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TEST REPORT No. 267162

Place and date of issue: Bellaria-Igea Marina - Italy, 15/03/2010

Customer: C & P COSTRUZIONI S.r.l. - Via d'Este, 5/7-5/8 - 42028 POVIGLIO (RE) - Italy

Date test requested: 17/12/2009

Order number and date: 47425, 18/12/2009

Date specimen received: 03/12/2009

Test date: 24/02/2010

Purpose of test: determination of the impact sound insulation of a floor in accordance with standards UNI EN ISO 140-6:2000 and UNI EN ISO 717-2:2007

Test site: Istituto Giordano S.p.A. - Cantiere di via Erbosa - 47043 Gatteo (FC) - Italy

Specimen origin: sampled and supplied by the Customer

Identification of specimen received: No. 2009/2599/C

Specimen name*

The test specimen is called "S 20".

(*) according to that stated by the Customer.

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Description of specimen*

The test specimen is a floor whose dimensions are specified in the following table:

Overall nominal length	5400 mm
Overall nominal width	3400 mm
Overall nominal thickness	405 mm
Nominal length of test opening	5000 mm
Nominal width of test opening	3000 mm
Effective sound-absorbing area (5000 × 3000 mm)	15,00 m^2

The specimen's main components are:

- layer of conventional cement-mortar plaster, nominal thickness 15 mm and nominal density 1900 kg/m^3;
- floor, overall nominal thickness 240 mm and nominal mass per unit area 300 kg/m^2, built using:
  - S20 mineralised-wood-chip concrete shuttering blocks, nominal size 1000 × 200 mm, nominal thickness 200 mm and nominal mass per unit area 120 kg/m^2, dry laid;
  - reinforcement formed by 3 longitudinal steel rebars, nominal diameter 10 mm, per beam and arc-welded steel mesh, mesh aperture size 200 × 200 mm and nominal rebar diameter 6 mm;
  - concrete topping, minimum nominal thickness 40 mm, maximum nominal thickness 190 mm and nominal density 2400 kg/m^3;
- lightweight levelling layer of untreated polystyrene foam beads, cement and sand, nominal thickness 80 mm and nominal density 400 kg/m^3;
- ISOLMANT UNDERSPECIAL resilient decoupling membrane, overall nominal thickness 8 mm and nominal density 30 kg/m^3, formed by a layer of physically-cross-linked closed-cell polyethylene foam sheet, embossed and screen-printed on the top face, nominal thickness 5 mm, bonded to a special needlefelt backing, nominal thickness 3 mm;
  the sheets are supplied in rolls and have a rebated edge;
- concrete screed, nominal thickness 50 mm and nominal density 1800 kg/m^3;
- floor covering created by fitting together porcelain tiles, size 320 × 320 mm, nominal thickness 8 mm and nominal mass per unit area 19 kg/m^2, that are glue to the screed.

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

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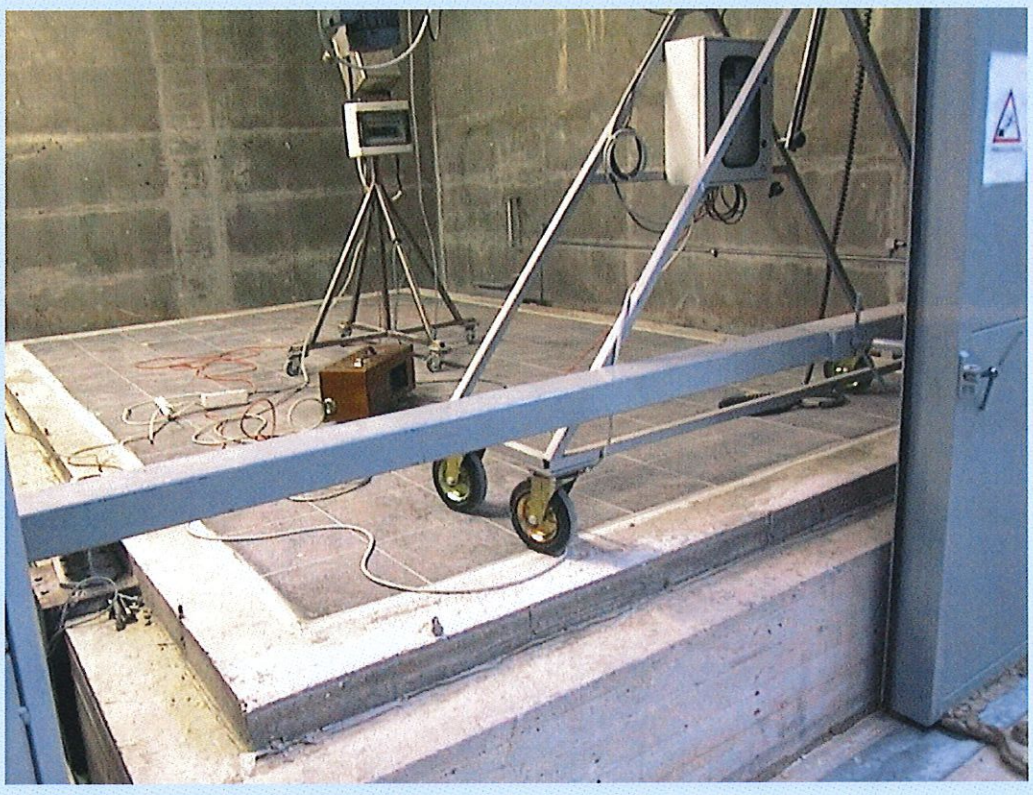
The Customer-manufactured specimen was mounted in the test opening by Istituto Giordano staff.



Specimen photo, source room side

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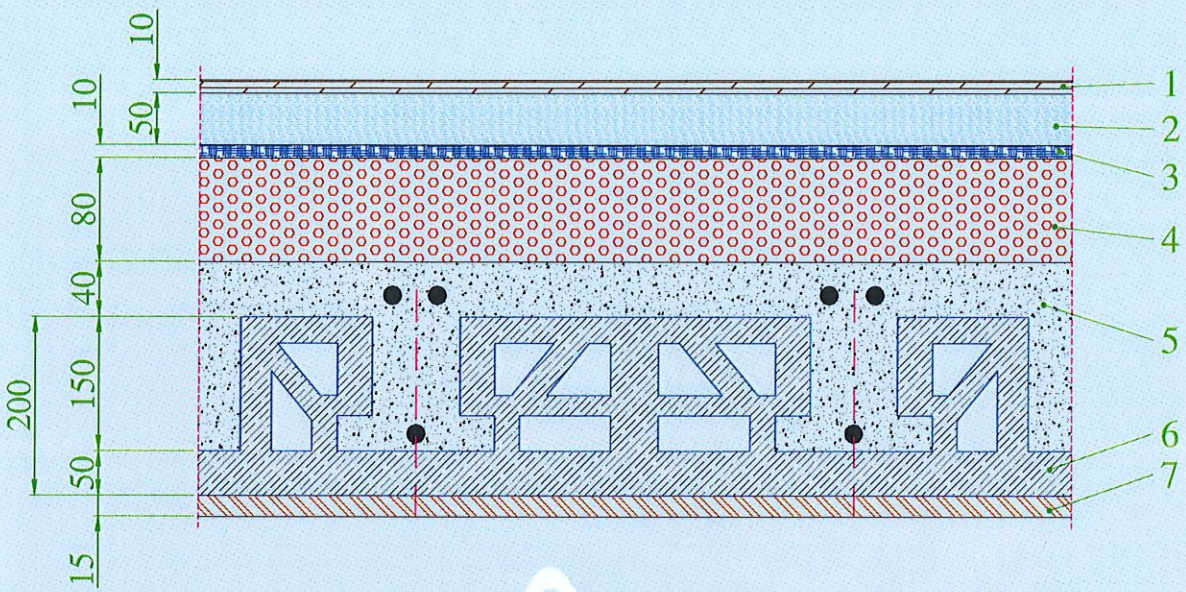
CLOSE-UP OF SPECIMEN SECTION



Key

Symbol	Description
1	Floor covering; porcelain tiles, size 320 × 320 mm, nominal thickness 8 mm and nominal mass per unit area 19 kg/m^2
2	Concrete screed, nominal thickness 50 mm and nominal density 1800 kg/m^3
3	ISOLMANT UNDERSPECIAL resilient decoupling membrane, overall nominal thickness 8 mm and nominal density 30 kg/m^3, formed by physically-cross-linked closed-cell polyethylene foam sheet, embossed and screen-printed on the top face, nominal thickness 5 mm, bonded to a special needlefelt backing, nominal thickness 3 mm
4	Lightweight levelling layer of untreated polystyrene foam beads, cement and sand, nominal thickness 80 mm and nominal density 400 kg/m^3
5	Concrete topping, minimum nominal thickness 40 mm, maximum nominal thickness 190 mm and nominal density 2400 kg/m^3
6	ISOTEX S 20 floor covering made from mineralised-wood-chip concrete shuttering blocks, nominal thickness 200 mm and nominal mass per unit area 120 kg/m^2
7	Layer of conventional cement-mortar plaster, nominal thickness 15 mm and nominal density 1900 kg/m^3

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Normative References

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

- UNI EN ISO 140-6:2000 dated 31/12/2000 "Acoustics - Measurement of sound insulation in buildings and building elements - Laboratory measurements of impact sound insulation of floors";
- UNI EN ISO 717-2:2007 dated 19/07/2007 "Acoustics. Rating of sound insulation in buildings and of building elements. Part 2: Impact sound insulation".

Test apparatus

The following equipment was used to carry out the test:

- Behringer EPX2000 2000 W power amplifier;
- Brüel & Kjær standard tapping machine - type 3204;
- fixed dodecahedron speaker positioned in the receiving room;
- 1 rotating microphone boom with sweep radius 1 m and 30° tilt;
- Behringer DEQ2496 ⅓-octave equaliser;
- Brüel & Kjær noise generator - type 1405;
- Brüel & Kjær 1/2" microphone - type 4192;
- Brüel & Kjær microphone preamplifier, type 2669;
- Sinus Messtechnik Soundbook Quadro 974301.6 four-channel real-time analyser;
- Brüel & Kjær calibrator for microphone calibration, type 4230;
- Kern VB 150 K 50LM electronic platform scale;
- Sola Tri-Matic 5 m/19 mm metric tape measure;
- Bosch DLE 50 Professional laser rangefinder;
- complementary accessories.
- 2 RS 212-124 thermohygrometers;
- Brüel & Kjær barometer - type UZ001;
- complementary accessories.

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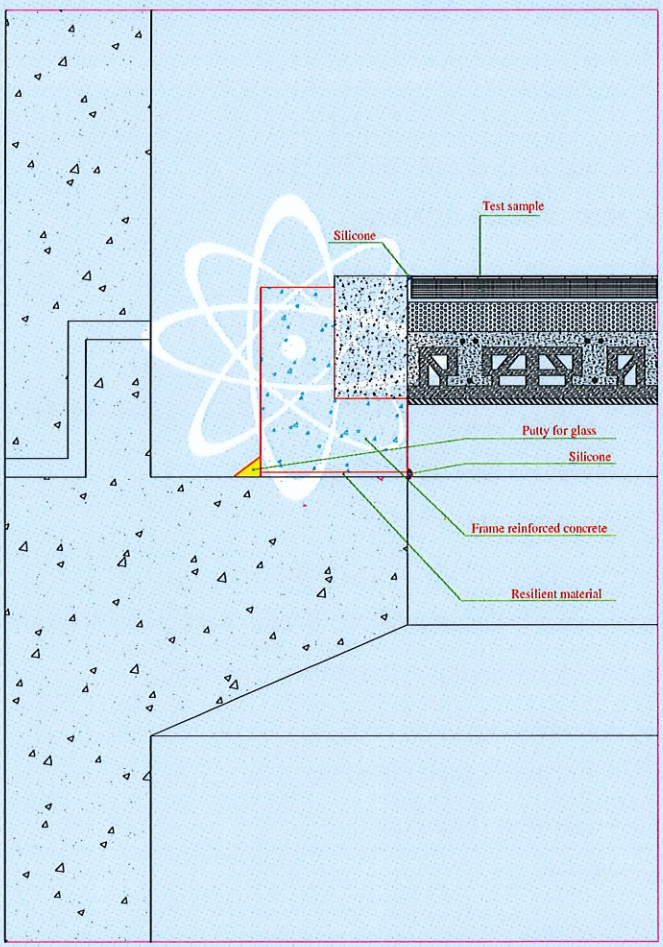
Test method

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

The specimen was installed in the test opening as shown in the following drawing.



Close-up of specimen positioning in the opening between the two rooms of the test environment

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After installing the specimen and placing the standard tapping machine on the specimen, the sound pressure level in the $^1/_3$ octave frequency range 100 Hz to 5000 Hz was measured in the receiving room along with reverberation times in the same operating range using pink noise to generate the sound field.

The weighted single number quantity "$L_{n,w}$" of the normalized impact sound pressure level "L_n" equals the value of the shifted reference curve in dB at 500 Hz in accordance with the method specified by standard UNI EN ISO 717-2:2007.

The normalised impact sound pressure level "L_n" was calculated using the following equation:

$$L_{n,f} = L_i + 10 \cdot \log \frac{A}{A_0}$$

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

$$L_i = 10 \cdot \log \left[10^{\frac{L_{ib}}{10}} - 10^{\frac{L_b}{10}} \right]$$

where L_{ib} = 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_{ib} - L_b] is less than 6 dB, a maximum correction of 1,3 dB is applied and the corresponding value of the of the normalized impact sound pressure level "L_n" shall be considered a measurement limit value;

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;

A_0 = reference equivalent sound absorption area, = 10 m^2.

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In addition, as proposed by standard UNI EN ISO 717-2:2007, the spectrum adaptation term "C_I" was calculated, in dB, this being added to the weighted normalized impact sound pressure level "$L_{n,w}$".

The test was carried out 23 days after the laying the concrete screed.

Environmental conditions during test

	Source room	Receiving room
Atmospheric pressure	100600 Pa	100600 Pa
Average temperature	11 °C	9 °C
Average relative humidity	79 %	88 %

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Test results

Positions of the standard tapping machine	4 with hammer connecting line orientated at 45°
Receiving room volume "V"	95,0 m^3
Specimen net measuring area "S"	15,00 m^2

Frequency [Hz]	L_i [dB]	T [s]	L_n [dB]	$L_{n,ref}$ [dB]
100	64,7	4,57	**59,9**	**55,0**
125	60,9	4,24	**56,4**	**55,0**
160	59,9	3,41	**56,4**	**55,0**
200	56,8	3,01	**53,8**	**55,0**
250	52,6	2,23	**50,9**	**55,0**
315	49,9	2,07	**48,6**	**55,0**
400	49,1	2,16	**47,6**	**54,0**
500	51,6	2,27	**49,9**	**53,0**
630	50,3	2,17	**48,8**	**52,0**
800	50,2	2,22	**48,6**	**51,0**
1000	50,7	2,21	**49,1**	**50,0**
1250	52,0	2,27	**50,3**	**47,0**
1600	48,7	2,25	**47,0**	**44,0**
2000	46,3	2,17	**44,8**	**41,0**
2500	44,9	2,11	**43,5**	**38,0**
3150	44,3	1,87	**43,4**	**35,0**
4000	42,2	1,66	**41,8**	**//**
5000	37,5	1,48	**37,6**	**//**

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Specimen net measuring area:

15,00 m^2

Source room volume:

110,8 m^3

Receiving room volume:

95,0 m^3

Test result*:

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

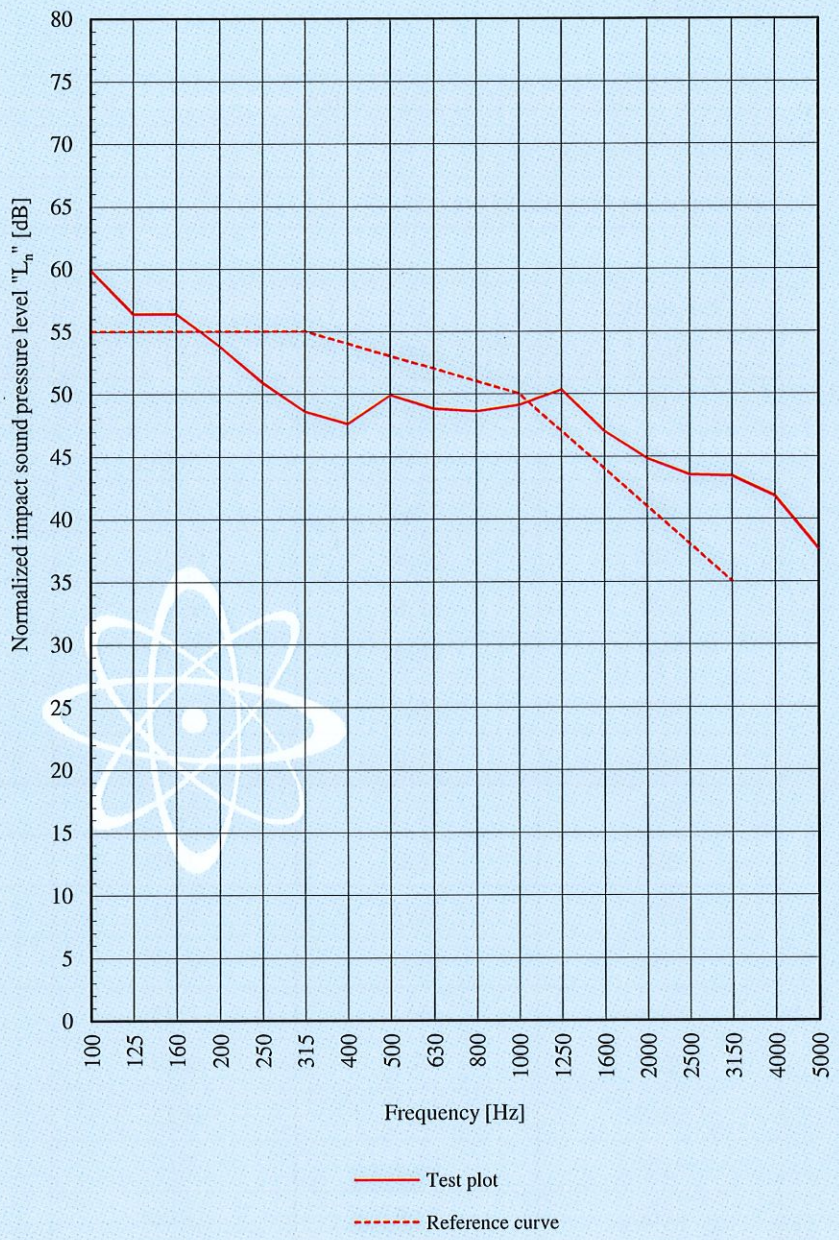
$L_{n,w}$ = 53 dB**

Adaptation terms:

C_I = -3 dB

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

(**) Weighted normalized impact sound pressure level measured in steps of 0,1 dB:
53,0 dB



Test Technician:
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Dott. Ing. Roberto Baruffa

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

Firmato digitalmente da GIORDANO SARA LORENZA