Serial No. 2071420	CERWIN VEGA; No. 012446
Booms	Brüel&Kjær 3923; Serial No. 2036584	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 Measurement uncertainty: T ($\pm 0,7$ °C), H (± 4 %), P (± 2 mbar) T: Air temperature; H: Relative humidity; P: Static pressure	Receiving room: Rotronic BL-1D; Serial No. A19060062 Measurement uncertainty: T ($\pm 0,7$ °C), H (± 4 %), P (± 5 mbar)

4. TEST PROCEDURE AND EVALUATION

The sound reduction index, R, for the one-third octave frequency bands from 100 Hz to 5 kHz is obtained according to EN ISO 10140-2:2021 using the following formula:

$$R = L_1 - L_2 + 10 \cdot \log S/A$$

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 by emitting equalized white noise using a moving omnidirectional sound source. The sound field in the source and receiving rooms is sampled using a moving microphone with a sweep radius of 1 m and a traverse period of 16 s/cycle during 32 s. of measure. Background noise in the receiving room is measured according to the same measurement process of sound field in the receiving room.

The equivalent sound absorption area is evaluated from the reverberation time measured in the receiving room, using Sabine's formula:

$$A=0,16 \cdot V/T$$

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 by using two positions of the sound source and three fixed microphone positions for each source position distributed at 120° 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 , for the one-third octave band 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 .
- C y C_{tr} : Spectrum adaptation terms from 100 to 3150 Hz, 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.
- The following Global indices 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:
 - A-weighted sound reduction index, R_A , from 100 to 5000 Hz, expressed to one decimal place.
 - A-weighted sound reduction global index for exterior traffic noise, from 100 to 5000 Hz, expressed to one decimal place.

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

CLIENT: **SUSPENSIONES
ELÁSTICAS DEL NORTE,
S.L. (SENOR)**

TEST DATE: 14/06/2024

RESULT No.: 110924-637

TEST SPECIMEN:

**ACOUSTIC PARTITION WITH
MAXIMUM WATERTIGHTNESS**

Estimated superficial mass: 41 kg/m²

Test specimen area: 10,08 m²

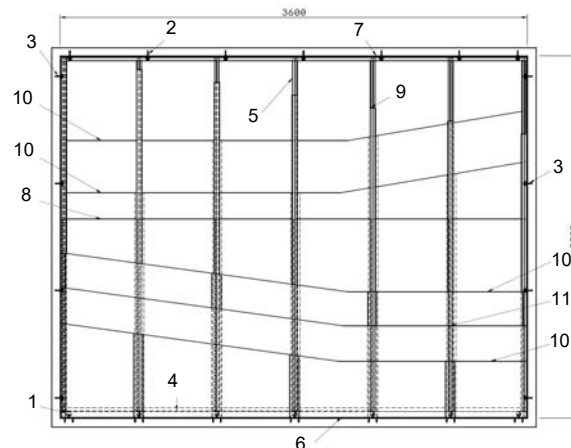
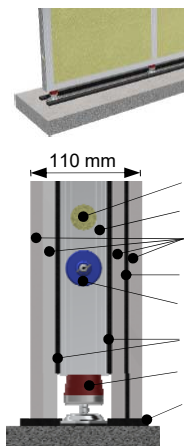
V_{src}: 67,0 m³ V_{rec}: 56,0 m³

T_{src}: 20,6 °C T_{rec}: 20,7 °C

H_{src}: 52 % H_{rec}: 57 %

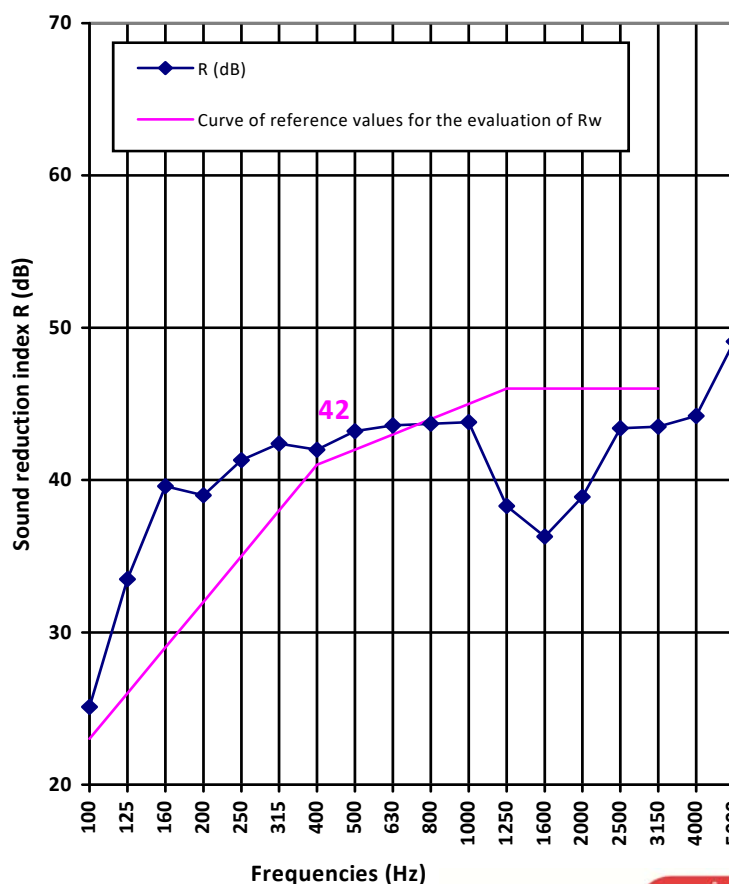
P_{src}: 956 mbar P_{rec}: 956 mbar

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



1. SE-TMT-50 R (SENOR)
2. SE-TAV-500/11R (SENOR)
3. SE-TAV-500/11A (SENOR)
4. 48/30 CHANNEL
5. 48/35 STUD
6. SE-BEC-8x40 (SENOR)
7. SE-BEC-8x120 (SENOR)
8. URSA TERRA PLUS 32 T0003 mineral wool
9. SE-MONT-BICAPA-40 (SENOR)
10. 12,5 mm plasterboard
11. 4 mm bituminous membrane

f (Hz)	R (dB)
100	25,1
125	33,5
160	39,6
200	39,0
250	41,3
315	42,4
400	42,0
500	43,2
630	43,6
800	43,7
1000	43,8
1250	38,3
1600	36,3
2000	38,9
2500	43,4
3150	43,5
4000	44,2
5000	49,1



Rating according to EN ISO 717-1:2020 **R_w (C;C_{tr}): 42 (-2; -3) dB**

Rating according to CTE DB-HR: **R_A: 40,8 dBA**

R_{A,tr}: 39,1 dBA



Evaluation based on laboratory measurement results obtained by an engineering method