

WTCB**CSTC**

BELGIAN BUILDING RESEARCH INSTITUTE

INSTITUTION RECOGNIZED BY APPLICATION OF THE DECREE-LAW OF JANUARY THE 30th, 1947

**BEL
TEST**
 N° 054-T

NBN-EN-ISO/IEC 17025

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 - Offices : B-1932 Sint-Stevens-Woluwe, Lozenberg 7
 - Head office : B-1060 Brussels, Boulevard Poincarélaan 79

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LABORATORY of ACOUSTICS
TEST REPORT
N° DE, ATA, RE: DE 631xA191

N° Labo: AC3982

N° Test sample: 2005-18-005/1

REQUESTED BY: Recticel
 Damstraat 2
 9230 Wetteren
 Belgium

Contacts:

Requested by:
 P. Hanssens

BBRI
 M. Van Damme

Tests carried out: Laboratory measurement of impact sound insulation of floors and of the reduction of impact noise by floor coverings on a heavyweight standard floor.

Brandmark: U100 (10mm) below a 60mm concrete slab

References:

EN ISO 140-6:1998 Acoustics – Measurement of sound insulation in buildings and of building elements - Part 6:

Laboratory measurements of impact sound insulation of floors (ISO 140-6:1998)

EN ISO 140-8:1997 Acoustics – Measurement of sound insulation in buildings and of building elements - Part 8:

Lab. measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight standard floor

EN ISO 717-2:1996 Acoustics-Rating of sound insulation in buildings and of building elements – Part 2: Impact sound insulation (ISO 717-2:1996)

Date and reference of the request: 11/01/2005

Date of receipt of the sample(s): 03/05/2005

Test date: 27/06/2005

Drafting date of the report: 28/06/2005

This report with its annexes contains 7 pages. It may only be reproduced in its entirety. Each page of the original report has been stamped (in red) by the laboratory and initialised by the head of the laboratory. The results and findings are only valid for the tested samples.

- No sample
- Sample(s) submitted to a destructive test
- Sample(s) to be removed from our laboratories 10 calendar days after sending of the report, unless a written request is received by the demander of the test

The engineer in charge of the test,

The chief technician,

The Head of the laboratory,

ing. M. Van Damme

P. Huart

ir. Bart Ingelaere

Technical Assistant: /



1. Test equipment

TEST EQUIPMENT	BRANDMARK
One microphone 1/2	Bruël & Kjaer -4165
One rotating microphone set-up	Bruël & Kjaer - 3923
One pre-amplifier for microphone	Bruël & Kjaer - 2639
One power supply for microphones	Bruël & Kjaer - 2804
One real time analyser	Bruël & Kjaer - 2133
Computers with own acoustical software	
One calibration source pistophone	Bruël & Kjaer - 4220
One standardised tapping machine	Norsonic NOR-211

2. The precision of the measurement results

The precision of the measurement results are : +/- 2dB up to 315 Hz and +/- 1dB for frequencies higher than 315 Hz.

3. Description of the test element

This description is given by the producer of the test element and is not guaranteed by the laboratory. The equivalence between the tested product in this report and the commercialised product is the sole responsibility of the producer.

GENERAL DESCRIPTION

U100 is a recycled product of PU foam. The density is 100 kg/m³. It is installed below a 60 mm concrete slab. A Visqueen PE foil is put between the concrete slab and the foam layer as a moisture and vapour barrier.

COMPOSITION OF THE TESTELEMENT

Only parts of the table below can be made unreadable in copies of this report, e.g. if some data are confidential.

layer	thickness [mm]	density [kg/m ³]	surface mass [kg/m ²]	description
+7				
+6				
+5				
+4				
+3				
+2	60 mm	1800.0 kg/m ³	108.0 kg/m ²	Chape
+1	10 mm	100.0 kg/m ³	1.0 kg/m ²	Special product U100
BASIC FLOOR	160 mm	2300.0 kg/m ³	368.0 kg/m ²	Reinforced concrete slab
-1				
-2				
-3				
-4				

Total thickness of the layers on top of the basic floor = 70 mm
 Total surface mass on top of the basic floor = 109kg/m² (calculated value)

REMARKS

REDUCTION OF IMPACT SOUND PRESSURE LEVEL

AFFAIBLISSEMENT ACOUSTIQUE BRUT / CONTACTGELUIDNIVEAUREDUCTIE



EN ISO 140-6:1998 Acoustics – Measurement of sound insulation in buildings and of building elements

- Part 6: Laboratory measurements of impact sound insulation of floors (ISO 140-6:1998)

EN ISO 140-8:1997 Acoustics – Measurement of sound insulation in buildings and of building elements

- Part 8: Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight standard floor

EN ISO 717-2:1996 Acoustics-Rating of sound insulation in buildings and of building elements– Part 2: Impact sound insulation (ISO 717-2:1996)

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area S of test specimen: 17.81 m²

(oppervlakte S proefmonster / surface de l'échantillon S)

T= 24.0 °C

air humidity: 45.0 %

receiving room:

(ontvangstruimte / salle de réception)

Hall K, cell a1

49.20 m³

n° sample: 2005-18-005/1

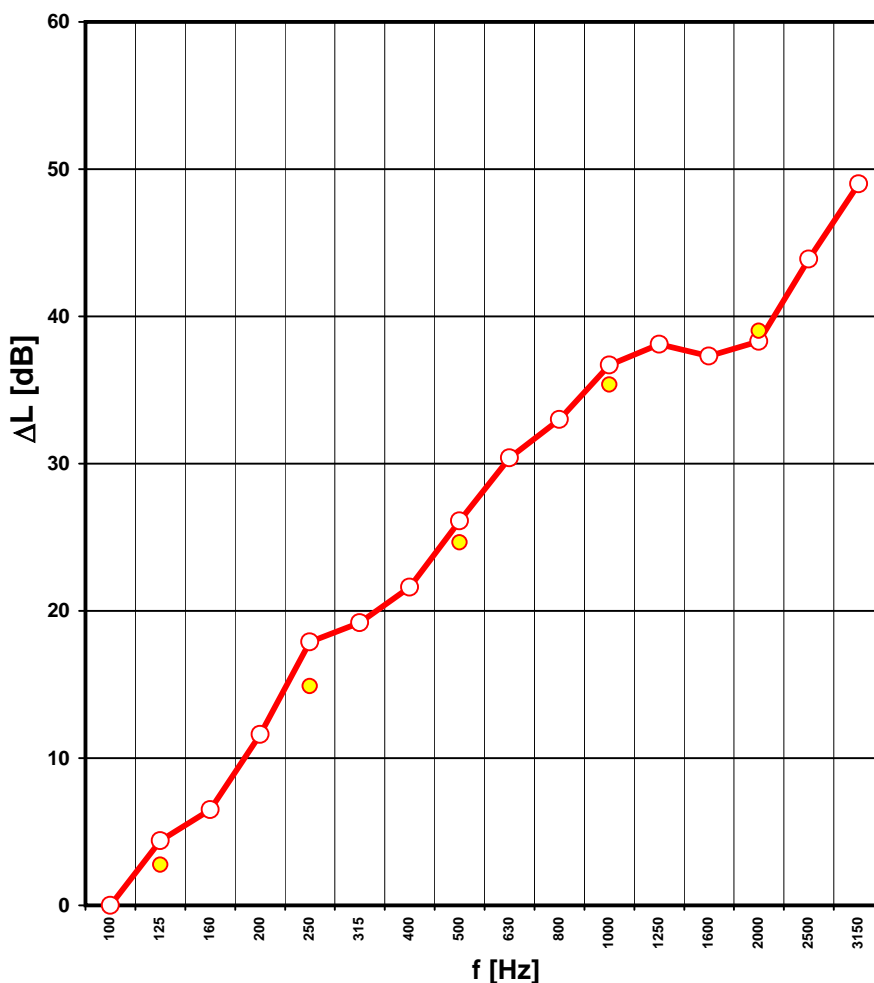
f (Hz)	ΔL = $L_{n,0} - L_n$ (dB)
1/3 octave bands : ■	
50	
63	
80	
100	0.0
125	4.4
160	6.5
200	11.6
250	17.9
315	19.2
400	21.6
500	26.1
630	30.4
800	33.0
1000	36.7
1250	38.1
1600	37.3
2000	38.3
2500	43.9
3150	49.0
4000	52.8
5000	55.8

octave bands : ●	
125	2.8
250	14.9
500	24.6
1000	35.4
2000	39.0
4000	51.7

$\Delta L_w = 25$ dB

$C_{l,\Delta} = -13$ dB

$\Delta L_{lin} = 12$ dB



Description by the producer - Beschrijving door de fabrikant - Description par le fabriquant

U100 is a recycled product of PU foam. The density is 100 kg/m³. It is installed below a 60 mm concrete slab. A Visqueen PE foil is put between the concrete slab and the foam layer as a moisture and vapour barrier.

Characteristics bearing test floor - Beschrijving draagtestvloer - Description de la dalle d'essai

Reinforced concrete slab 16 cm thickness / 16 cm dikke gewapende betonplaat / dalle en béton armé de 16 cm d'épaisseur.

WETENSCHAPPELIJK EN TECHNISCH
CENTRUM VOOR HET BOUWBEDRIJF
Laboratorium Akoestiek
Poincarélaan 79
B-1060 BRUSSEL NBN-EN-ISO/IEC 17025

**BEL
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N° 054-T



CENTRE SCIENTIFIQUE ET TECHNIQUE
DE LA CONSTRUCTION
Laboratoire Acoustique
79, Boulevard Poincaré
B-1060 BRUXELLES

REDUCTION OF IMPACT SOUND PRESSURE LEVEL

AFFAIBLISSEMENT ACOUSTIQUE BRUT / CONTACTGELUIDNIVEAUREDUCTIE



EN ISO 140-6:1998 Acoustics – Measurement of sound insulation in buildings and of building elements

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EN ISO 717-2:1996 Acoustics-Rating of sound insulation in buildings and of building elements– Part 2: Impact sound insulation (ISO 717-2:1996)

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PV: AC3982
date test: 27/06/2005
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area S of test specimen: 17.81 m²
(oppervlakte S proefmonster / surface de l'échantillon S)

T= 24.0 °C
air humidity = 45.0 %

receiving room: Hall K, cell a1
(ontvangstruimte / salle de réception)

49.20 m²

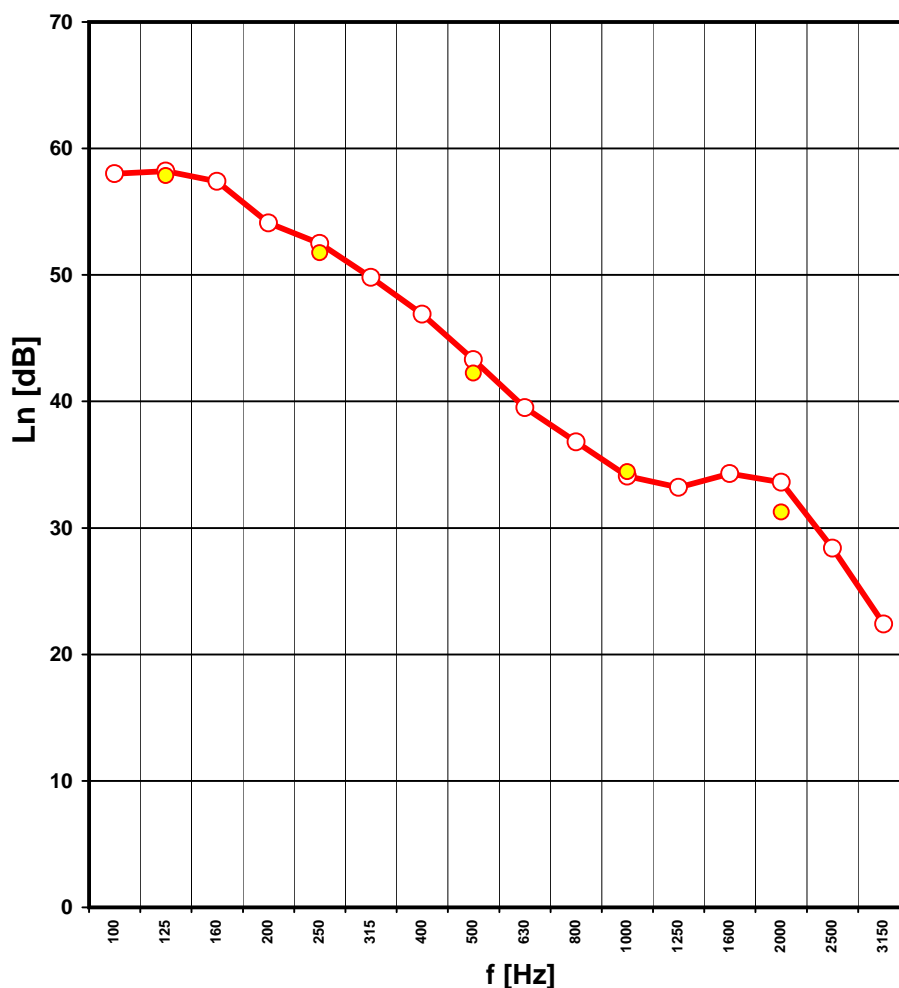
n° sample: 2005-18-005/1

f	Ln
(Hz)	(dB)
1/3 octave bands : ■	
50	
63	
80	
100	58.0
125	58.2
160	57.4
200	54.1
250	52.5
315	49.8
400	46.9
500	43.3
630	39.5
800	36.8
1000	34.1
1250	33.2
1600	34.3
2000	33.6
2500	28.4
3150	22.4
4000	17.9
5000	13.5

octave bands : ●	
125	57.9
250	51.8
500	42.2
1000	34.5
2000	31.2
4000	16.5

Ln,w = 48 dB

C₁ = 1 dB



Description by the producer - Beschrijving door de fabrikant - Description par le fabriquant

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Characteristics bearing test floor - Beschrijving draagtestvloer - Description de la dalle d'essai

Reinforced concrete slab 16 cm thickness / 16 cm dikke gewapende betonplaat / dalle en béton armé de 16 cm d'épaisseur.

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DE LA CONSTRUCTION
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1. Determination of the standardised impact sound insulation

The standardised impact sound insulation in the laboratory L_n is determined according to "EN ISO 140-6:1998 Acoustics – Measurement of sound insulation in buildings and of building elements – Part 6: Laboratory measurements of impact sound insulation of floors (ISO 140-6:1998)"
A detailed description of the measuring procedures can be found in this standard.
In simple terms, the determination principle can be summarized as follows :

The impact sound is generated by the standardised tapping machine (with steel-headed hammers) which is set successively at various positions on the test floor. For each position, sound pressure measurements are carried out with the help of a continually rotating microphone in the measuring cell located beneath the floor. Measurements are done during at least one complete rotation and in three different planes of rotation. One thus obtains an integration over time and space of the sound pressure level spectrum, which results in an average sound pressure level. The reverberation time in the receiving room is measured, which permits one to calculate the correction term to be integrated into the formula for calculating the standardised impact sound level:

$$L_n = L_{pm} + 10 \log (A / A_0)$$

with: L_{pm} = the average pressure level in the receiving room, in dB (reference 20 Micro Pa);
 A_0 = reference surface 10 m²;
 A = the equivalent absorption-surface of the receiving room in m².

2. Determination of the standardised impact sound level of the measurement support floor

The measurement support floor consists of a 16 cm thick solid reinforced concrete slab (dimensions: see figure in annex 1). The standardised impact sound insulation is determined according to 1.

3. Determination of the standardised impact sound insulation of the floating floor construction

FLOATING FLOOR: The "floating" covering floor is installed on top of the measurement support floor between low sidewalls, allowing as such to take into account the side contact insulation.
FLOOR COVERINGS: These are placed in at least 5, evenly spread places on the measurement floor. A description of the floor covering and its mounting on the measurement floor can be found in point 3 on page 2.
The standardised impact sound insulation of the floating floor construction is determined according to point 1. The result is represented on page 4.

4. Determination of the impact noise level reduction by the floating covering floor (ΔL)

The impact noise level reduction represents the difference of the standardised impact sound insulation of the measurement support floor alone minus the standardised impact sound insulation of the total floor (support floor + covering). It is the best way to acoustically characterise the product tested. The results can be found on page 3.

5. Determination of the sound pressure level of the standardised impact sound $L_{n,r}$ of a fictitious, normalised reference support floor covered with the testconstruction

The standard EN ISO 717-2:1996 gives the pressure level range of the standardised impact sound $L_{n,r,0}$ of a reference support floor. The calculated sound pressure level $L_{n,r}$ of the standardised impact noise of the reference floor covered with the covering subjected to the test is calculated from this value and the reduction of the noise level according to:

$$L_{n,r} = L_{n,r,0} - \Delta L$$

6. Single value indicators.

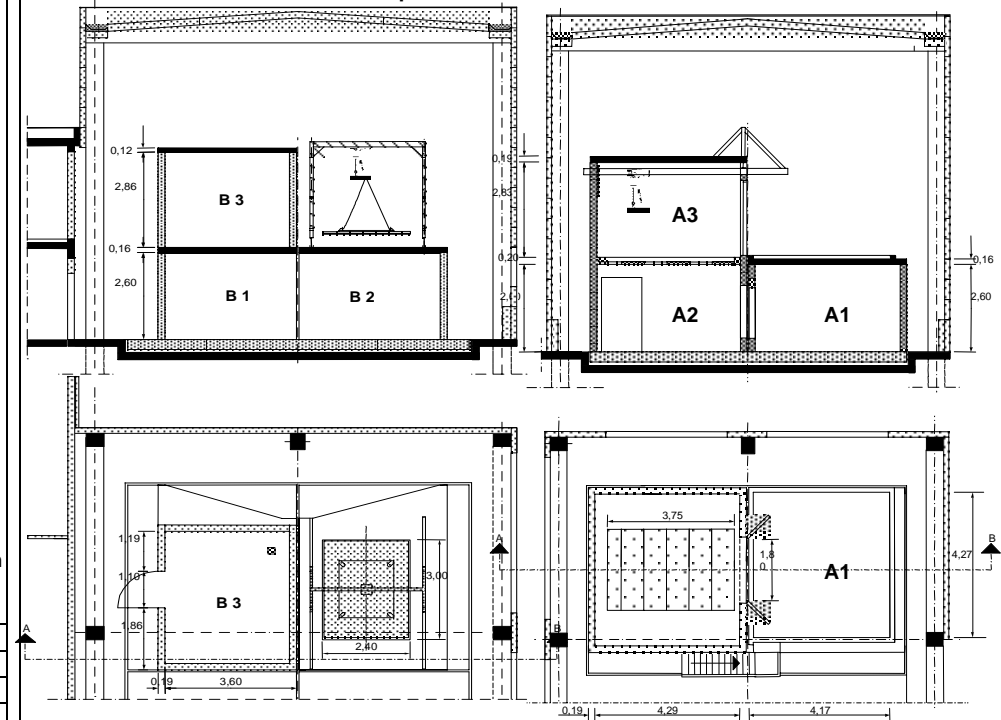
The single-value indicator (given by the index "w") is described in the standard :

"EN ISO 717-2:1996 Acoustics-Rating of sound insulation in buildings and of building elements – Part 2: Impact sound insulation (ISO 717-1:1996)"

The calculation of the single-value indicator cannot be summarised in a few lines. See standard for details.

Old national single-value indicators (NL, B, FR) are also given in the annex to this report. Calculation modules and more information about the single-value indicator (and about acoustical standardisation in general) can be found on the website of the Acoustics laboratory, i.e.:

http://www.bbri.be/antenne_norm



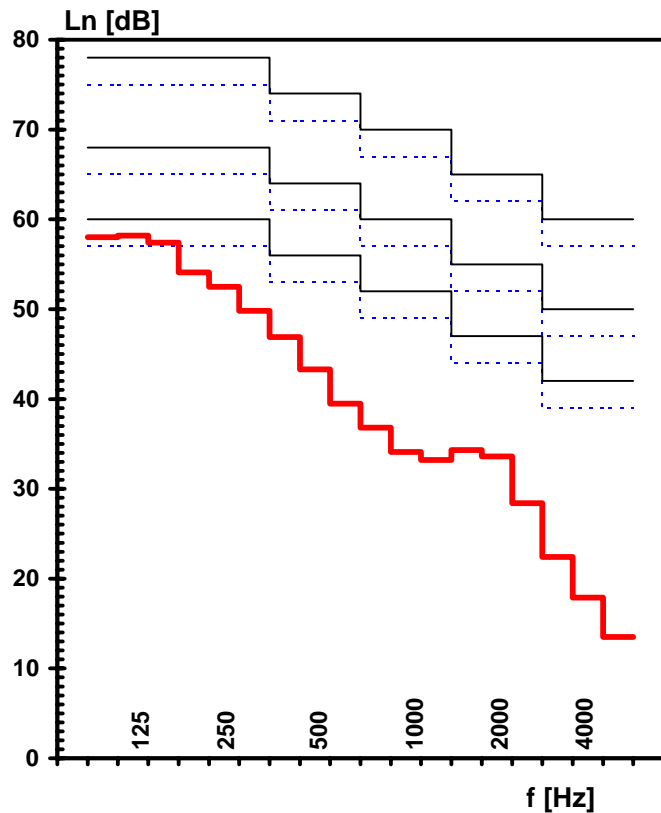
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graphical representation of Ln as to the old NBN S01-400:1977



weighted values: old national values (before 1996)

BELGIUM: NBN S01-400:1977 Critères de l'isolation acoustique - Criteria van de akoestische isolatie

BEPALING VAN DE CATEGORIE

Het feit dat de vloer tot een bepaalde categorie behoort, wordt bepaald door de ligging van het spectrum van het door deze vloer overgebrachte contactgeluid t.o.v. de spectra, die de categorieën begrenzen. Wanneer het gemeten spectrum één of meer grensspectra snijdt, is het de ligging van het ongunstigste deel van het spectrum die de categorie van de wand bepaalt. Nochtans, wanneer de overschrijdingen in de ongunstige zin (boven een grensspectrum) zodanig zijn dat hun som in om het even welke groep van 6 opeenvolgende tertsbanden kleiner is dan of gelijk aan 12 dB, dient hiermee geen rekening gehouden te worden.

DETERMINATION DE LA CATEGORIE

L'appartenance d'un plancher à une catégorie est déterminée par la situation du spectre des bruits de choc transmis par ce plancher par rapport aux spectres délimitant les catégories. Dans le cas où le spectre mesuré chevauche un ou plusieurs spectres-limites, c'est la situation de la partie la plus défavorable du spectre qui est déterminante pour le classement du plancher. Toutefois, lorsque les dépassements dans le sens défavorable (au-dessus d'un spectre-limite) sont tels que leur addition dans n'importe quel groupe de 6 tiers successives est inférieure à 12 dB, il n'en n'est pas tenu compte pour le classement en catégories.

Basic testfloor: cat. /
Floating floor: cat. I a

NETHERLANDS: NEN 5079: mei 1989 Geluidwering in woongebouwen. Het weergeven in één getal van de geluidisolatie van bouwelementen, gemeten in het laboratorium.

Basic testfloor: laboratorium-isolatie-index voor contactgeluid $I_{co,lab} = -7$ dB
Floating floor: laboratorium-isolatie-index voor contactgeluid $I_{co,lab} = 10$ dB

FRANCE

a) NF S 31-052 (Février 1979) Acoustique - Mesure du pouvoir d'isolation acoustique des éléments de construction et de l'isolement des immeubles. Mesure en laboratoire de la transmission du bruit de choc par les planchers.

Basic testfloor: Niveau Ln exprimé en dB(A) = 81.9 dB(A)
Floating floor: Niveau Ln exprimé en dB(A) = 52.2 dB(A)

b) NF S 31-053 (Février 1979) Acoustique - Mesure du pouvoir d'isolation acoustique des éléments de construction et de l'isolement des immeubles. Mesure en laboratoire de la transmission du bruit de choc par les revêtements de sol et les dalles flottantes*.

L'efficacité ΔL exprimée en dB(A) = 27.8 dB(A)

*Note: measurement method based upon EN ISO 140-6:1998: no supplementary weights have been used upon the floor

GERMANY, GREAT BRITAIN: the old national values are the same as the new EN ISO values in this report

measured data and calculations

f	(a)	(b)	(b)-(a)	(c)	(c)+(b)-(a)
(Hz)	$L_{n,0}$ (dB)	L_n (dB)	ΔL (dB)	$L_{n,r,0}$ (dB)	$L_{n,r}$ (dB)
50					
63					
80					
100	58.0	58.0	0.0	67.0	67.0
125	62.6	58.2	4.4	67.5	63.1
160	63.9	57.4	6.5	68.0	61.5
200	65.7	54.1	11.6	68.5	56.9
250	70.4	52.5	17.9	69.0	51.1
315	69.0	49.8	19.2	69.5	50.3
400	68.5	46.9	21.6	70.0	48.4
500	69.4	43.3	26.1	70.5	44.4
630	69.9	39.5	30.4	71.0	40.6
800	69.8	36.8	33.0	71.5	38.5
1000	70.8	34.1	36.7	72.0	35.3
1250	71.3	33.2	38.1	72.0	33.9
1600	71.6	34.3	37.3	72.0	34.7
2000	71.9	33.6	38.3	72.0	33.7
2500	72.3	28.4	43.9	72.0	28.1
3150	71.4	22.4	49.0	72.0	23.0
4000	70.7	17.9	52.8	/	/
5000	69.3	13.5	55.8	/	/
125	66.9	62.7	2.8	72.3	69.3
250	73.5	57.2	14.9	73.8	58.6
500	74.1	49.0	24.6	75.3	50.3
1000	75.4	39.8	35.4	76.6	41.1
2000	76.7	37.5	39.0	76.8	37.7
4000	75.3	24.1	51.7	/	/

WEIGHTED VALUES AS TO EN ISO 717-2:1996

Basic testfloor (based on spectrum (a)):

$L_{n,0,w} = 78.0$ dB $C_{1,0} = -11$ dB

Basic + floating floor (based on spectrum(b)):

$L_{n,w} = 48.0$ dB $C_1 = 1$ dB

Reference floor (data (c) given in EN ISO 717-2)

$L_{n,r,0,w} = 78.0$ dB $C_{1,r,0} = -11$ dB

Refer. + floating floor (calculated (c)+(b)-(a))

$L_{n,r,w} = 53.0$ dB $C_{1,r} = 2$ dB

Reduction of impact sound pressure level

$\Delta L_w = 78 - L_{n,r,w} = 25.0$ dB

$C_{1,\Delta} = C_{1,r,0} - C_{1,r} = -12.7$ dB

PRODUCT TESTED:

U100 (10mm) below a 60mm concrete slab

COMPANY: Recticel

Damstraat 2

9230 Wetteren

date test

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ANNEX 2: ADDITIONAL DATA



datum test
27/06/2005

datum PV
28/06/2005



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ANNEX 3