ISTITUTO GIORDANO

Istituto Giordano S.p.A.
Via Rossini, 2 - 47814 Bellaria-Igea Marina (RN) - Italy
Tel. +39 0541 343030 - Fax +39 0541 345540
istitutogiordano@giordano.it - www.giordano.it
Cod. Fisc./P.Iva 00 549 540 409 - Cap. Soc. € 1.500.000 i.v.
R.E.A. c/o C.C.I.A.A. (RN) 156766
Registro Imprese di Rimini n. 00 549 540 409

TEST REPORT No. 298014

Place and date of issue: Bellaria-Igea Marina - Italy, 20/09/2012

Customer: SEALED AIR S.r.l. - Via Trento, 7 - 20017 PASSIRANA DI RHO (MI) - Italy

Date test requested: 02/08/2012

Order number and date: 57276, 07/08/2012

Date specimen received: 02/08/2012

Test date: 06/08/2012

Purpose of test: laboratory measurements of airborne sound insulation of a partition in accordance with standards UNI EN ISO 10140-2:2010 and UNI EN ISO 717-1:2007

Test site: Istituto Giordano S.p.A. - Via Erbosa, 78 - 47043 Gatteo (FC) - Italy

Specimen origin: sampled and supplied by the Customer

Identification of specimen received: No. 2012/1716/B

Specimen name*

The test specimen is called "Single plasterboard layer partition with Stratocell Whisper FR 50mm white".

(*) according to that stated by the Customer.

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ACCREDIA L'ENTE ITALIANO DI ACCREDITAMENTO

LAB N° 0021

Comp. AV Revis. AB	This test report consists of 8 sheets.	Sheet 1 of 8

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Description of specimen*

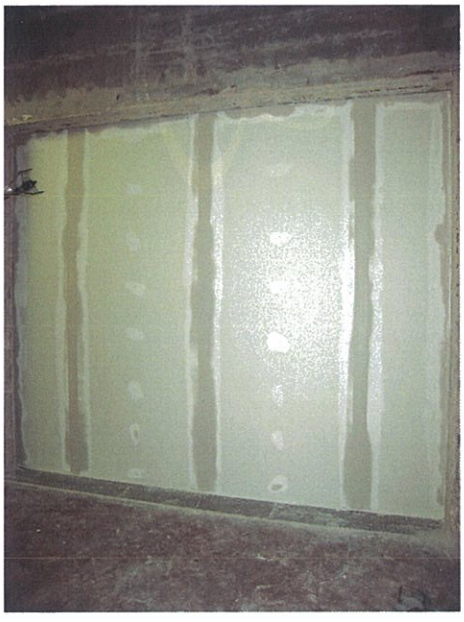
The partition consists of a 100 mm metal stud single framework with studs at 600 mm centres, 50 mm insulation in the cavity and a single layer of 12,5 mm plasterboard on each side of the framework, having the following specifications:

Measured width	3600 mm
Measured height	3000 mm
Measured thickness	125 mm
Effective acoustic surface (1250 × 1500 mm)	10,80 m^2
Mass per unit area (analytical determination)	25 kg/m^2

More specifically, the insulation in the cavity consists of:

- material: low density polyethylene foam;
- nominal density: 25 kg/m^3;
- nominal thickness: 50 mm.

The specimen was mounted in the test opening by Istituto Giordano staff.



Specimen photo

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(*) according to that stated by the Customer, apart from characteristics specifically stated to be measurements.

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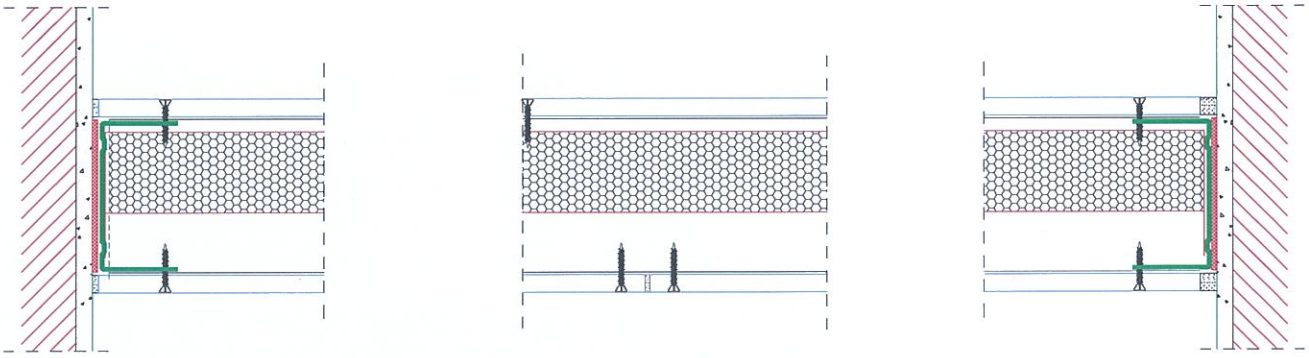
SCHEMATIC DRAWING OF THE PARTITION



Normative references

The test was carried out in accordance with the requirements of the following standards:

- UNI EN ISO 10140-2:2010 dated 21/10/2010 "Acustica - Misurazione in laboratorio dell'isolamento acustico di edifici e di elementi di edificio - Parte 2: Misurazione dell'isolamento acustico per via aerea" *("Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation")*;
- UNI EN ISO 717-1:2007 dated 19/07/2007 "Acustica - Valutazione dell'isolamento acustico in edifici e di elementi di edificio - Parte 1: Isolamento acustico per via aerea" *("Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation")*.

Test apparatus

The following equipment was used to carry out the test:

- LEM "ENERGY 2" 1000 W power amplifier;
- Behringer "DEQ2496" digital ⅓-octave equaliser;

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- portable dodecahedron speaker with line-of-sight path, length 1,6 m and 15° tilt, positioned in the source room;
- fixed dodecahedron speaker positioned in the receiving room;
- 2 rotating microphone booms with sweep radius 1 m and 30° tilt;
- 2 G.R.A.S. Sound & Vibration "40AR" ½ " random-incidence microphones;
- 2 G.R.A.S. Sound & Vibration "26AK" microphone preamplifiers;
- 01 dB-Stell "Symphonie" 2-channel real-time analyser;
- 01 dB-Stell "Cal21" acoustic calibrator for microphone calibration;
- Kern "VB 150 K 50LM" electronic platform scale;
- Sola "Tri-Matic 5 m/19 mm" metric tape measure;
- Bosch "DLE 50 Professional" laser rangefinder;
- 2 Delta Ohm "HD206-2" and "HD206S1" thermo-hygrometers;
- Brüel & Kjær "UZ001" barometer;
- complementary accessories.

Test method

The test was carried out using detailed internal procedure PP017 revision 8 dated 06/12/2011 "Misura in laboratorio dell'isolamento acustico di elementi di edificio" *("Laboratory measurement of sound insulation of building elements")*.

The test environment consists of two chambers, one of which, known as "source room", contains the noise source, whilst the other, known as "receiving room", is characterised acoustically by the equivalent sound absorption area.

Following installation of the specimen, the sound pressure level was measured in the ⅓-octave frequency range 100 Hz to 5000 Hz in both source and receiving room and the latter's reverberation times in the same operating range were recorded; pink noise was used to generate the sound field.

The single-number quantity "R_w" of the sound reduction index "R" is equal to the value in dB of the reference curve at 500 Hz in accordance with the method specified by standard UNI EN ISO 717-1:2007.

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The sound reduction index "R", equal to 10 times the common logarithm of the ratio of the sound power which is incident on the test specimen to the sound power transmitted through the specimen, was calculated using the following equation:

$$R = L_1 - L_2 + 10 \cdot \log \frac{S}{A}$$

where: R = sound reduction index in dB;

L_1 = average sound pressure level in the source room, in dB;

L_2 = average sound pressure level in the receiving room, in dB, adjusted for background noise and calculated using the following equation:

$$L_2 = 10 \cdot \log \left[10^{\frac{L_{2b}}{10}} - 10^{\frac{L_b}{10}} \right]$$

where: L_{2b}= combined average sound pressure level of signal and background noise in dB;

L_b = average background noise level in dB;

if the difference between the levels [L_{2b} - Lb] is less than 6 dB, a maximum correction of 1,3 dB is applied and the corresponding value of the sound reduction index "R" shall be considered a measurement limit value;

S = effective measuring surface of test specimen, expressed in m^2;

A = equivalent sound absorption area in the receiving room, expressed in m^2, in turn calculated using the following equation:

$$A = \frac{0{,}16 \cdot V}{T}$$

where: V = receiving room volume, expressed in m^3;

T = reverberation time, in seconds.

Furthermore, as proposed by standard UNI EN ISO 717-1:2007, 2 adaptation terms have been calculated in dB that take account of the characteristics of certain source sound spectra, more specifically:

– adaptation term "C" to be added to single-number rating "R_w" with source spectrum for A-weighted pink noise;

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– adaptation term "C_{tr}" to be added to single-number rating "Rw" with source spectrum for A-weighted traffic noise.

The test was performed immediately after completion of sample preparation.

Uncertainty of measurement

Uncertainty of measurement was determined in accordance with standard UNI CEI ENV 13005:2000 dated 31/07/2000 "Guida all'espressione dell'incertezza di misura" *("Guide to the expression of uncertainty in measurement")*, by calculating for each frequency the number of effective degrees of freedom "ν_{eff}" and expanded uncertainty "U" of the sound reduction index "R", using a coverage factor "k" representing a confidence level of 95 %.
Uncertainty of measurement of the single-number quantity "$U(R_w)$" is calculated with a coverage factor k = 2 representing a confidence level of 95 %.

Environmental conditions during test

Atmospheric pressure	101300 Pa
Average temperature	28 °C
Average relative humidity	50 %

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Test results

Receiving room volume "V"	91,8 m^3
Specimen effective measuring surface "S"	10,80 m^2

Frequency [Hz]	L_1 [dB]	L_2 [dB]	T [s]	R [dB]	R_{ref} [dB]	v_{eff}	k	U [dB]
100	101,0	85,4	1,47	**15,9**	**25,0**	6	2,45	2,6
125	101,2	82,1	1,23	**18,7**	**28,0**	7	2,36	2,0
160	97,4	65,4	1,40	**32,1**	**31,0**	9	2,26	1,1
200	99,3	64,3	1,33	**34,9**	**34,0**	9	2,26	0,9
250	99,2	62,7	1,38	**36,6**	**37,0**	7	2,36	0,9
315	98,1	58,4	1,60	**40,4**	**40,0**	10	2,23	0,7
400	97,1	52,4	1,70	**45,7**	**43,0**	13	2,00	0,4
500	98,4	50,5	1,67	**48,8**	**44,0**	12	2,00	0,4
630	97,3	46,2	1,64	**51,9**	**45,0**	10	2,23	0,5
800	96,2	42,3	1,66	**54,8**	**46,0**	11	2,00	0,4
1000	95,9	40,1	1,66	**56,7**	**47,0**	13	2,00	0,3
1250	93,6	37,1	1,70	**57,5**	**48,0**	18	2,00	0,3
1600	95,4	38,3	1,77	**58,2**	**48,0**	13	2,00	0,3
2000	93,5	38,8	1,78	**55,9**	**48,0**	15	2,00	0,3
2500	95,1	51,8	1,66	**44,2**	**48,0**	12	2,00	0,3
3150	95,1	52,4	1,50	**43,1**	**48,0**	13	2,00	0,3
4000	95,0	48,1	1,39	**47,0**	//	10	2,23	0,4
5000	95,3	44,4	1,29	**50,7**	//	13	2,00	0,3

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Specimen effective measuring surface:

10,80 m^2

Source room volume:

99,1 m^3

Receiving room volume:

91,8 m^3

Test result*:

Single-number rating at 500 Hz in the frequency range 100 Hz to 3150 Hz:

R_w = 44 dB**

Adaptation terms:

C = -4 dB
C_{tr} = -10 dB

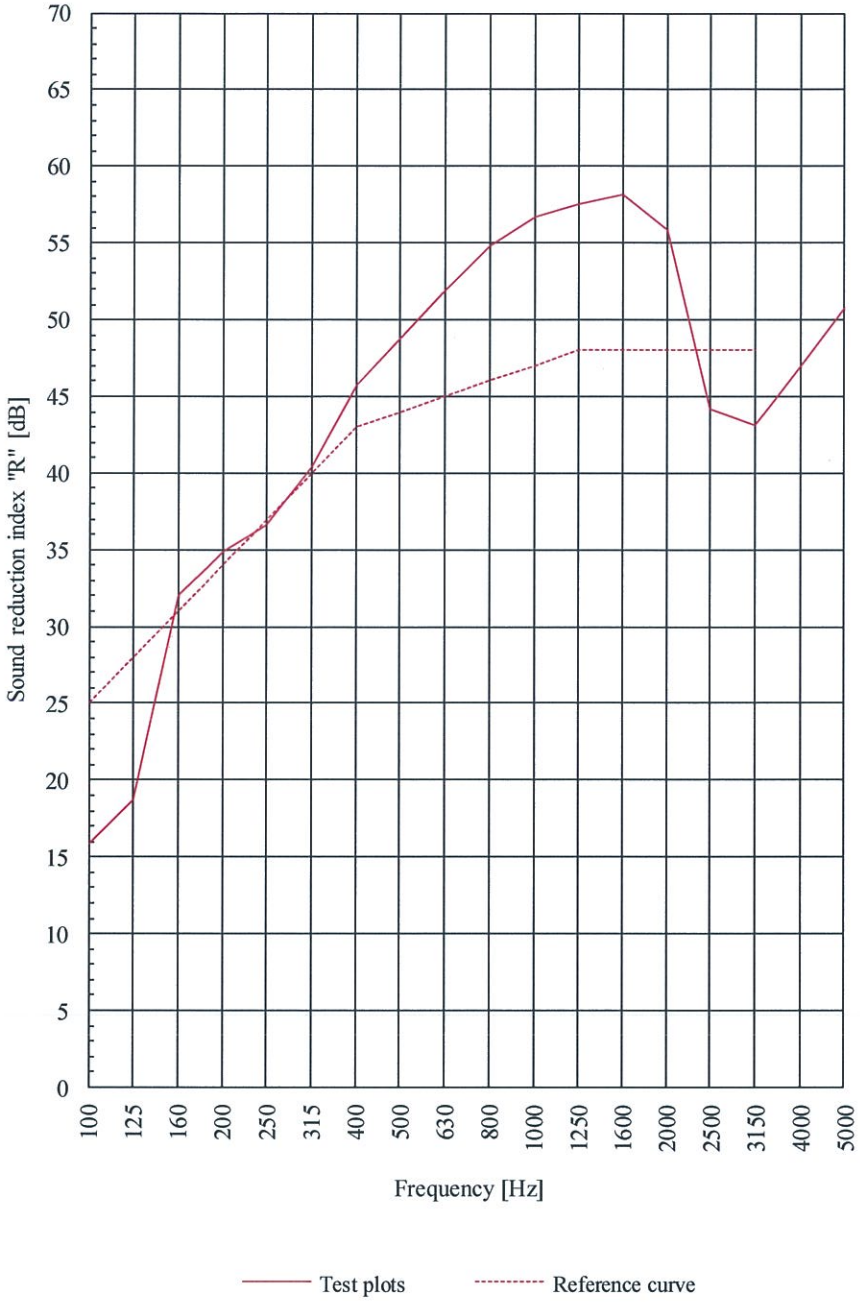
(*) Evaluation based on laboratory measurement results obtained by an engineering method.

(**) Single-number quantity of sound reduction index measured in steps of 0,1 dB:

44,8 dB

Uncertainty of measurement of the single number quantity $U(R_w)$:

0,6 dB



Test Technician
(Dott. Ing. Roberto Baruffa)

Head of
Acoustics and Vibrations Laboratory
(Dott. Ing. Roberto Baruffa)

Managing Director

L'AMMINISTRATORE DELEGATO
Dott. Ing. Vincenzo Iommi

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