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Technical Report
C/23631/T01

Project

The Laboratory Measurement of The Improvement of Impact Sound Insulation of Various Underlay Samples

Prepared for

Interfloor Ltd

By

George Thomson

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SRL
Telephone +44(0)1787 247595
Website www.srltsl.com
London, Birmingham, Manchester, Sudbury

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Client	Interfloor Ltd
Client Address	Broadway Haslingden Rossendale Lancashire BB4 4LS
Author	George Thomson
Checker	Richard Critchlow
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Summary

Tests have been done in SRL's Laboratory at Holbrook House, Sudbury, Suffolk, to determine the improvement of impact sound insulation of underlays in accordance with BS EN ISO 10140-3:2010.

From these measurements, the required results have been derived and are presented in both tabular and graphic form in Data Sheets 1 to 5.

The results are given in 1/3rd octave bands over the frequency range 100Hz to 5kHz.

George Thomson
For and on behalf of
SRL Technical Services Limited
Tel: 01787 247595
Email: asmalls@srltsl.com

Richard Critchlow
Deputy Technical Manager

Contents

1.0 Details of Measurements

1.1 Location

Sound Research Laboratories

Holbrook House

Little Waldingfield

Sudbury

Suffolk

CO10 0TF

1.2 Test Dates

28 November 2016

1.3 Tester

George Thomson of SRL Technical Services Limited

1.4 Instrumentation and Apparatus Used

Make	Description	Type
E D I	Microphone Multiplexer	
	Microphone Power Supply Unit	
Norwegian Electronics	Tapping Machine	211
	Real Time Analyser	830

Brüel & Kjaer	Windshields	UA0237
	Pre Amplifiers	2669C
	Microphone Calibrator	4231
Larson Davis	12mm Condenser Microphone	2560, 377A60
SRL	Loudspeakers	100w
Oregon Scientific	Temperature & Humidity & Probe	THGR810
TOA	Graphic Equalizer	E-1231
QSC Audio	Power Amplifier	RMX 1450

1.5 References

BS EN ISO 717-1:2013	Rating of sound insulation in buildings and of building elements. Airborne Sound Insulation.
BS EN ISO 10140-3:2010	Laboratory measurement of sound insulation of building elements – Part 3: Measurement of impact sound insulation.

2.0 Description of Test

2.1 Description of Sample

Five samples of flexible underlays were tested. See section 3 results for more details.

Sampling plan: Enough for test only

Sample condition: New

Details supplied by: Interfloor Ltd

Sample installed by: SRL

2.2 Sample Delivery date

28 November 2016

2.3 Test Procedures

The sample was mounted/located and tested in accordance with the relevant standard. The method and procedure is described in Appendix A. The measurement uncertainty is given in Appendix B.

3.0 Results

The results of the measurements and subsequent analysis are given in Data Sheets 1 to 5 and summarised below.

Results relate only to the items tested.

SRL Test No.	Description in Brief	ΔL_w
A1	Technics 6 Underlay	28
A2	Technics 5 Underlay	25
A3	Silentfloor Gold Underlay	21
A4	Timbermate Excel Underlay	22
A5	Duratex Underlay	20

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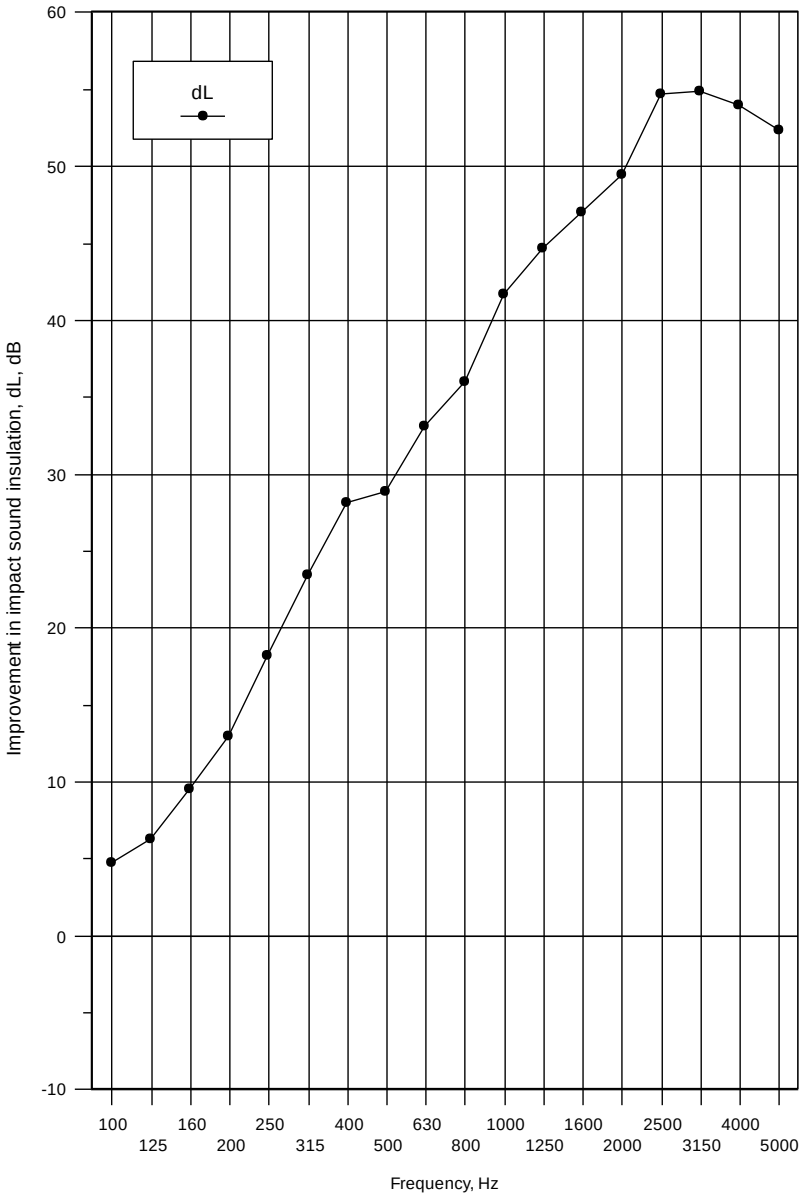
Data Sheet 1

Improvement in impact sound insulation measured according to BS EN ISO 10140-3 : 2010
Laboratory measurements of the improvement of impact sound insulation by floor coverings on a heavyweight standard floor

Test Number:	A1	**Sample mass:**	3.06 kg/m2	**Test Room:**	**Source**	**Receiving**	
Test Date:	28/11/2016	**Thickness:**	6 mm	**Air temperature:**	14.9	15.7	deg.C
Client:	Interfloor Ltd	**Length:**	1.35 m	**Air Humidity:**	72	59	%
Method of mounting:	Loose laid	Width:	1.04 m	**Air Pressure:**	1023 mbar		
Receiving room volume:	300m3						
Product identification:	Technics 6 underlay						

The sample did not suffer visible damage during the test

Freq f Hz	Ln,0 Third octave dB	**dL Third octave dB**
100	66.7	**4.8**
125	66.8	**6.3**
160	67.2	**9.6**
200	68.9	**13.0**
250	69.8	**18.2**
315	70.9	**23.5**
400	71.3	**28.2**
500	71.9	**28.9**
630	71.8	**33.1**
800	71.8	**36.0**
1000	72.8	**41.7**
1250	74.1	**44.7**
1600	75.2	**47.0**
2000	75.7	**49.5**
2500	76.1	**54.7**
3150	75.4	**54.9**
4000	73.8	**54.0**
5000	70.3	**52.4 ***



Ln,0 : Is the normalised impact sound pressure level of the bare heavyweight test floor.
dL : Is the improvement in impact sound insulation resulting from the installation of the test floor covering.
* Denotes results corrected for background # Denotes results at background

Rating according to BS EN ISO 717-2:2013 Results are based on a test made with an artificial source under laboratory conditions

Weighted reduction of impact sound pressure level of sample and (spectrum adaptation term)	**dLw (Cld) = 28 (-12) dB**
Weighted normalised impact sound pressure level of bare reference floor and (spectrum adaptation term)	Ln,r,0,w (Cl,r,0) = 78 (-11) dB
Weighted normalised impact sound pressure level of reference floor with sample and (spectrum adaptation term)	Ln,r,w (Cl,r) = 50 (1) dB

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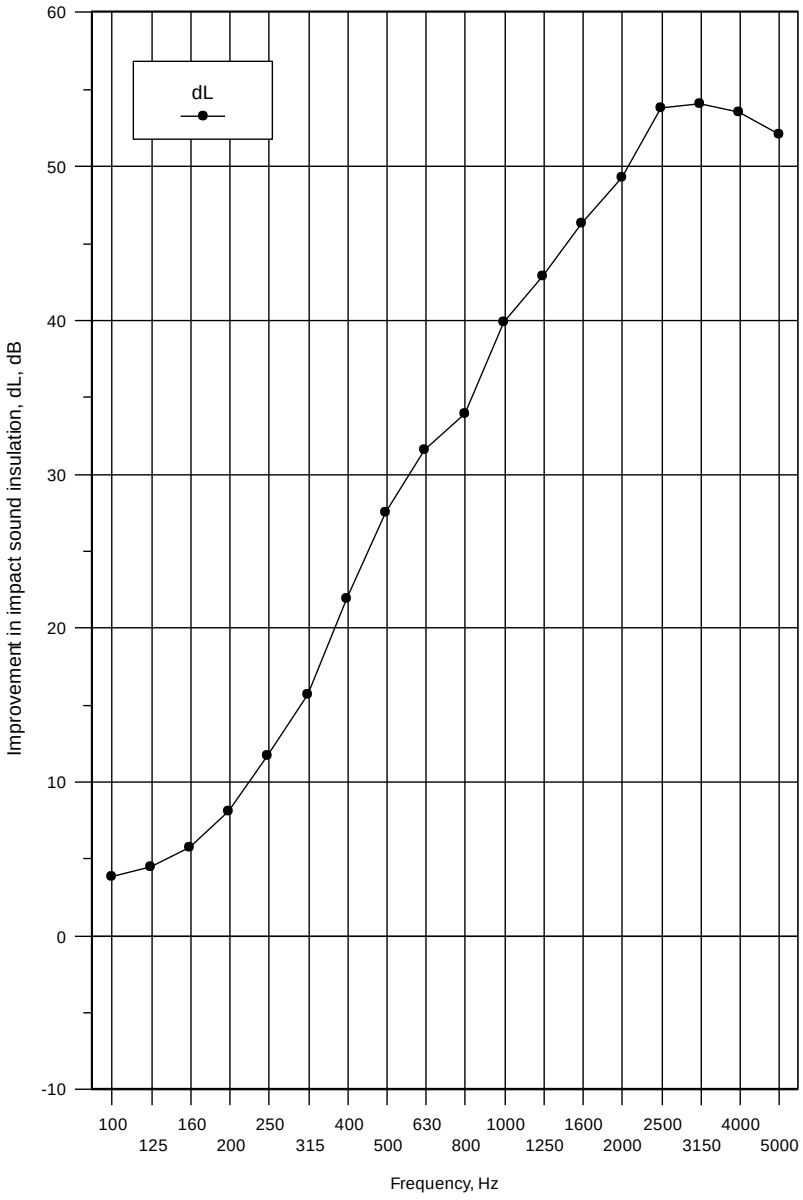
Data Sheet 2

Improvement in impact sound insulation measured according to BS EN ISO 10140-3 : 2010
Laboratory measurements of the improvement of impact sound insulation by floor coverings on a heavyweight standard floor

Test Number:	A2	**Sample mass:**	3.06 kg/m2	**Test Room:**	**Source**	**Receiving**	
Test Date:	28/11/2016	**Thickness:**	5 mm	**Air temperature**	14.9	15.4	deg.C
Client:	Interfloor Ltd	**Length:**	1.35 m	**Air Humidity:**	72	59	%
Method of mounting:	Loose laid	Width:	1.04 m	**Air Pressure:**	1023 mbar		
Receiving room volume:	300m3						
Product identification:	Technics 5 underlay						

The sample did not suffer visible damage during the test

Freq f Hz	Ln,0 Third octave dB	**dL Third octave dB**
100	66.7	**3.9**
125	66.8	**4.5**
160	67.2	**5.8**
200	68.9	**8.1**
250	69.8	**11.7**
315	70.9	**15.7**
400	71.3	**21.9**
500	71.9	**27.5**
630	71.8	**31.6**
800	71.8	**33.9**
1000	72.8	**39.9**
1250	74.1	**42.9**
1600	75.2	**46.3**
2000	75.7	**49.3**
2500	76.1	**53.8**
3150	75.4	**54.1**
4000	73.8	**53.5**
5000	70.3	**52.1 ***



Ln,0 : Is the normalised impact sound pressure level of the bare heavyweight test floor.
dL : Is the improvement in impact sound insulation resulting from the installation of the test floor covering.
* Denotes results corrected for background # Denotes results at background

Rating according to BS EN ISO 717-2:2013 Results are based on a test made with an artificial source under laboratory conditions

Weighted reduction of impact sound pressure level of sample and (spectrum adaptation term)	**dLw (Cld) = 25 (-12) dB**
Weighted normalised impact sound pressure level of bare reference floor and (spectrum adaptation term)	Ln,r,0,w (Cl,r,0) = 78 (-11) dB
Weighted normalised impact sound pressure level of reference floor with sample and (spectrum adaptation term)	Ln,r,w (Cl,r) = 53 (1) dB

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Data Sheet 3

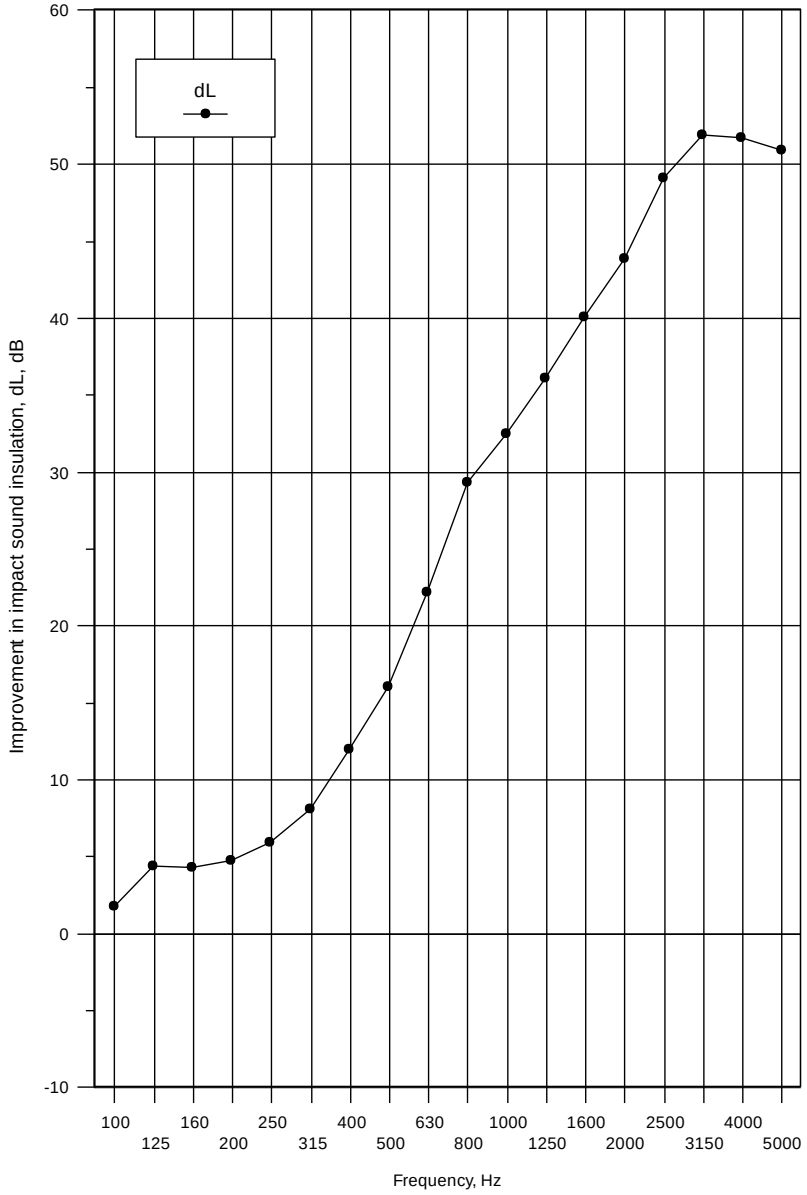
Improvement in impact sound insulation measured according to BS EN ISO 10140-3 : 2010

Laboratory measurements of the improvement of impact sound insulation by floor coverings on a heavyweight standard floor

Test Number:	A3	**Sample mass:**	2.8 kg/m2	**Test Room:**	**Source**	**Receiving**	
Test Date:	28/11/2016	**Thickness:**	4.2 mm	**Air temperature:**	14.9	15.4	deg.C
Client:	Interfloor Ltd	**Length:**	1.32 m	**Air Humidity:**	72	59	%
Method of mounting:	Loose laid	Width:	1 m	**Air Pressure:**	1023 mbar		
Receiving room volume:	300m3						
Product identification:	Silentfloor Gold underlay						

The sample did not suffer visible damage during the test

Freq f Hz	Ln,0 Third octave dB	**dL Third octave dB**
100	66.7	**1.8**
125	66.8	**4.4**
160	67.2	**4.3**
200	68.9	**4.8**
250	69.8	**5.9**
315	70.9	**8.1**
400	71.3	**12.0**
500	71.9	**16.1**
630	71.8	**22.2**
800	71.8	**29.3**
1000	72.8	**32.5**
1250	74.1	**36.1**
1600	75.2	**40.1**
2000	75.7	**43.9**
2500	76.1	**49.1**
3150	75.4	**51.9**
4000	73.8	**51.7**
5000	70.3	**50.9 ***



Ln,0 : Is the normalised impact sound pressure level of the bare heavyweight test floor.

dL : Is the improvement in impact sound insulation resulting from the installation of the test floor covering.

* Denotes results corrected for background # Denotes results at background

Rating according to BS EN ISO 717-2:2013 Results are based on a test made with an artificial source under laboratory conditions

Weighted reduction of impact sound pressure level of sample and (spectrum adaptation term)	**dLw (Cld) = 21 (-11) dB**
Weighted normalised impact sound pressure level of bare reference floor and (spectrum adaptation term)	Ln,r,0,w (Cl,r,0) = 78 (-11) dB
Weighted normalised impact sound pressure level of reference floor with sample and (spectrum adaptation term)	Ln,r,w (Cl,r) = 57 (-0) dB

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Data Sheet 4

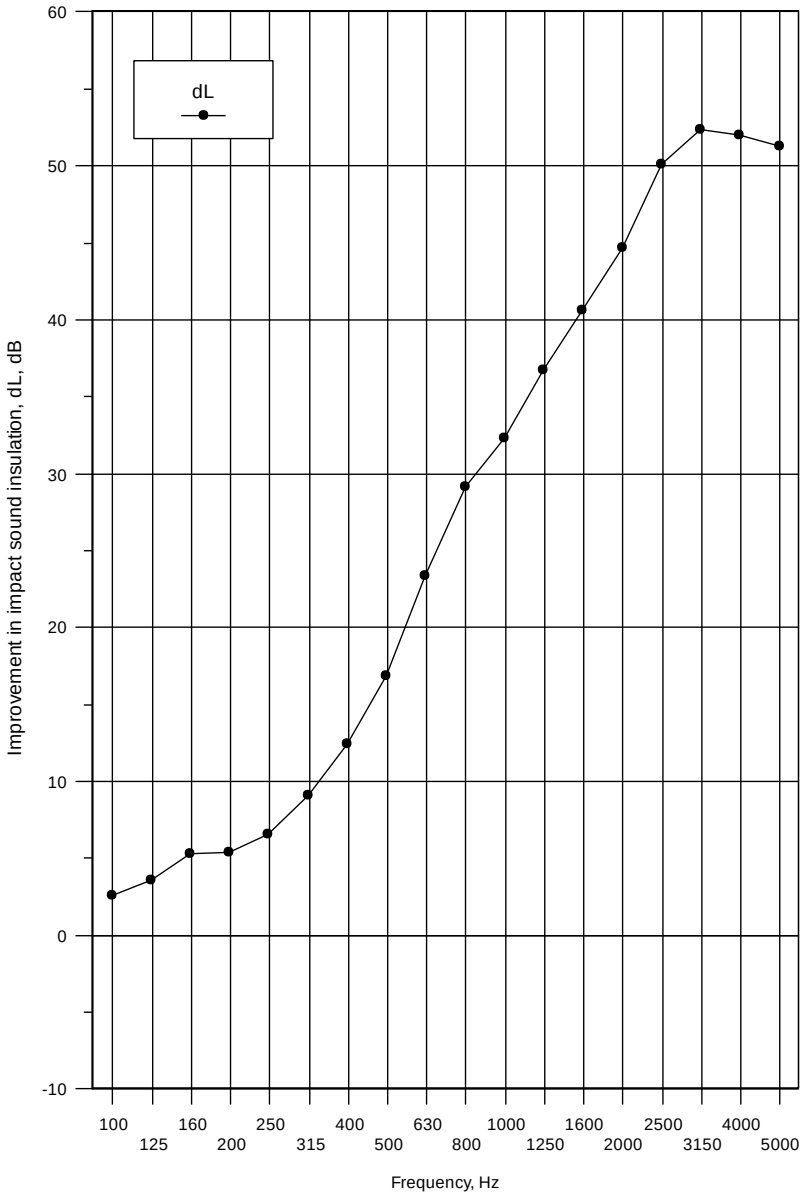
Improvement in impact sound insulation measured according to BS EN ISO 10140-3 : 2010

Laboratory measurements of the improvement of impact sound insulation by floor coverings on a heavyweight standard floor

Test Number:	A4	**Sample mass:**	2.6 kg/m2	**Test Room:**	**Source**	**Receiving**	
Test Date:	28/11/2016	**Thickness:**	3.6 mm	**Air temperature:**	14.9	15.4	deg.C
Client:	Interfloor Ltd	**Length:**	1.31 m	**Air Humidity:**	72	59	%
Method of mounting:	Loose laid	Width:	0.99 m	**Air Pressure:**	1023 mbar		
Receiving room volume:	300m3						
Product identification:	Timbermate Excel Underlay						

The sample did not suffer visible damage during the test

Freq f Hz	Ln,0 Third octave dB	**dL Third octave dB**
100	66.7	**2.6**
125	66.8	**3.6**
160	67.2	**5.3**
200	68.9	**5.4**
250	69.8	**6.6**
315	70.9	**9.1**
400	71.3	**12.4**
500	71.9	**16.9**
630	71.8	**23.4**
800	71.8	**29.2**
1000	72.8	**32.3**
1250	74.1	**36.7**
1600	75.2	**40.6**
2000	75.7	**44.7**
2500	76.1	**50.1**
3150	75.4	**52.4**
4000	73.8	**52.0**
5000	70.3	**51.3 ***



Ln,0 : Is the normalised impact sound pressure level of the bare heavyweight test floor.
dL : Is the improvement in impact sound insulation resulting from the installation of the test floor covering.
* Denotes results corrected for background # Denotes results at background

Rating according to BS EN ISO 717-2:2013 Results are based on a test made with an artificial source under laboratory conditions

Weighted reduction of impact sound pressure level of sample and (spectrum adaptation term)	**dLw (Cld) = 22 (-11) dB**
Weighted normalised impact sound pressure level of bare reference floor and (spectrum adaptation term)	Ln,r,0,w (Cl,r,0) = 78 (-11) dB
Weighted normalised impact sound pressure level of reference floor with sample and (spectrum adaptation term)	Ln,r,w (Cl,r) = 56 (0) dB

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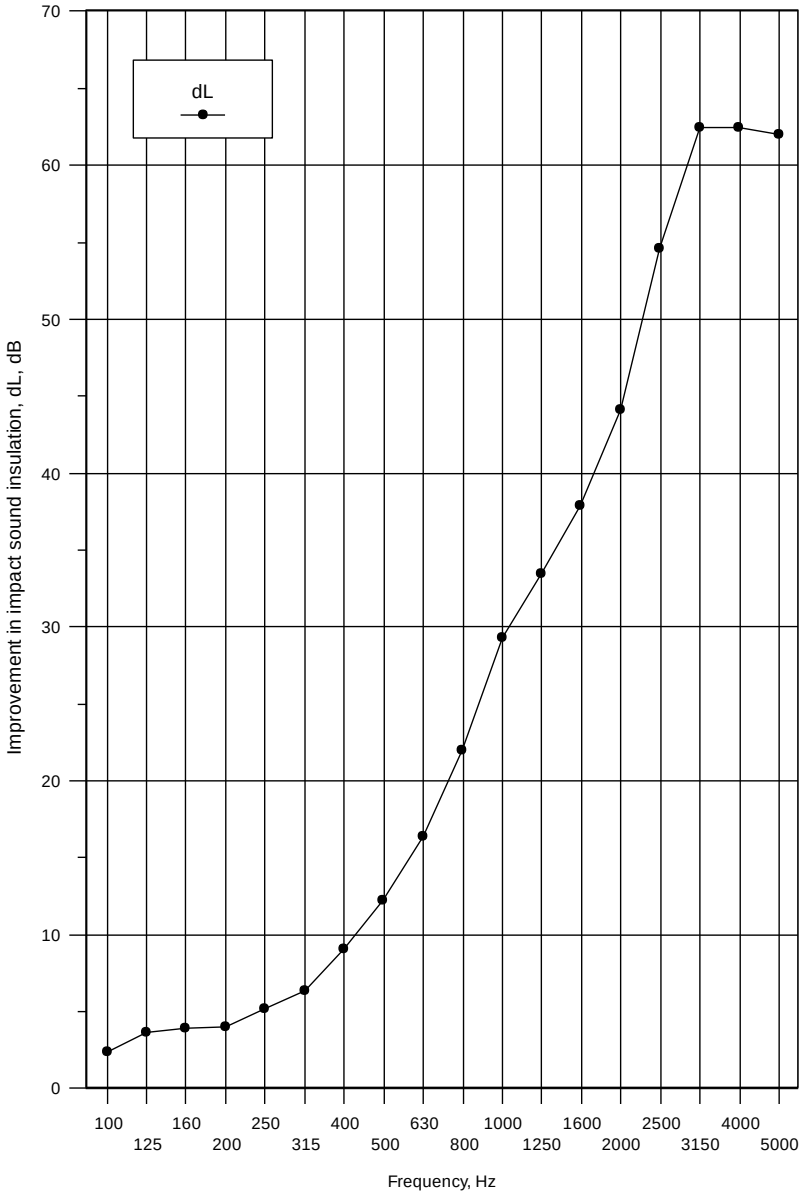
Data Sheet 5

Improvement in impact sound insulation measured according to BS EN ISO 10140-3 : 2010
Laboratory measurements of the improvement of impact sound insulation by floor coverings on a heavyweight standard floor

Test Number:	A5	**Sample mass:**	2.5 kg/m2	**Test Room:**	**Source**	**Receiving**	
Test Date:	28/11/2016	**Thickness:**	3.6 mm	**Air temperature**	14.9	15.4	deg.C
Client:	Interfloor Ltd	**Length:**	1.34 m	**Air Humidity:**	72	59	%
Method of mounting:	Loose laid	Width:	1 m	**Air Pressure:**	1023 mbar		
Receiving room volume:	300m3						
Product identification:	Duratex underlay						

The sample did not suffer visible damage during the test

Freq f Hz	Ln,0 Third octave dB	**dL Third octave dB**
100	66.7	**2.4**
125	66.8	**3.7**
160	67.2	**3.9**
200	68.9	**4.0**
250	69.8	**5.2**
315	70.9	**6.4**
400	71.3	**9.1**
500	71.9	**12.2**
630	71.8	**16.4**
800	71.8	**22.0**
1000	72.8	**29.3**
1250	74.1	**33.5**
1600	75.2	**37.9**
2000	75.7	**44.1**
2500	76.1	**54.6**
3150	75.4	**62.5 ***
4000	73.8	**62.5 ***
5000	70.3	**62.0 #**



Ln,0 : Is the normalised impact sound pressure level of the bare heavyweight test floor.
dL : Is the improvement in impact sound insulation resulting from the installation of the test floor covering.
* Denotes results corrected for background # Denotes results at background

Rating according to BS EN ISO 717-2:2013 Results are based on a test made with an artificial source under laboratory conditions

Weighted reduction of impact sound pressure level of sample and (spectrum adaptation term)	**dLw (Cld) = 20 (-10) dB**
Weighted normalised impact sound pressure level of bare reference floor and (spectrum adaptation term)	Ln,r,0,w (Cl,r,0) = 78 (-11) dB
Weighted normalised impact sound pressure level of reference floor with sample and (spectrum adaptation term)	Ln,r,w (Cl,r) = 58 (-1) dB

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Appendix A - Test Procedure

Measurement of impact sound reduction of a floor covering in accordance with BS EN ISO 140-8: 1998 - Category 1 (Small Samples) - TP13

In the laboratory, impact sound reduction is determined from the difference a sample floor covering makes to the sound pressure levels generated by a standard impact machine. The impact machine, known as a tapping machine, is operated standing first on a concrete slab and then on the test sample installed on that slab. The test floor for the installation of the test samples measures 3.7m by 3.5m. The test sample is installed on top of the roof of a reverberation room, which is acoustically "live", and the sound pressure levels are measured in that room. The test is done under conditions which restrict the transmission of sound other than directly through the sample and test slab. The measured sound pressure levels are corrected for the amount of sound absorption in the reverberation room.

The reverberation room, which has a volume of 300 cubic metres, is constructed from 215mm brick which is internally plastered with a reinforced concrete roof and floor. The room is isolated from the surrounding structure by resilient mountings and seals, ensuring good acoustic isolation. Reverberation time measurements are done to calibrate the reverberation room.

At least three test samples are installed at predetermined positions. The tapping machine is placed, in turn, immediately each side of the first test sample/position and operated on the bare concrete roof slab. With the tapping machine operating on the bare slab, the resulting sound pressure levels in the room are sampled using a spaced array of microphones connected to a real time analyser. The signal is filtered into one-third octave bandwidths, integrated and averaged. Six microphones are used with minimum separating distances as follows:

- 0.7m between microphone positions
- 0.7m between any microphone position and room boundaries or diffusers
- 1.0m between any microphone position and the upper floor being excited by the tapping machine

The procedure is then repeated on the bare concrete slab immediately either side of each of the other sample positions. The individual values for the different positions are arithmetically averaged to give the impact sound pressure level ($L_{i,0}$). This is corrected to a reference room absorption, referred to as normalising, to give the normalised impact sound pressure levels ($L_{n,0}$) for the bare concrete slab.

$$L_{n,0}=L_{i,0}+10\log\frac{A}{A_{ref}} \text{ in decibels}$$

Where A is the actual absorption of the test chamber A_{ref} is the reference room absorption of $10m^2$.

The whole procedure is then repeated in turn on each of the samples to obtain the normalised impact sound pressure levels with covering (L_i) and the corresponding normalised levels (L_n).

The reduction of impact sound pressure level (improvement of impact sound insulation) ΔL, for a given frequency band is determined as follows:

$$\Delta L = L_{n0} - L_n$$

The Weighted Impact Sound Improvement Index ΔL_w, is a single figure rating of impact sound reduction and is calculated in accordance with BS EN ISO 717-2:1997.

The impact sound pressure levels for the test floor with test sample, depend to small extent on the particular test floor itself. To standardise these levels they are adjusted by calculation to what they would be if the bare concrete slab were replaced by a reference floor. The impact sound pressure levels that would be produced on the bare reference floor ($L_{n,0}$) are defined in BS EN ISO 717-2:1997. Using these, the impact sound pressure levels for the sample on the reference floor ($L_{n,r}$) and the corresponding weighted level ($L_{n,w,r}$) are calculated in accordance with the same standard.

Appendix B – Measurement Uncertainty

Measurement Uncertainty
BS EN ISO 140-8:1998 - TP13

The following values of uncertainty are based on a standard uncertainty multiplied by a coverage factor of k = 2, which provides a level of confidence of approximately 95%.

Frequency, Hz	Uncertainty, ± dB
100	1.2
125	1.2
160	1.2
200	1.2
250	1.2
315	0.8
400	0.8
500	0.8
630	0.8
800	1.2
1000	1.2
1250	1.2
1600	1.5
2000	2.2
2500	2.2
3150	2.2

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Sudbury Consultancy
Holbrook House
Little Waldingfield
Sudbury
Suffolk
CO10 0TF
Tel: +44 (0)1787 247595

Manchester Consultancy
Lynnfield House
Church Street
Altrincham
Cheshire
WA14 4DZ
Tel: +44 (0)161 929 5585

London Consultancy
Citypoint, 12th Floor
1 Ropemaker Street
London
EC2Y 9HT
Tel: +44 (0)207 251 3585

Birmingham Consultancy
Cornwall Buildings
45 Newhall Street
Birmingham
B3 3QR
Tel: +44 (0)121 270 6680

South Africa Consultancy
Ground Floor, Liesbeek House
River Park
Gloucester Road
Mowbray
7700
South Africa
Tel: +27 (0)21 680 5305

Laboratory
Holbrook House
The Street
Sudbury
Suffolk
CO10 0TF
Tel: +44 (0)1787 247595

Website: www.srltsl.com
e-mail: srl@srltsl.com

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Registered Name and Address:
SRL Technical Services Limited
Holbrook House
Little Waldingfield
Sudbury
Suffolk
CO10 0TF

Registered Number: 907694 England

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