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BELGIAN BUILDING RESEARCH INSTITUTE

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

BELTEST
N° 054-T
NBN-EN-ISO/IEC 17025

- Test centre : B-1342 Limelette, avenue P. Holoffe, 21 — Tel : (32) 2 655 77 11 — Fax : (32) 2 653 07 29
- Offices : B-1932 Sint-Stevens-Woluwe, Lozenberg 7 — Tel : (32) 2 716 42 11 — Fax : (32) 2 725 32 12
- Head office : B-1060 Brussels, Boulevard Poincarélaan 79 — Tel : (32) 2 502 66 90 — Fax : (32) 2 502 81 80

VAT n° : BE 407.695.057

LABORATORY of ACOUSTICS	**TEST REPORT**	**N° DE, ATA, RE:** DE 631xA191 **N° Labo:** AC3983 **N° Test sample:** 2005-18-005/2

REQUESTED BY: Recticel NV
Damstraat 2
9230 Wetteren
Belgium

Contacts:	**Requested by:**	**BBRI**
	P. Hanssens	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: U80 (20mm) 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:	19/08/2005
Drafting date of the report:	22/08/2005

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 calender 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	Brüel & 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 responsability of the producer.

GENERAL DESCRIPTION

U80 is a recycled product of PU foam. The density is 80 kg/m³. It is installed below a 60 mm concrete slab and layed in two layers with thickness 10mm. The individual plates measure 2 by 1 meter. The two layers are installed perpendicular. 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/m³]	surface mass [kg/m²]	description
+7				
+6				
+5				
+4				
+3				
+2	60 mm	1800.0 kg/m³	108.0 kg/m²	Chape
+1	20 mm	80.0 kg/m³	1.6 kg/m²	Special product U80 (2 x 10mm)
BASIC FLOOR	160 mm	2300.0 kg/m³	368.0 kg/m²	Reinforced concrete slab
-1				
-2				
-3				
-4				

Total thickness of the layers on top of the basic floor = 80 mm

Total surface mass on top of the basic floor = 109.6kg/m ² (calculated value)

REMARKS

REDUCTION OF IMPACT SOUND PRESSURE LEVEL

AFFAIBLISSEMENT ACOUSTIQUE BRUT / CONTACTGELUIDNIVEAUREDUCTIE

ΔL

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)

client: Recticel NV
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area S of test specimen: 17.81 m²
(oppervlakte S proefmonster / surface de l'échantillon S)
receiving room: Hall K, cell a1
(ontvangstruimte / salle de réception) 49.20 m³

T= 20.0 °C
air humidity: 70.0 %
n° sample: 2005-18-005/2

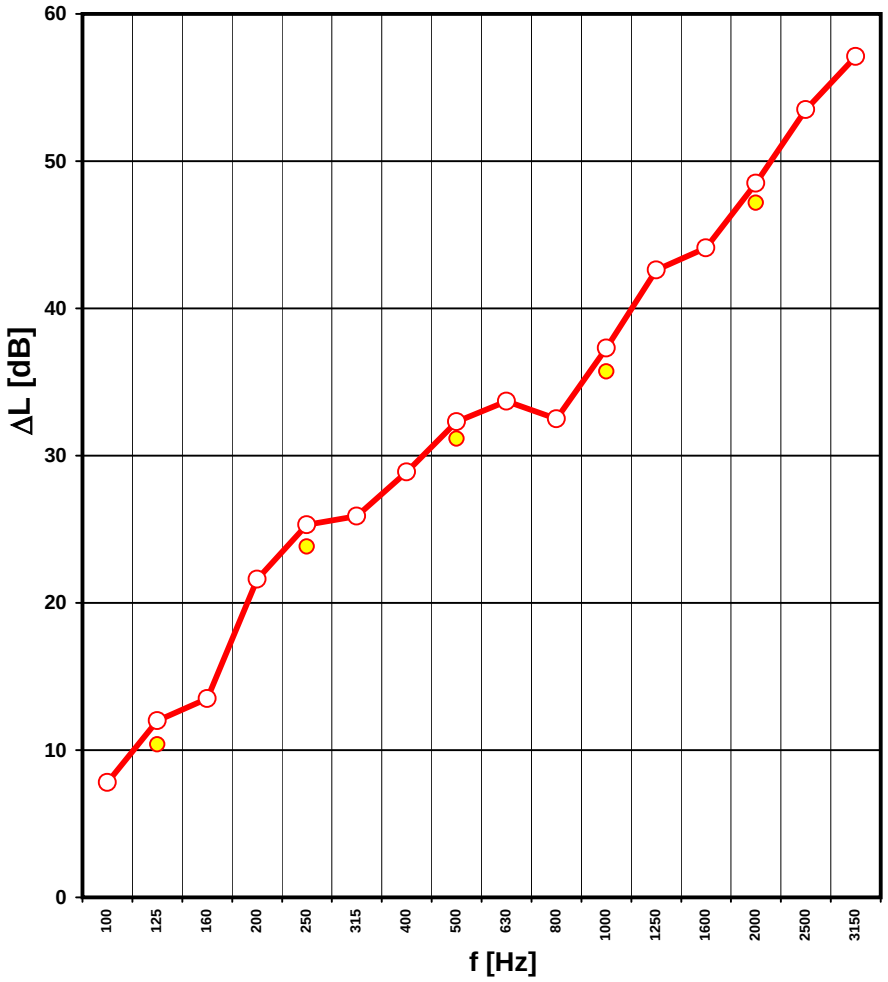
f (Hz)	ΔL $=L_{n,0} - L_n$ (dB)
1/3 octave bands :	
50	
63	
80	
100	7.8
125	**12.0**
160	13.5
200	21.6
250	**25.3**
315	25.9
400	28.9
500	**32.3**
630	33.7
800	32.5
1000	**37.3**
1250	42.6
1600	44.1
2000	**48.5**
2500	53.5
3150	57.1
4000	**60.1**
5000	59.4

octave bands :	
125	**10.4**
250	**23.8**
500	**31.1**
1000	**35.7**
2000	**47.2**
4000	**58.7**

ΔL_w = 33 dB

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

ΔL_{lin} = 20 dB



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

U80 is a recycled product of PU foam. The density is 80 kg/m³. It is installed below a 60 mm concrete slab and layed in two layers with thickness 10mm. The individual plates measure 2 by 1 meter. The two layers are installed perpendicular. 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

BELTEST N° 054-T

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

REDUCTION OF IMPACT SOUND PRESSURE LEVEL

L_n

AFFAIBLISSEMENT ACOUSTIQUE BRUT / CONTACTGELUIDNIVEAUREDUCTIE

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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: AC3983
date test: 19/08/2005
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area S of test specimen: 17.81 m²
(oppervlakte S proefmonster / surface de l'échantillon S)

T= 20.0 °C
air humidity = 70.0 %

receiving room: Hall K, cell a1
(ontvangstruimte / salle de réception) 49.20 m³

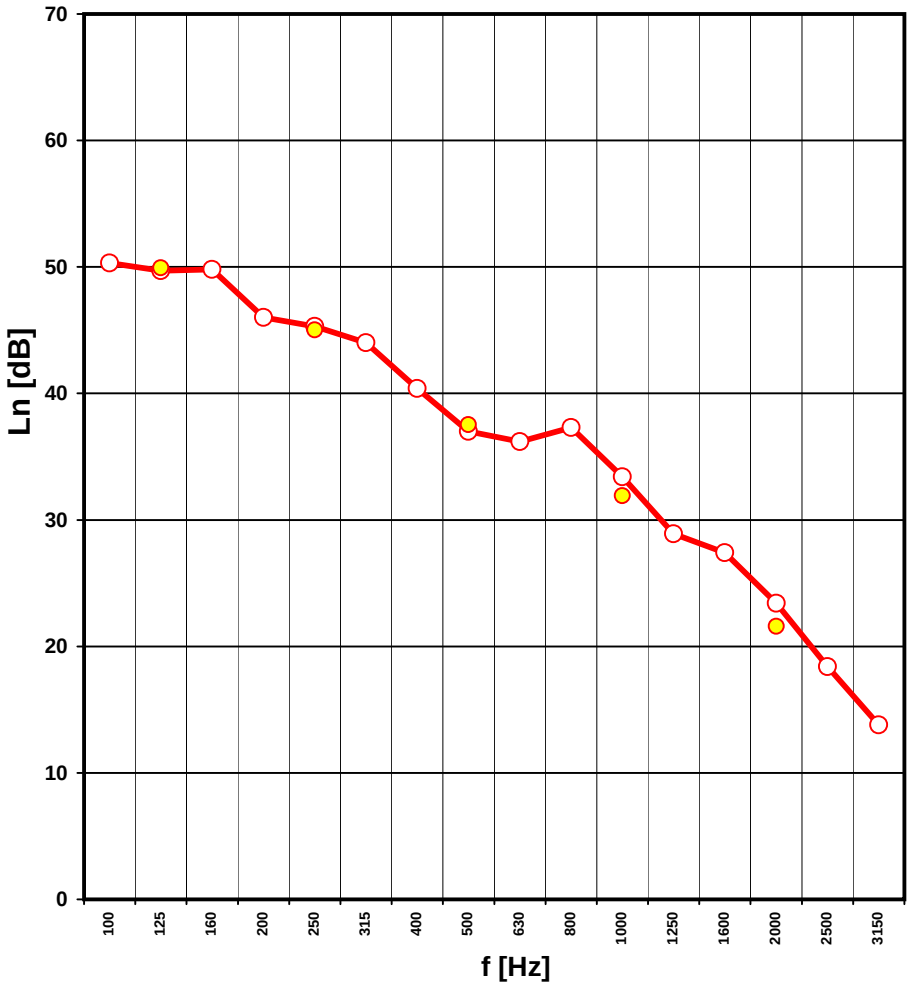
n° sample: 2005-18-005/2

f (Hz)	L_n (dB)
1/3 octave bands :	
50	
63	
80	
100	50.3
125	**49.7**
160	49.8
200	46.0
250	**45.3**
315	44.0
400	40.4
500	**37.0**
630	36.2
800	37.3
1000	**33.4**
1250	28.9
1600	27.4
2000	**23.4**
2500	18.4
3150	13.8
4000	**10.4**
5000	9.7

octave bands :	
125	**49.9**
250	**45.0**
500	**37.5**
1000	**31.9**
2000	**21.6**
4000	**11.0**

$L_{n,w}$ = 41 dB

C_I = 0 dB



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

U80 is a recycled product of PU foam. The density is 80 kg/m³. It is installed below a 60 mm concrete slab and layed in two layers with thickness 10mm. The individual plates measure 2 by 1 meter. The two layers are installed perpendicular. 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.

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Laboratoire Acoustique
79, Boulevard Poincaré
B-1060 BRUXELLES

1. Determination of the standardised impact sound insulation

The standardised impact sound insulation in the laboratory Ln 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 Ln,r of a fictious, 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 Ln,r,0 of a reference support floor. The calculated sound pressure level Ln,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:

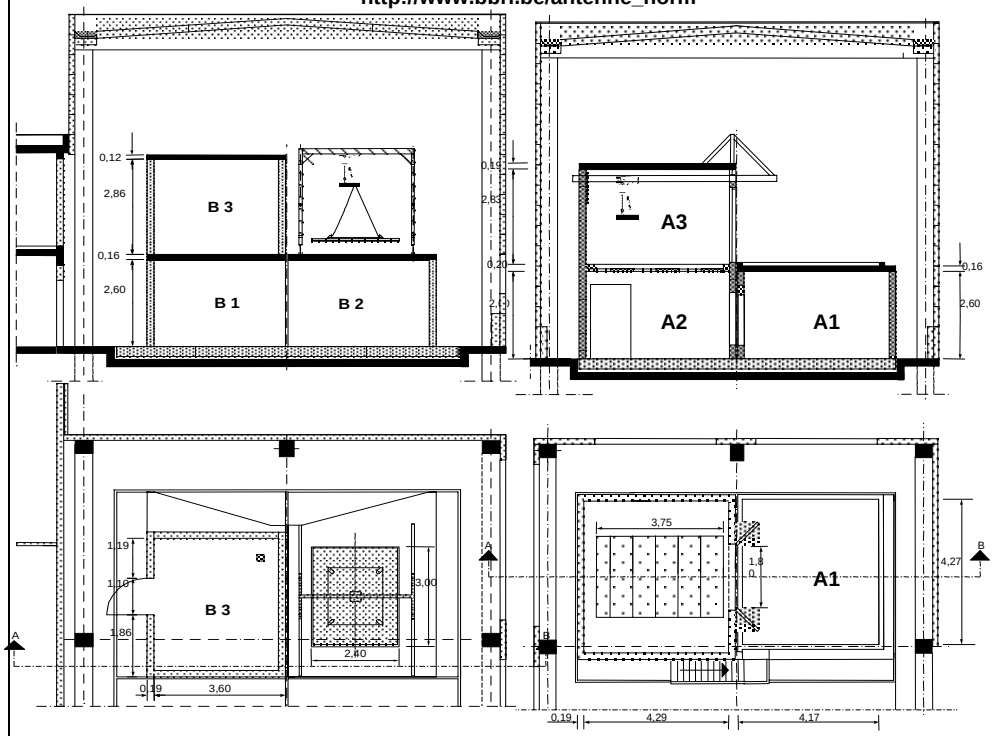
$$L_{n,r} = L_{n,r,0} - \Delta L$$

6. Single value indicators.

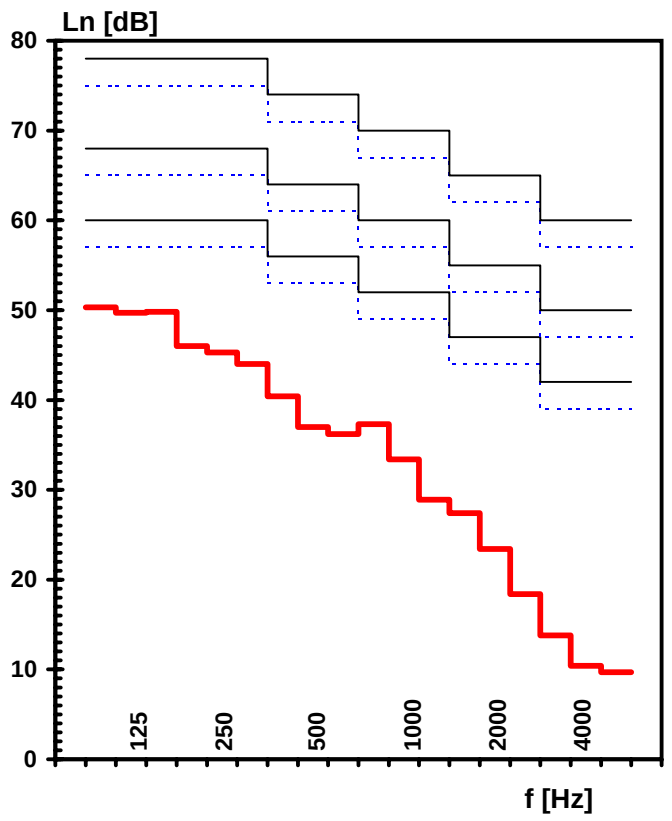
The single-value indicator (given by the index "w") is described in the standard :

"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



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



PRODUCT TESTED:
U80 (20mm) below a 60mm concrete slab

COMPANY: Recticel NV
Damstraat 2
9230 Wetteren

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ANNEX 2: ADDITIONAL DATA

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 tièrces 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 $I_{co,lab}$ = 18 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) = 81.8 dB(A)
Floating floor: Niveau Ln exprimé en dB(A) = 45.9 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) = 34.6 dB(A)

°Note: measurement method based upon EN ISO 14O-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

	(a)	(b)	(b)-(a)	(c)	(c)+(b)-(a)
f (Hz)	$L_{n,0}$ (dB)	L_n (dB)	ΔL (dB)	$L_{n,r,0}$ (dB)	$L_{n,r}$ (dB)
50					
63					
80					
100	58.1	50.3	7.8	67.0	59.2
125	61.7	49.7	12.0	67.5	55.5
160	63.3	49.8	13.5	68.0	54.5
200	67.6	46.0	21.6	68.5	46.9
250	70.6	45.3	25.3	69.0	43.7
315	69.9	44.0	25.9	69.5	43.6
400	69.3	40.4	28.9	70.0	41.1
500	69.3	37.0	32.3	70.5	38.2
630	69.9	36.2	33.7	71.0	37.3
800	69.8	37.3	32.5	71.5	39.0
1000	70.7	33.4	37.3	72.0	34.7
1250	71.5	28.9	42.6	72.0	29.4
1600	71.5	27.4	44.1	72.0	27.9
2000	71.9	23.4	48.5	72.0	23.5
2500	71.9	18.4	53.5	72.0	18.5
3150	70.9	13.8	57.1	72.0	14.9
4000	70.5	10.4	60.1	/	/
5000	69.1	9.7	59.4	/	/
125	66.3	54.7	10.4	72.3	61.7
250	74.3	49.9	23.8	73.8	49.8
500	74.3	43.0	31.1	75.3	44.0
1000	75.5	39.2	35.7	76.6	40.7
2000	76.5	29.2	47.2	76.8	29.6
4000	75.0	16.5	58.7	/	/

WEIGHTED VALUES AS TO EN ISO 717-2:1996

Basic testfloor (based on spectrum (a)):
$L_{n,0,w}$ = 78.0 dB $C_{I,0}$ = -11 dB

Basic + floating floor (based on spectrum(b)):
$L_{n,w}$ = 41.0 dB C_I = dB

Reference floor (data (c) given in EN ISO 717-2)
$L_{n,r,0,w}$ = 78.0 dB $C_{I,r,0}$ = -11 dB

Refer. + floating floor (calculated (c)+(b)-(a))
$L_{n,r,w}$ = 45.0 dB $C_{I,r}$ = 2 dB

Reduction of impact sound pressure level
ΔL_w = 78-Ln,r,w = 33.0 dB
$C_{I,\Delta} = C_{I,r,0} - C_{I,r}$ = -13.0 dB

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ANNEX 3