ISTITUTO GIORDANO

Client Report

November 7th, 2014

muraflex

Measurement of Airborne Sound Transmission Loss

Product

Planika

Engineered by:

MANGINI

ISTITUTO GIORDANO

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TEST REPORT No. 318889

Place and date of issue: Bellaria-Igea Marina - Italy, 25/09/2014

Customer: MANGINI S.r.l. - S.P. 237 per Noci, 8 - 70017 PUTIGNANO (BA) - Italia

Date test requested: 23/09/2013

Order number and date: 60830, 24/09/2013

Date sample received: 10/07/2014

Test date: 11/07/2014

Purpose of test: laboratory measurements of the airborne sound insulation of dividing wall in accordance with standards UNI EN ISO 10140-2:2010 and UNI EN ISO 717-1:2013

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

Sample origin: sampled and supplied by the Customer

Identification of sample received: No. 2014/1888/D

Sample name*

The test sample is called "PLANIKA STEEL solid modules".

(*) according to that stated by the Customer.

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Description of sample*

The test sample is a dividing wall and having the physical characteristics specified in the following table.

Nominal width	3600 mm
Nominal height	3000 mm
Nominal thickness	104 mm
Effective sound-acoustic area	10,80 m^2

The sample, in details, is composed of:

- Loadbearing structure composed of:
  - No. 2 horizontal guides, disposed at ceiling and floor, made of galvanized steel metal profile of shaped like a "U", overall section dimensions 60 x 35 mm, and thickness 0,8 mm on which is placed an extruded plastic gasket;
  - No. 6 uprights made of galvanized steel sheet profiles shaped like an "H", dimensions 60 x 35 mm and thickness of 1,00 mm, provided at the bottom, of an adjustable feet for levelling, and on the top equipped with a fixing steel bracket, both of them enter in the horizontal guides above described. Along the short sides of the uprights, the ones facing the panels, is fixed a continuous coextruded seal. The profiles are provided with lateral slots for the hooking of the panels and central slots for the passage of installation cables;
  - No. 2 cross piece for each module made of galvanized steel profiles shaped like a "H", dimensions 60 × 35 mm and thickness of 1,00 mm provided with slots for the passage of plants, they are locked to the studs through galvanized steel brackets and levers;
  - the ending parts are made of vertical profiles made of galvanized steel "C" profiles with a thickness of 0,8 mm and a size of 104 x 18 mm. Inside the profiles has been positioned a pair of strips of plasterboard thickness of 12,5 mm;
- panels of the blind parts are constituted of:
  - panels on both sides realized in galvanized varnished steel thickness 0,8 mm bended on the sides like a bowl thickness 18 mm; in the internal part there is a gypsum panel thickness 12,5 mm density 720 kg/m^3. The panels are provided in the back part of hooks for the fixing in the slots of the uprights;
  - internal insulation, in the middle between the panels, composed of panels of mineral wool thickness 60 mm density 67 kg/m^3;
  - gasket in the gap between the panels;

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

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- 60 mm plasterboard thickness 12,5 mm with viscoelastic synthetic film situated, between the uprights, inside the upper and lower rails;
- perimeter seal around the entire perimeter between the sample and the test area.

The sample is manufactured by the Customer who also arranged for assembly in the test opening.

Photo of sample.

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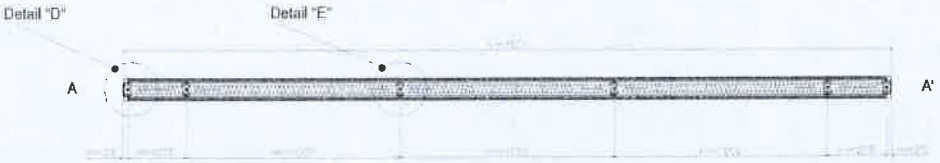
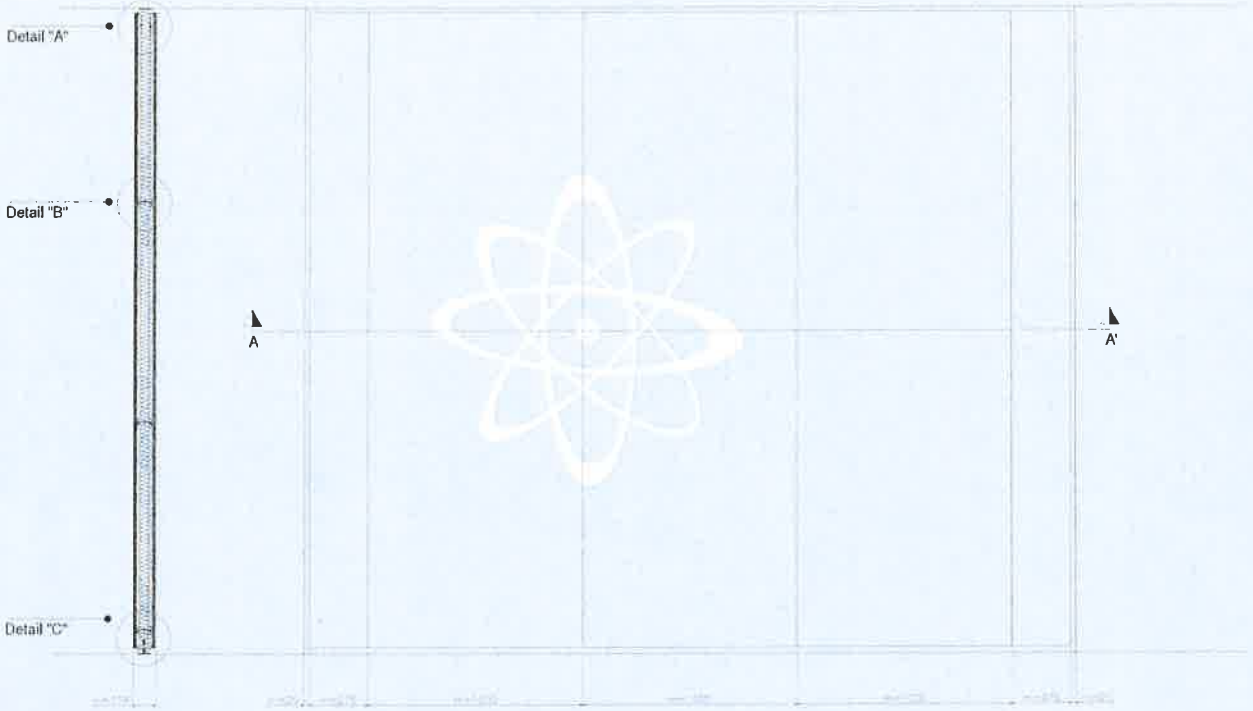
SAMPLE ELEVATION AND SECTIONS
(supplied by the Customer)





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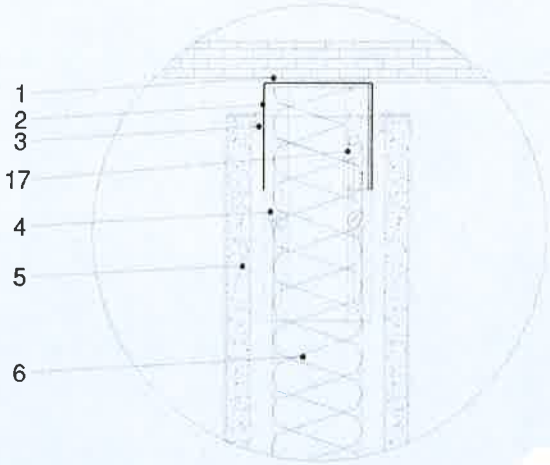
DETAILS
(supplied by the Customer)

Detail "A"



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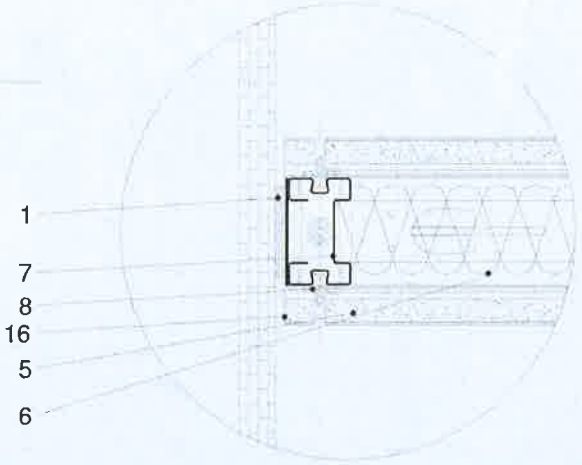

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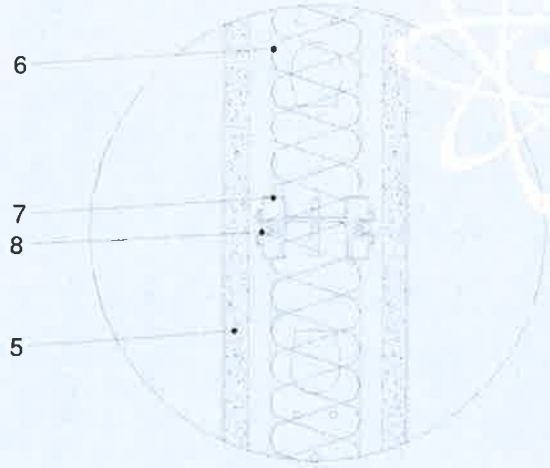

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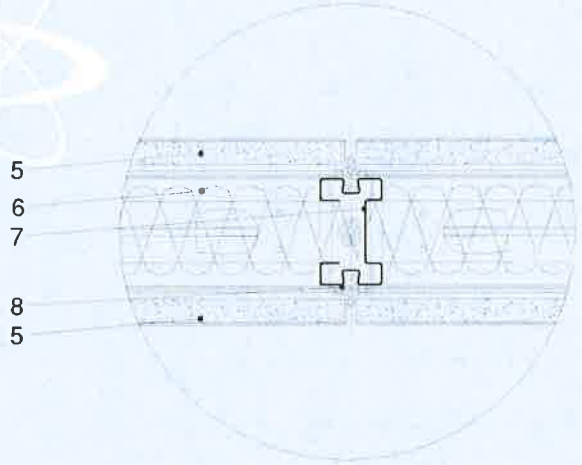

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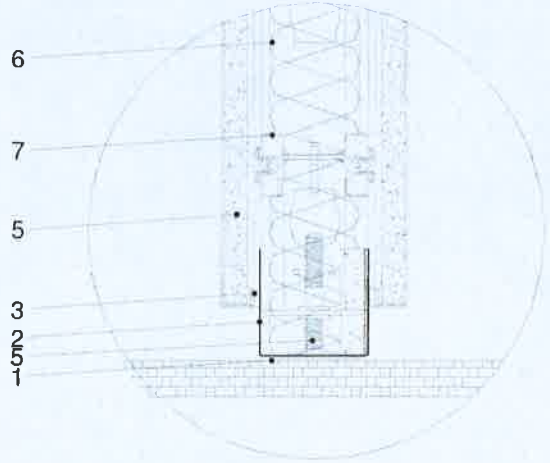

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KEY

Symbol	Description
1	EPDM antivibration expanded gasket 5 x 50 mm
2	Steel rail 0,8 mm - 60 x 60 mm
3	EPDM antivibration expanded gasket 5 x 15 mm
4	Superior fixing system steel stirrup locked with screw on upright and rail
5	Steel panel (thickness 0,8 mm) combined with plasterboard panel (thickness 12,5 mm)
6	Mineral wool panel (density 67 kg/m^3 thickness 60 mm)
7	Zinc-coated steel structure (thickness 1,00 mm dimensions 60 x 35 mm)
8	Co-extruded gasketD84.145.120.NE01 + A67.120.OP.NE01
9	Lower regulation steam M 10 x 70
16	Steel wall starting profile (thickness 0,8 mm dimensions 104 x 18 mm)
17	Gypsum board + synthetic viscoelastic at high density thickness 2,6 mm weight 5 kg/m^2

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 "Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation";
- UNI EN ISO 717-1:2013 dated 04/04/2013 "Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation".

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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;
- 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 temperature and humidity loggers with combined probe;
- Brüel & Kjær UZ001 barometer;
- complementary accessories.

Test method

The test was carried out using detailed internal procedure PP017 revision 11 dated 30/06/2014 "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.

After conditioning for at least 24 h in the measuring rooms, the sample was installed in the test opening as shown in the previous drawing.

Following installation of the sample, 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.

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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.

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 sample to the sound power transmitted through the sample, 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:

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

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 = sample effective sound-absorbing surface area, 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, 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;
- adaptation term "C_{tr}" to be added to single-number rating "R_w" with source spectrum for A-weighted traffic noise.

The test was performed immediately after completion of sample preparation.

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Uncertainty of measurement

Uncertainty of measurement was determined in accordance with standard UNI CEI ENV 13005:2000 dated 31/07/2000 "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 weighted sound reduction index "$U(R_w)$" is calculated with a coverage factor k = 2 representing a confidence level of 95 %.

Environmental conditions during test

	Source room	Receiving room
Atmospheric pressure	101000 Pa	101000 Pa
Average temperature	25 °C	25 °C
Average relative humidity	54 %	56 %

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Test results

Receiving room volume "V"	90,2 m^3
Sample effective sound-absorbing surface area "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	95,2	69,9	1,41	**25,5**	**34,0**	7	2,36	2,6
125	98,1	68,7	1,30	**29,3**	**37,0**	7	2,36	2,0
160	100,2	65,6	1,15	**33,9**	**40,0**	9	2,26	1,1
200	96,3	57,8	1,10	**37,7**	**43,0**	9	2,26	0,8
250	92,7	47,5	1,17	**44,6**	**46,0**	8	2,31	0,8
315	91,7	40,3	1,19	**50,9**	**49,0**	11	2,00	0,7
400	93,4	38,0	1,43	**55,7**	**52,0**	16	2,00	0,6
500	93,6	36,2	1,43	**57,7**	**53,0**	19	2,00	0,6
630	92,8	34,9	1,48	**58,3**	**54,0**	13	2,00	0,5
800	93,8	33,9	1,57	**60,6**	**55,0**	13	2,00	0,5
1000	92,9	31,3	1,63	**62,5**	**56,0**	9	2,26	0,7
1250	91,9	28,9	1,68	**64,0**	**57,0**	6	2,45	1,4
1600	92,7	28,0	1,72	**65,8**	**57,0**	10	2,23	0,6
2000	94,6	31,0	1,70	**64,6**	**57,0**	11	2,00	0,5
2500	97,9	34,4	1,59	**64,3**	**57,0**	14	2,00	0,3
3150	96,0	29,2	1,53	**67,4**	**57,0**	12	2,00	0,4
4000	94,4	23,6	1,39	**71,0**	//	12	2,00	0,5
5000	93,5	20,7	1,25	**72,5**	//	8	2,31	0,7

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Sample effective sound-absorbing surface area:

10,80 m^2

Source room volume:

99,1 m^3

Receiving room volume:

90,2 m^3

Test result*:

Single-number rating at 500 Hz in the frequency range 100 Hz to 3 150 Hz:

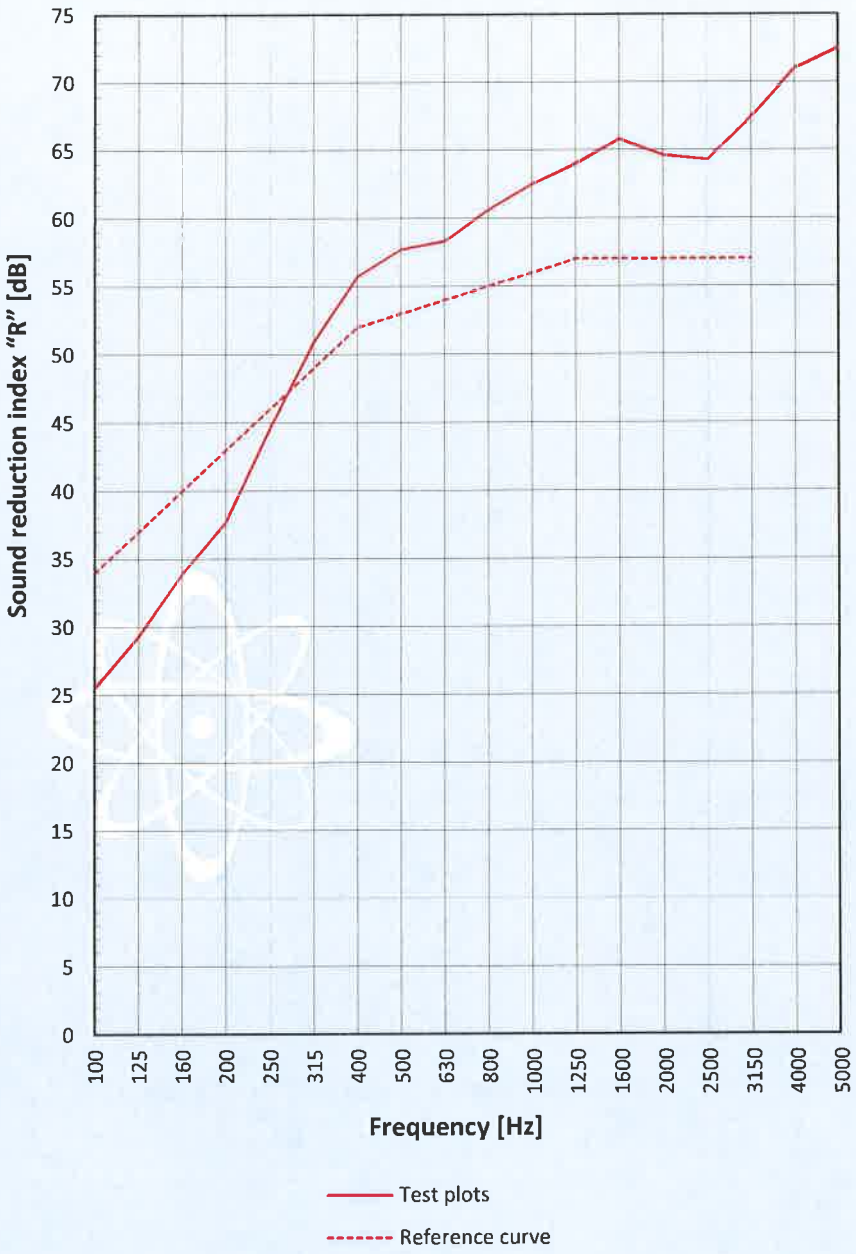
R_w = 53 dB**

Adaptation terms:

C = -3 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 and uncertainty of measurement of the single number quantity $U(R_w)$:
(53,6 ± 0,6) dB



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(Dott. Ing. Roberto Baruffa)

Chief Executive Officer
(Dott. Arch. Sara Lorenza Giordano)

Firmato digitalmente da GIORDANO SARA LORENZA