

**Test report No B0082 – IN – CM – 26-M52-I****Laboratory measurements of sound insulation****TEST SPECIMEN:** False ceiling (2 plasterboards)
under floor.**APPLICANT:** AMC, S.A.**USED STANDARDS:** ISO 140-3:1995.**DATE OF TEST:** July 16th, 2004.**DATE OF TEST REPORT:** August 27th, 2004.

| Acoustics Laboratory Manager | Acoustics Laboratory Engineer |
|------------------------------|-------------------------------|
| | |
| Mª José de Rozas | Susana Escudero |

The technical-owned of the ENAC N°4/LE456 accreditation fall to technological centre LABEIN, the same way as the technical signatures of this report.

The installations where are performed the measurements according ENAC N°4/LE456 accreditation belong to the Acoustics Area of Laboratory for Quality Control in Buildings of the Basque Country Government.

THIS REPORT CONTAINS:

Total number of pages: 9 Pages in the ANNEX: 1

This document includes only and exclusively the tested specimens and the moment and conditions in which those measurements were made. This report is the English version of the Spanish report B0082-IN-CM-26-M52.

It is expressly forbidden any total or partial reproduction of this document, except with a written conformity from LABEIN.

The test specimen has been subjected to the test asked by the applicant, following the specified procedures in the used standards.

Test results are detailed in the inside pages. Measurements repeatability complies with ISO 140-2:1991 requirements.

This document is a PDF copy of the original report, asked by our client.





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ANNEX Test results.



1.- AIM

This report presents the results of the laboratory measurements of **airborne sound insulation** according to **ISO 140-3** of a false ceiling under floor.

2.- APPLICANT

COMPANY: AMC, S.A.
(Aplicaciones Mecánicas del Caucho, S.A.)

ADDRESS: Pol. Ind., Sector A, Parcela 35.
20159 ASTEASU (Guipúzcoa)
SPAIN.

CONTACT: Iñaki Lopetegi.

3.- PLACE OF TEST SPECIMEN CONSTRUCTION AND TEST EXECUTION

The test specimen was mounted in the Laboratory for Quality Control in Buildings of the Basque Country Government located at:

C/ Aguirrelanda, N° 10
01013 Vitoria – Gasteiz

The test was performed in the vertical transmission rooms of the laboratory by technological centre LABEIN (Construction and Environment Unit).

The materials used in the test specimen construction were chosen by the applicant. The false ceiling construction was made by personal taken on by the applicant and supervised by LABEIN and it was finished on 15 July 2004.



4.- TEST STANDARDS AND PROCEDURES

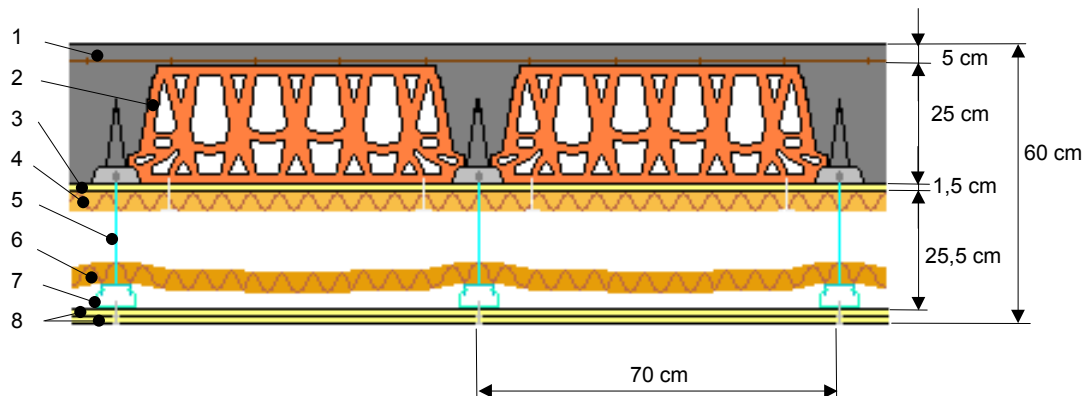
- **ISO 140-3:1995:** “Acoustics - Measurement of sound insulation in buildings and of building elements. Part 3: Laboratory measurements of airborne sound insulation of building elements.”
- **ISO 717-1:1996:** “Acoustics - Rating of sound insulation in buildings and of building elements. Part 1: Airborne sound insulation.”
- **LABEIN internal procedures.** According to ENAC accreditation No 4/LE456 (ENAC: Spanish National Accreditation Body).

5.- TEST ARRANGEMENT

5.1.- Test specimen description

The test specimen consist of a floor with false ceiling (see figure 1 and photos 1-4).

The size of the test specimen is 13,86 m² (4,2 x 3,3 m).



- | | |
|---|---|
| 1. Concrete layer | 5. M6 rod |
| 2. Ceramic hollow block | 6. Semi-rigid rock wool board (5 cm; 20 kg/m ³) |
| 3. Plaster | 7. Metallic profile |
| 4. Rigid rock wool board (4 cm; 160 kg/m ³) | 8. Plasterboard (15 mm; 11 kg/m ²) |

Figure 1: Test specimen sketch (B0082-26-M52)



Photo 1: Mounting of the first layer of rock wool



Photo 2: Mounting of rods, profiles and second layer of rock wool



Photo 3: Mounting of plasterboard



Photo 4: Mounting of the second layer of plasterboard



5.2.- Laboratory test facilities

The test has been performed in the vertical transmission acoustic rooms of the laboratory, composed of a source and a receiving room.

The mobility of the source room allows to prepare the test specimen outside the rooms (mounted in a reinforced concrete frame) and to move it later inside the test rooms.

Acoustic rooms dimensions:

| | Source room | Receiving room |
|--------------------------|-------------|----------------|
| Volume (m ³) | 53,6 | 61 |

A sketch of the rooms is included:

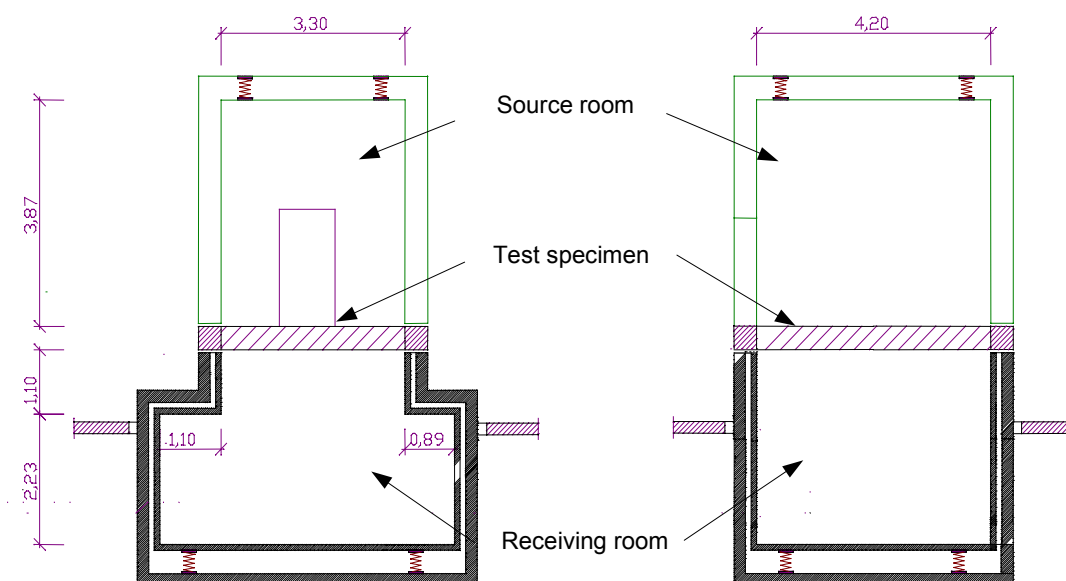


Figure 2: Vertical transmission acoustic rooms

Laboratory test facilities comply with the requirements of **ISO 140-1:1997**.



5.3.- Equipment

| | Source room | Receiving room |
|---------------|-------------------------------|-------------------------------|
| Microphones | Brüel & Kjær 4192; N° 1933119 | Brüel & Kjær 4190; N° 2058385 |
| Preamplifiers | Brüel & Kjær 2669; N° 2025850 | Brüel & Kjær 2669; N° 2025851 |
| Sound sources | Brüel & Kjær 4296; N° 2071427 | BR 112 T/A |
| Booms | Brüel & Kjær 3923; N° 2036591 | Brüel & Kjær 3923; N° 2036585 |

| | Control room | |
|------------------------------|--------------------|-------------------|
| Analyzer | Brüel & Kjær 2144; | N° 1893979 |
| Amplifier | LAB 300; | N° 970-967 |
| Equalizer | Sony, SRP-E100; | N° 400238 |
| Calibrator | Brüel & Kjær 4231; | N° 2061476 |
| Atmospheric conditions meter | Testo 0560 4540; | N° 711.88490007GB |

6.- TEST PROCEDURE AND EVALUATION

The sound reduction index (R) for the one-third-octave band 100 Hz to 5 kHz has been calculated according to **ISO 140-3** standard using the following formula:

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

L₁: Average sound pressure level in the source room.

L₂: 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 L₁ and L₂ has been performed emitting an equalized noise (between 100 Hz and 5 kHz) with a moving sound source.

The sound field in the source and receiving rooms has been sampled using six different microphone positions.



The equivalent sound absorption area has been evaluated from the reverberation time measured in the receiving room and determined using Sabine's formula:

$$A=0.16*V/T \quad \text{where,}$$

- 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 has been determined using one position of the sound source and six different fixed microphone positions, at 60° in the microphone path.

At last, background noise was measured in the receiving room in the one-third-octave band 100 Hz to 5 kHz using six different microphone positions.

All the testing equipment was calibrated just before and after every measurement.

The weighted sound reduction index (R_w) of the test specimen and the spectrum adaptation terms C and C_{tr} have been obtained according to **ISO 717-1** standard from the insulation curve.

Additionally, the pink noise insulation index, $R(A)$, between 100 Hz and 5 kHz has been calculated as the index specified by the Spanish Basic Building Regulation: **NBE-CA 88** "Acoustical Conditions in Buildings".

7.- **RESULTS**

The results of the test are attached in the ANNEX.