

FIELD IMPACT INSULATION TESTS

SKYLINE LUXURY VINYL FLOORING SAMPLES U706 THE HUDSON, 50 HUDSON RD, ALBION



TEST REPORT

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TITLE	Field Impact Insulation Tests Skyline Luxury Vinyl Flooring samples U706 The Hudson, 50 Hudson Rd, Albion, QLD 4010 Test Report
TESTS BY	Hasitha Gallage Acoustic Engineer - Palmer Acoustics (Australia) Pty Ltd
REPORT DATE	18 May 2020
TEST DATE	15 May 2020
TEST LOCATION	Level 7 Unit 706 Living Area to Level 6 Unit 606 Living Area
FOR	Decoline

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1.0 INTRODUCTION

Palmer Acoustics have been engaged by Decoline to perform field impact insulation tests at U706 The Hudson, 50 Hudson Rd, Albion. The tests were conducted on the Skyline Luxury Vinyl Flooring samples installed in the living area of Unit 706 on level 7. The measurements were conducted in living area of Unit 606 on level 6 – directly beneath the living area of Unit 706. Floor systems tested:

- Test 1: Bare Concrete Slab
- Test 2: Skyline Luxury Vinyl Flooring sample + 3mm Rubber underlay
- Test 3: Skyline Luxury Vinyl Flooring sample

2.0 EQUIPMENT AND PROCEDURES

2.1 Measurement Procedures

Testing was conducted in conformance with ISO 16283-2:2015 “Field measurement of impact sound insulation of floors”. The evaluation of the results, to derive the single figure $L'_{nT,w}$ rating, was conducted to ISO 717-2 2013 “Rating of insulation in buildings and of building elements – Part 2 Impact Sound Insulation”.

The Skyline Luxury Vinyl Flooring samples installed in the living area of Unit 706 were tapped in two (2) different orientations with the receiving space’s sound measurements averaged over 2 x 30 seconds periods - per test position.

Ambient sound levels were measured before the testing with the results included in the assessment as per standard.

Receiving room reverberation measurements were performed, utilising RT Software in the Norsonics 140 analyser, at five (5) locations throughout the space, with the results arithmetically averaged.

2.2 Instrumentation

The following instruments were used in the evaluation.

- Norsonics 140 Sound level meter (serial number 1403252)
- Look Line tapping machine EM50 (serial number TM.14031)
- B & K 4230 Calibrator #3 (serial number 1638750)

The sound level measuring equipment was field calibrated before and after each measurement session and was found to be within 0.2dB of the reference signal. All instrumentation used in this assessment holds a current calibration certificate from a certified NATA calibration laboratory.

3.0 DESCRIPTION OF ROOMS

All windows and doors were closed in the source room and receiving room.

Concrete slab: 200mm thick

Transmitting Room (living area of Unit 706 on level 7)

Test Floor: Skyline Luxury Vinyl Flooring samples;
Adhesive: Loose laid;
Walls: Plasterboard;
Enclosure: All doors and windows were closed;
Room Finish: Furnished;

Receiving Room (living area of Unit 606 on level 6)

Ceiling: Plasterboard;
Floor: Carpet & Tile;
Walls: Plasterboard and Ceramic tiles;
Enclosure: All doors and windows were closed;
Room Finish: Furnished;

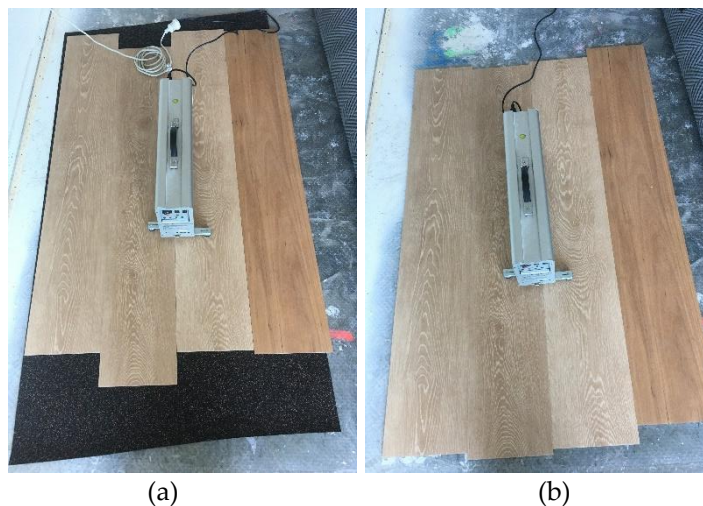


Figure 1: Testing on the (a) Skyline Luxury Vinyl Flooring sample + 3mm Rubber underlay, and (b) Luxury Vinyl Flooring installed in the living area of Unit 706

4.0 RESULTS

Our tests gave the following results:

Table 1: Test Result Summary – Floor impact tests

Test System	L'nT,w	FIIC
Test 1: Bare Concrete Slab	57	43
Test 2: Skyline Luxury Vinyl Flooring sample + 3mm Rubber underlay	40	67
Test 3: Skyline Luxury Vinyl Flooring sample	49	56

L'nT,w term is used in the Building Code of Australia (BCA), see also Appendix A. It should be noted that L'nT,w is a weighted room noise level and that a lower number represents better performance.

FIIC is an ASTM term which represents a floor/ceiling assembly's ability to resist the transmission of impact noise. A higher value represents greater performance.

5.0 NOTES

- In our experience, test samples are similar in performance to a fully laid floor ± 2 dB.
- To ensure that the maximum rating is achieved the impact layer must be laid strictly in accordance with manufacturer's recommended procedures.

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APPENDIX A

GLOSSARY

IMPACT MEASUREMENT AND ASSESSMENT DESCRIPTORS

- $L_{Aeq,T}$ – Time average A-weighted sound pressure level is the average energy equivalent level of the A Weighted sound over a period "T".
- L_{Aeq} – Equivalent Continuous Noise Level. The noise level in dB(A) which if present for the entire measurement period would produce the same sound energy to be received as was actually received as a result of a signal which varied with time. Normally abbreviated to "Leq" or "L_{Aeq}", often followed by a specification of the time period (such as 1 hour or 8 hours) indicating the period of time to which the measured value has been normalized;
- $L'_{nT,w}$ – Weighted Standardised impact sound pressure level; a measurement of impact sound transmission between rooms. Lower values denote better performance. The single figure measure is derived by adapting a standard response curve to measured 1/3 octave band sound pressure levels. Measured results are adjusted based upon a reverberation time of 0.5 sec in receiving room. Normally derived from a field test.
- $L'_{n,w}$ – Weighted Normalized impact sound pressure level; a laboratory measurement of impact sound transmission between rooms. Lower values denote better performance. The single figure measure is derived by adapting a standard response curve to measured 1/3 octave band sound pressure level measurements. Measured results are adjusted based on the absorption of 10m² in the receiving room. Normally derived from a laboratory test.
- C_i – A spectrum adaptation term compensating for the effect of floor coverings when applied to bare floors under test. The usually negative value, in decibels, is added to the single-number quantity, $L'_{n,w}$ or $L'_{nT,w}$.
- **Field Impact Insulation Class (FIIC)** – a single-number rating derived from measured values of normalized one-third octave band impact sound pressure levels in accordance with Eq 4 and the reference contours in Classification E 989. It provides an estimate of the sound insulating performance of a floor-ceiling assembly and associated support structures under tapping machine excitation.
- **Impact Insulation Class (IIC)** – This classification covers the determination of a single-figure rating that can be used for comparing floor-ceiling assemblies for general building design purposes.
- **Impact Sound Pressure Level (L)** – the average sound pressure level in a specified frequency band produced in the receiving room by the operation of the standard tapping machine on the floor assembly, averaged over each of the specified machine positions.
- L'_{nT} – **Standardised Impact Sound Pressure Level** – the impact sound pressure level standardised to room with a reference reverberation time of 0.5 seconds.

- *L'_n* – **Normalized Impact Sound Pressure Level** – the impact sound pressure level normalized to reference absorption area of 10 metric sabins (108 sabins).
- **Receiving Room** – a room below or adjacent to the floor specimen under test in which the impact sound pressure levels are measured.
- **Source Room** – the room containing the tapping machine.

STANDARDS

- **ISO 16283 – 2**
Acoustics – Field measurement of sound insulation in buildings and of building elements – Part 7: Default procedure for sound pressure level measurement
- **ISO 717 – 2**
Acoustics – Rating of sound insulation in building and of building elements – Part 2: Impact sound insulation
- **ASTM Classification E 1007 – 97**
Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures
- **ASTM Classification E 989 – 89**
Standard Classification for Determination of Impact Insulation Class (IIC)

APPENDIX B

CALCULATION METHODOLOGY - $L'_{nT,w}$

Standardized impact sound pressure level – ISO 16283-2:2015

$$L'_{nT} = L_i - 10 \log \left(\frac{T}{T_0} \right)$$

L'_{nT} is the standardized impact sound pressure level;

L_i is the impact sound pressure level;

T is the reverberation time in the receiving room;

T_0 is the reference reverberation time in the receiving room; for dwellings, $T_0 = 0.5$ s.

Method of comparison – ISO 717-2:2013

To evaluate the results of a measurement of L'_{nT} in one-third-octave bands, the reference curve is shifted in increments of 1 dB towards the L'_{nT} curve until the sum of unfavourable deviations is as large as possible but not more than 32.0 dB.

An unfavourable deviation at a particular frequency occurs when the results of measurements exceed the reference value. Only the unfavourable deviations are taken into account.

The value, in decibels, of the reference curve at 500 Hz, after shifting in accordance with this procedure is $L'_{nT,w}$.

Correction to the signal level for background noise – ISO 16283-2:2015

If $(L_{sb} - L_b) > 10$, then $L = L_{sb}$

If $10 > (L_{sb} - L_b) > 6$, then $L = 10 \log \left(10^{\frac{L_{sb}}{10}} - 10^{\frac{L_b}{10}} \right)$

If $6 > (L_{sb} - L_b)$, then $L = L_{sb} - 1.3$

L is the adjusted signal level, in decibels;

L_{sb} is the level of signal and background noise combined, in decibels;

L_b is the background noise level, in decibels.

CALCULATION METHODOLOGY – FIIC

Correction to the signal level for background noise – ASTM E 1007 - 97

If $(L_{sb} - L_b) > 10$, then $L_s = L_{sb}$

If $10 > (L_{sb} - L_b) > 5$, then $L_s = 10 \log \left(10^{\frac{L_{sb}}{10}} - 10^{\frac{L_b}{10}} \right)$

If $5 > (L_{sb} - L_b)$, then $L_s = L_{sb} - 2$

L_s is the adjusted signal level, in decibels;

L_{sb} is the level of signal and background noise combined, in decibels;

L_b is the background noise level, in decibels.

Normalized impact sound pressure level – ASTM E 1007 - 97

$$L_n = L_p - 10 \log \left(\frac{A_0}{A_2} \right)$$

$$A_2 = 0.921 \left(\frac{Vd}{c} \right)$$

L_n = normalized impact sound pressure level;

L_p = average one-third octave band sound pressure level;

A_2 = equivalent sound absorption area of the room, in m²;

A_0 = reference sound absorption area of the room, $A_0 = 10$ m²;

V = volume of the room, in m³;

d = rate of decay of sound pressure level in the room, in dB/s ($d = 60/T$, T = reverberation time);

c = speed of the sound in air, in m/s ($c = 20.047\sqrt{273.15 + t}$, t = receiving room's temperature).

Determination of Impact Insulation Class – ASTM E 989 - 1999

To determine the impact insulation class (IIC) of a floor-ceiling assembly, the reference IIC contour is shifted vertically relative to the normalised impact sound pressure levels until the following conditions are fulfilled:

- The sum of the deviations above the contour do not exceed 32 dB
- The maximum deviation at a single test frequency do not exceed 8 dB

The normalised sound pressure level at the intersection of the contour and 500 Hz ordinate is subtracted from 110 to obtain the impact insulation class.

APPENDIX C

Test certificates (3)

FIELD IMPACT SOUND INSULATION - TEST CERTIFICATE

Test 1 of 3

Bare Concrete Slab

PROJECT:	PN4921 U706 The Hudson, 50 Hudson Rd, Albion LNT	Meas. Date:	15-May-2020
Test Location:	Level 7 U706 Living Area to Level 6 U606 Living Area	Meas. Parameter:	LLeq
Test Surface:	Bare Concrete Slab	Tapping Machine:	Look Line EM50
Client:	Decoline	Receiving Room Volume:	52 m ³
Test Performed:	Hasitha Gallage		

DESCRIPTION OF FLOOR AND SPECIMEN

Unit:	Bare Concrete Slab	No. of Source posn:	2
Product:		Mic. posn:	2 sweeps
Adhesive:		RT meas:	5 Imp.
Ceiling:	Plasterboard	SLM:	Nor 140
Slab:	200mm thick Concrete		

Weighted Standardized Impact SPL

Results standardized to a RT of 0.5 seconds

L'nT,w

57

ISO 16283-2:2015 & 717-2:2013

Impact Insulation Class

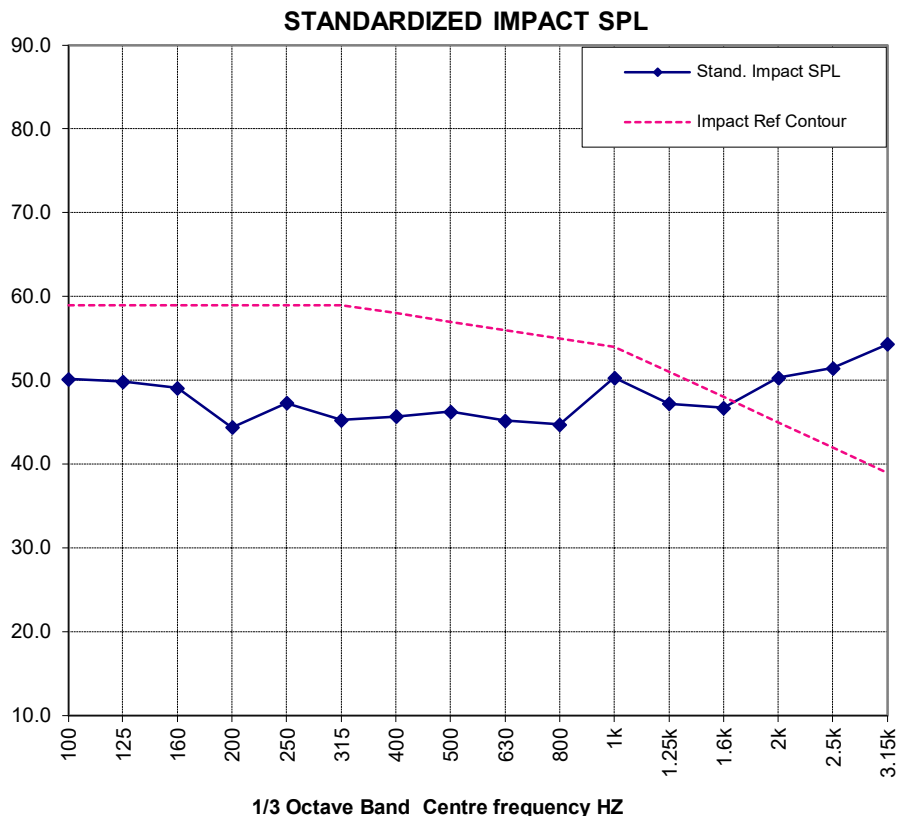
FIIC

43

ASTM E1007-97 & E989-89

Centre Frequency	Stand. Impact SPL	Impact Ref Contour	Deficiencies
Hz	dB	dB	dB
100	50.1	59	
125	49.8	59	
160	49.1	59	
200	44.4	59	
250	47.3	59	
315	45.3	59	
400	45.7	58	
500	46.2	57	
630	45.2	56	
800	44.7	55	
1k	50.3	54	
1.25k	47.2	51	
1.6k	46.7	48	
2k	50.3	45	5.3
2.5k	51.4	42	9.4
3.15k	54.3	39	15.3
Total			

Standardized Impact SPL, L'nT, dB



L'nT,w 57 30.1

FIELD IMPACT SOUND INSULATION - TEST CERTIFICATE

Test 2 of 3

Skyline Luxury Vinyl Flooring sample

3mm Rubber underlay

PROJECT:	PN4921 U706 The Hudson, 50 Hudson Rd, Albion LNT	Meas. Date:	15-May-2020
Test Location:	Level 7 U706 Living Area to Level 6 U606 Living Area	Meas. Parameter:	LLeq
Test Surface:	Skyline Luxury Vinyl Flooring sample	Tapping Machine:	Look Line EM50
Client:	Decoline	Receiving Room Volume:	52 m ³
Test Performed:	Hasitha Gallage		

DESCRIPTION OF FLOOR AND SPECIMEN

Unit:	Skyline Luxury Vinyl Flooring sample	No. of Source posn:	2
Product:	3mm Rubber underlay	Mic. posn:	2 sweeps
Adhesive:	Loose laid	RT meas:	5 Imp.
Ceiling:	Plasterboard	SLM:	Nor 140
Slab:	200mm thick Concrete		

Weighted Standardized Impact SPL

Results standardized to a RT of 0.5 seconds

L'nT,w

40

ISO 16283-2:2015 & 717-2:2013

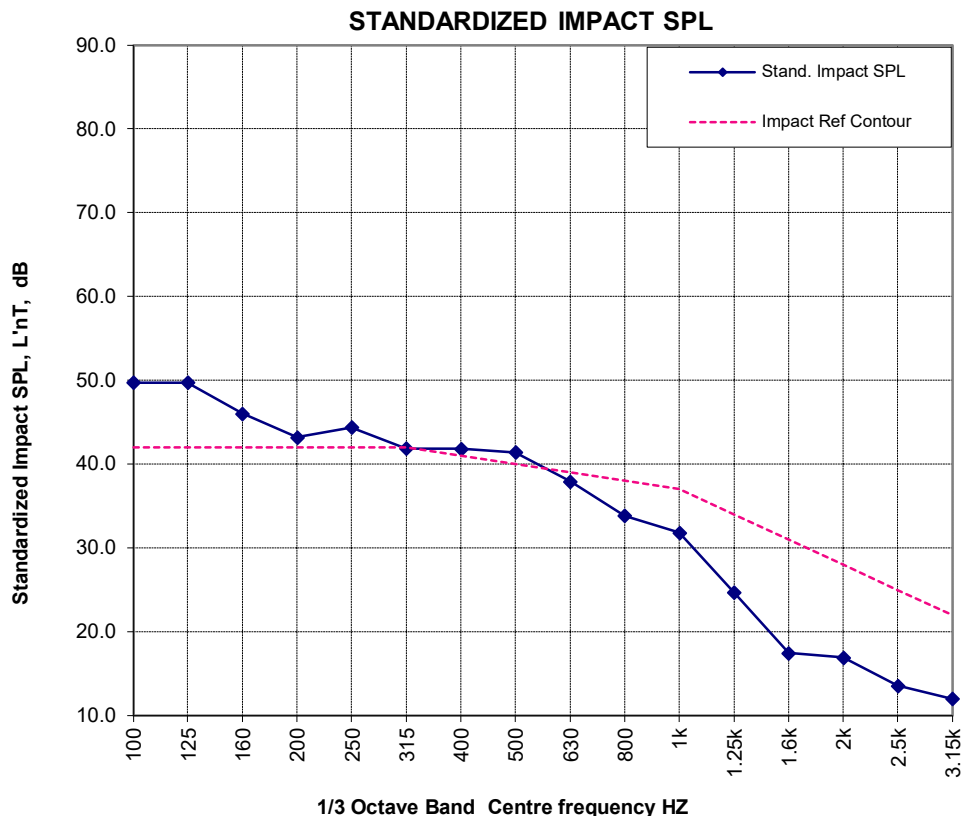
Impact Insulation Class

FIIC

67

ASTM E1007-97 & E989-89

Centre Frequency	Stand. Impact SPL	Impact Ref Contour	Deficiencies
Hz	dB	dB	dB
100	49.7	42	7.7
125	49.8	42	7.8
160	46.0	42	4.0
200	43.2	42	1.2
250	44.4	42	2.4
315	41.9	42	
400	41.8	41	0.8
500	41.4	40	1.4
630	37.9	39	
800	33.8	38	
1k	31.8	37	
1.25k	24.7	34	
1.6k	17.5	31	
2k	16.9	28	
2.5k	< 13.6	25	
3.15k	< 12.0	22	
Total			



L'nT,w 40 25.4

FIELD IMPACT SOUND INSULATION - TEST CERTIFICATE

Test 3 of 3

Skyline Luxury Vinyl Flooring sample

PROJECT:	PN4921 U706 The Hudson, 50 Hudson Rd, Albion LNT	Meas. Date:	15-May-2020
Test Location:	Level 7 U706 Living Area to Level 6 U606 Living Area	Meas. Parameter:	LLeq
Test Surface:	Skyline Luxury Vinyl Flooring sample	Tapping Machine:	Look Line EM50
Client:	Decoline	Receiving Room Volume:	52 m ³
Test Performed:	Hasitha Gallage		

DESCRIPTION OF FLOOR AND SPECIMEN

Unit:	Skyline Luxury Vinyl Flooring sample	No. of Source posn:	2
Product:		Mic. posn:	2 sweeps
Adhesive:	Loose laid	RT meas:	5 Imp.
Ceiling:	Plasterboard	SLM:	Nor 140
Slab:	200mm thick Concrete		

Weighted Standardized Impact SPL

Results standardized to a RT of 0.5 seconds

L'nT,w

49

ISO 16283-2:2015 & 717-2:2013

Impact Insulation Class

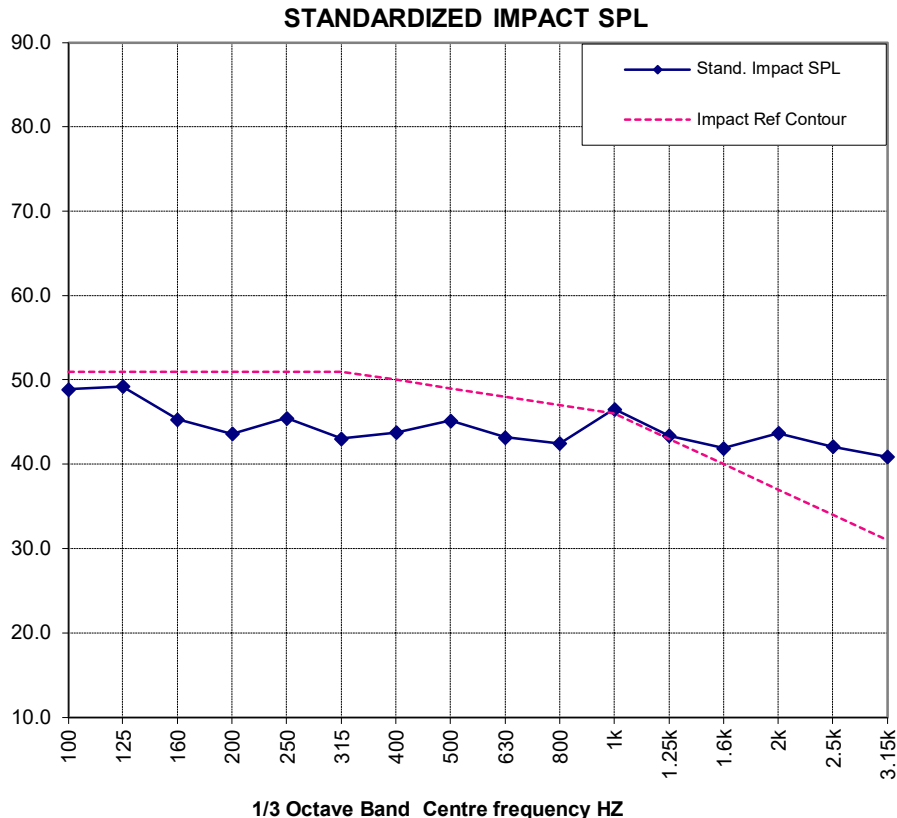
FIIC

56

ASTM E1007-97 & E989-89

Centre Frequency	Stand. Impact SPL	Impact Ref Contour	Deficiencies
Hz	dB	dB	dB
100	48.9	51	
125	49.3	51	
160	45.3	51	
200	43.6	51	
250	45.4	51	
315	43.0	51	
400	43.7	50	
500	45.2	49	
630	43.2	48	
800	42.4	47	
1k	46.5	46	0.5
1.25k	43.4	43	0.4
1.6k	41.9	40	1.9
2k	43.7	37	6.7
2.5k	42.1	34	8.1
3.15k	40.9	31	9.9
Total			

Standardized Impact SPL, L'nT, dB



L'nT,w 49 27.3