AIRO

Report No. L/3460

for
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UKAS TESTING
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LABORATORY MEASUREMENTS

OF THE IMPACT SOUND INSULATION

OF

NEW ERA ACOUSTIC CRADLE AND BATTEN FLOORING

OVER A STANDARD CONCRETE FLOOR

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LABORATORY MEASUREMENTS OF THE IMPACT SOUND INSULATION OF NEW ERA ACOUSTIC CRADLE AND BATTEN FLOORING OVER A STANDARD CONCRETE FLOOR

1. INTRODUCTION

This report presents the results of measurements made in the AIRO Acoustics Laboratory of the impact sound insulation of two New Era Acoustic Cradle and Batten flooring systems when installed for test over a Standard Concrete Floor.

The measurements were made on 26 and 27 February for Ikoustic Limited.

Measurements of impact sound transmission, Normalized Impact Sound Pressure Level (L_n), were conducted in accordance with British Standard BS EN ISO 10140 (ref 1). Single figure ratings of impact sound insulation performance, known as the Weighted Normalized Impact Sound Pressure Level ($L_{n,w}$) and Spectrum Adaptation Term (C_I), are derived from these measurements in accordance with British Standard BS EN ISO 717 (ref 2).

AIRO is a UKAS accredited testing laboratory No. 0483 and measurements to the above British Standards are included on our schedule of accreditation. UKAS is the United Kingdom Accreditation Service.

2. SUMMARY OF RESULTS

The results of the measurements presented in this report are summarised in the following table:

AIRO Test No.	Test Specimen	$L_{n,w}$ (C_I) dB
L/3460/1	Standard Concrete Floor	81 (-13)
L/3460/2	New Era S1 Acoustic Cradle and Batten Flooring over a Standard Concrete Floor	54 (1)
L/3460/3	New Era S2 Acoustic Cradle and Batten Flooring over a Standard Concrete Floor	53 (2)

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3. TEST SPECIMEN DETAILS AND CONDITIONS

3.1 Standard Concrete Floor

AIRO Test No. L/3460/1

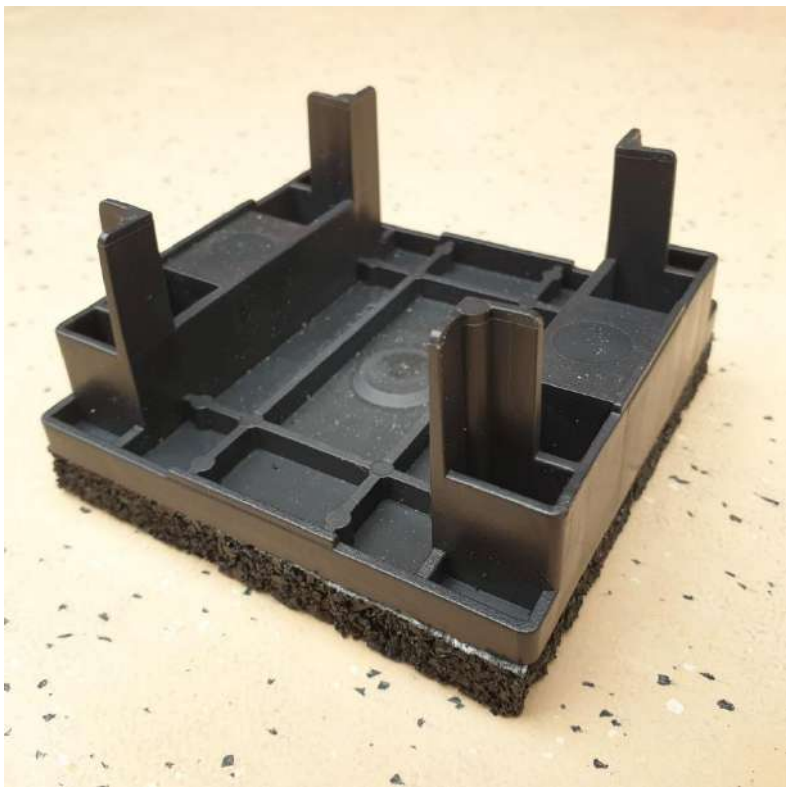
The specimen comprised a 150 mm (6 inch) thick reinforced standard concrete floor (approx 365 kg/m²). The walking surface area of the floor is 3800 mm x 3720 mm (14.14 m²), with a ceiling area of 3330 mm x 3360 mm (11.19 m²).

3.2 New Era S1 Acoustic Cradle and Batten Flooring over a Standard Concrete Floor

AIRO Test No. L/3460/2

The specimen comprised a 150 mm (6 inch) thick reinforced standard concrete floor (approx 365 kg/m²). The walking surface area of the floor is 3800 mm x 3720 mm (14.14 m²), with a ceiling area of 3330 mm x 3360 mm (11.19 m²). The concrete floor was overlaid by a cradle and batten flooring system consisting of New Era S1 16/30 mm Acoustic Cradles, incorporating 10 mm MuteMat 750-10 resilient pads, set out at 450 mm x 400 mm centres. The cradles supported 36 x 45 mm plywood battens set at 400 mm centres to which a walking surface of 18 mm P5 t&g flooring grade chipboard was screwed, with 50 mm Knauf Earthwool glass mineral wool cut to fit between the battens. A 10 x 100 mm flanking strip was incorporated at the perimeter of the floating floor. The floating floor void height was 56 mm, with a finished floor height of 74 mm.

The following image shows a New Era S1 Acoustic Cradle.

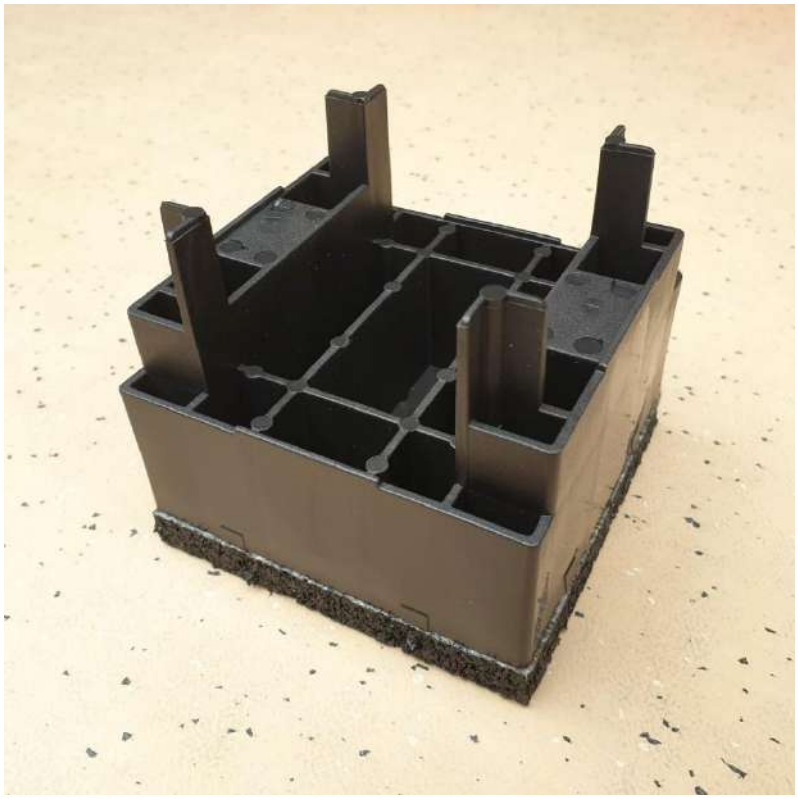


3.3 New Era S2 Acoustic Cradle and Batten Flooring over a Standard Concrete Floor

AIRO Test No. L/3460/3

The specimen comprised a 150 mm (6 inch) thick reinforced standard concrete floor (approx 365 kg/m²). The walking surface area of the floor is 3800 mm x 3720 mm (14.14 m²), with a ceiling area of 3330 mm x 3360 mm (11.19 m²). The concrete floor was overlaid by a cradle and batten flooring system consisting of New Era S2 45/60 mm Acoustic Cradles, incorporating 10 mm MuteMat 750-10 resilient pads, set out at 600 mm x 400 mm centres. The cradles supported 48 x 45 mm plywood battens set at 400 mm centres to which a walking surface of 18 mm P5 t&g flooring grade chipboard was screwed, with 50 mm Knauf Earthwool glass mineral wool cut to fit between the battens. A 10 x 100 mm flanking strip was incorporated at the perimeter of the floating floor. The floating floor void height was 120 mm, with a finished floor height of 138 mm.

The following image shows a New Era S2 Acoustic Cradle.

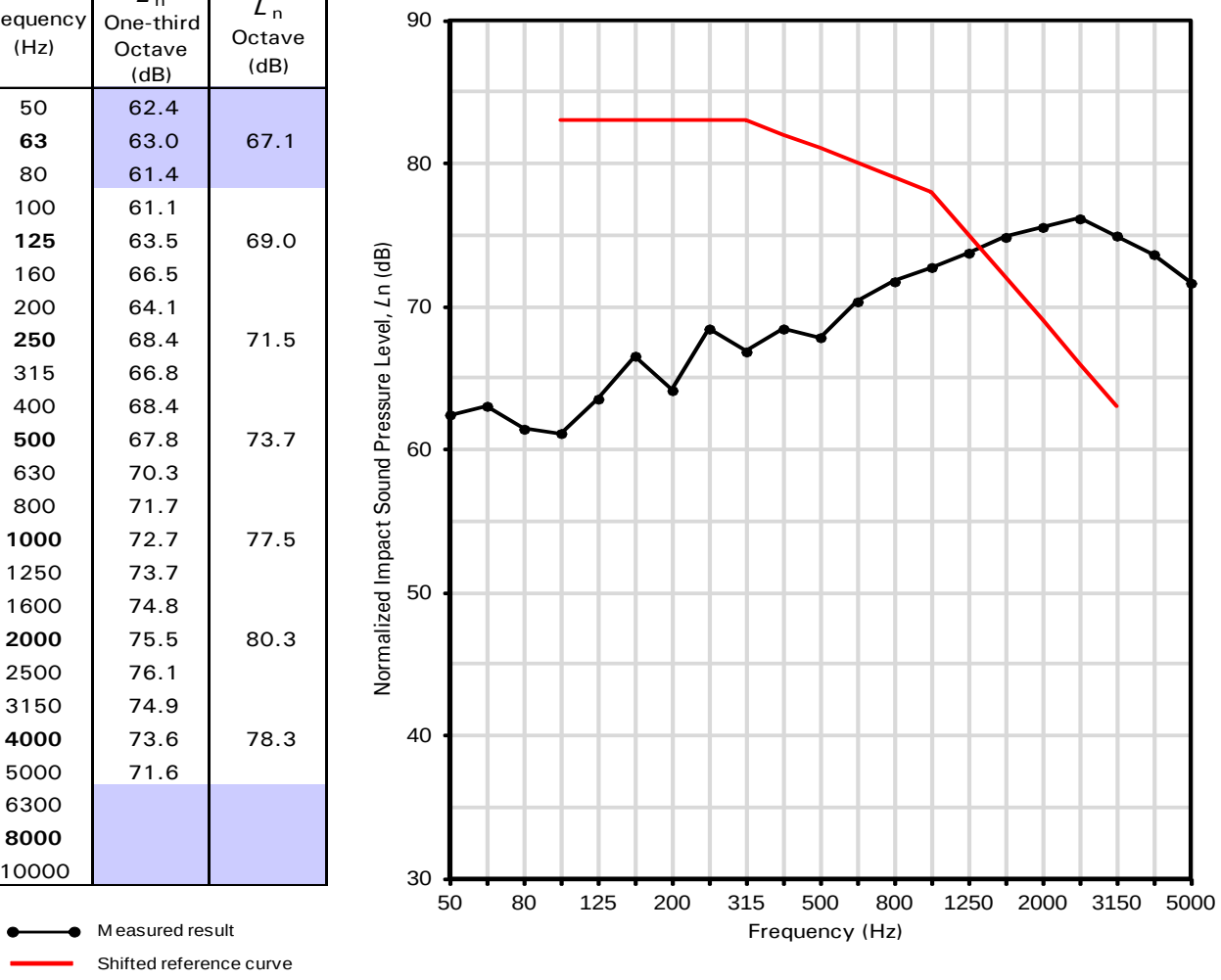


Normalized Impact Sound Pressure Level (L_n) according to BS EN ISO 10140-3:2010

Test No. L/3460/1 Date of Test: 26 February 2019
Client: Ikoustic Limited
Specimen: Standard Concrete Floor
Installed by: AIRO
Specimen area: 11.19 m² Mass per unit area: 365 kg/m²

Chamber Conditions	Volume	Air Temperature	Relative Humidity	Air Pressure
Source Chamber	130 m³	13°C	60%	1015 hPa
Receiving Chamber	211 m³	10°C	80%	1015 hPa

Frequency (Hz)	L_n One-third Octave (dB)	L_n Octave (dB)
50	62.4	
63	63.0	67.1
80	61.4	
100	61.1	
125	63.5	69.0
160	66.5	
200	64.1	
250	68.4	71.5
315	66.8	
400	68.4	
500	67.8	73.7
630	70.3	
800	71.7	
1000	72.7	77.5
1250	73.7	
1600	74.8	
2000	75.5	80.3
2500	76.1	
3150	74.9	
4000	73.6	78.3
5000	71.6	
6300		
8000		
10000		



Rating according to BS EN ISO 717-2:2013

$L_{n,w}$ (C_I) = 81 (-13) dB $C_{I,50\text{-}2500}$ = -13 dB

Evaluation based on laboratory measurement results obtained by an engineering method

Approved by:
W R Stevens
W R Stevens MIOA
Principal Consultant

Report Author:
M Sawyer
M Sawyer MIOA
Laboratory Manager

Normalized Impact Sound Pressure Level (L_n) according to BS EN ISO 10140-3:2010

Test No. L/3460/2 Date of Test: 27 February 2019

Client: Ikoustic Limited

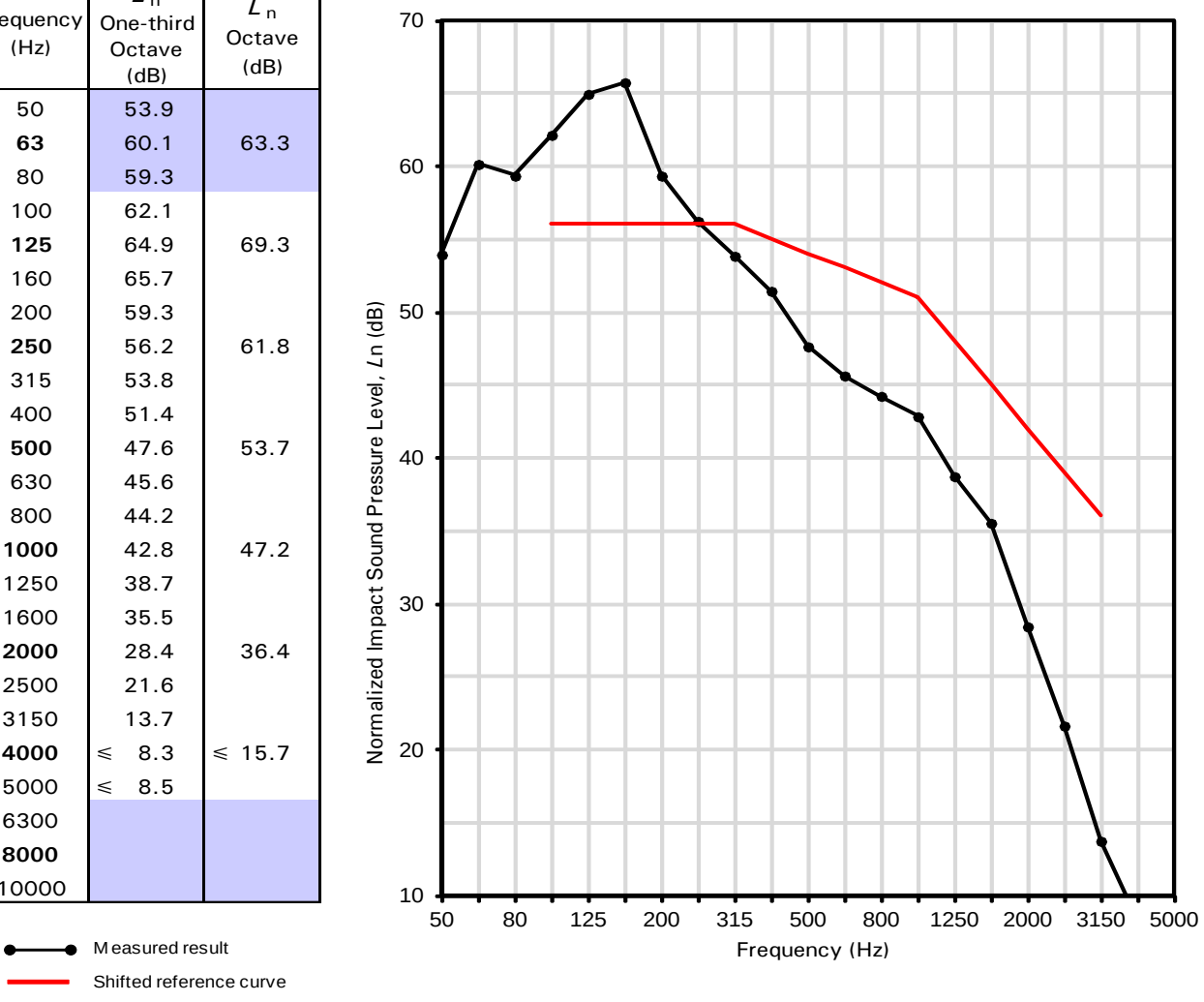
Specimen: New Era S1 Acoustic Cradle and Batten Flooring over a Standard Concrete Floor

Installed by: V A Hutchinson Flooring Limited for Ikoustic Limited

Specimen area: 11.19 m² Mass per unit area: 365 and 14 kg/m²

Chamber Conditions	Volume	Air Temperature	Relative Humidity	Air Pressure
Source Chamber	129 m³	11°C	75%	1010 hPa
Receiving Chamber	211 m³	10°C	80%	1010 hPa

Frequency (Hz)	L_n One-third Octave (dB)	L_n Octave (dB)
50	53.9	
63	60.1	63.3
80	59.3	
100	62.1	
125	64.9	69.3
160	65.7	
200	59.3	
250	56.2	61.8
315	53.8	
400	51.4	
500	47.6	53.7
630	45.6	
800	44.2	
1000	42.8	47.2
1250	38.7	
1600	35.5	
2000	28.4	36.4
2500	21.6	
3150	13.7	
4000	⩽ 8.3	⩽ 15.7
5000	⩽ 8.5	
6300		
8000		
10000		



Rating according to BS EN ISO 717-2:2013

$L_{n,w}$ (C_I) = 54 (1) dB $C_{I,50\text{-}2500}$ = 2 dB

Evaluation based on laboratory measurement results obtained by an engineering method

Approved by:

W R Stevens

W R Stevens MIOA

Principal Consultant

Report Author:

M Sawyer

M Sawyer MIOA

Laboratory Manager

Normalized Impact Sound Pressure Level (L_n) according to BS EN ISO 10140-3:2010

Test No. L/3460/3 Date of Test: 27 February 2019

Client: Ikoustic Limited

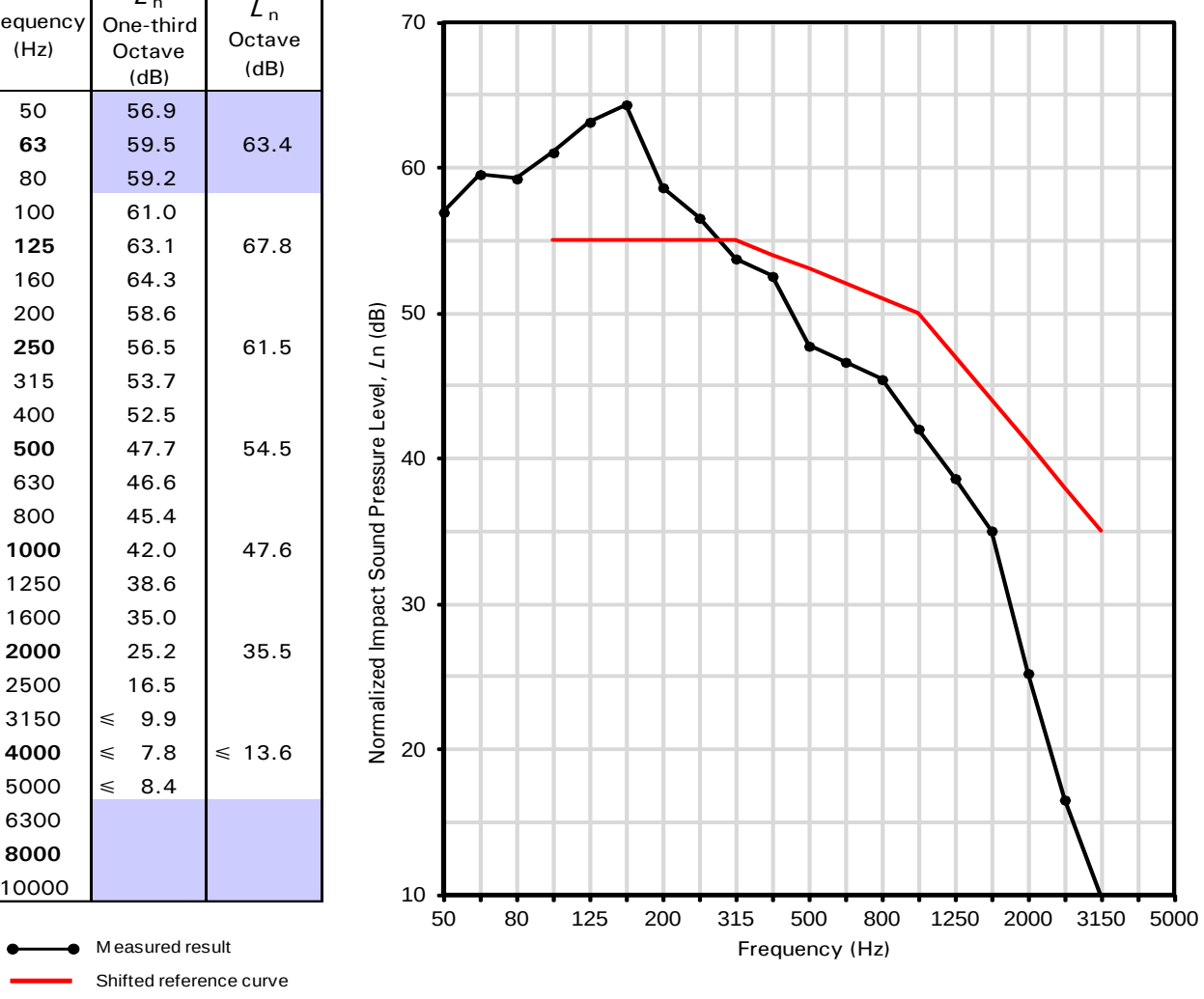
Specimen: New Era S2 Acoustic Cradle and Batten Flooring over a Standard Concrete Floor

Installed by: V A Hutchinson Flooring Limited for Ikoustic Limited

Specimen area: 11.19 m² Mass per unit area: 365 and 14 kg/m²

Chamber Conditions	Volume	Air Temperature	Relative Humidity	Air Pressure
Source Chamber	129 m³	13°C	65%	1010 hPa
Receiving Chamber	211 m³	10°C	80%	1010 hPa

Frequency (Hz)	L_n One-third Octave (dB)	L_n Octave (dB)
50	56.9	
63	59.5	63.4
80	59.2	
100	61.0	
125	63.1	67.8
160	64.3	
200	58.6	
250	56.5	61.5
315	53.7	
400	52.5	
500	47.7	54.5
630	46.6	
800	45.4	
1000	42.0	47.6
1250	38.6	
1600	35.0	
2000	25.2	35.5
2500	16.5	
3150	≤ 9.9	
4000	≤ 7.8	≤ 13.6
5000	≤ 8.4	
6300		
8000		
10000		



Rating according to BS EN ISO 717-2:2013

$L_{n,w}$ (C_I) = 53 (1) dB $C_{I,50\text{-}2500}$ = 2 dB

Evaluation based on laboratory measurement results obtained by an engineering method

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Laboratory Manager

APPENDIX A1 - METHOD OF MEASUREMENT

The test specimen is erected in an aperture of approximately 11 square metres between two vertically adjacent reverberant chambers which have been constructed to suppress the transmission of sound by flanking paths. To improve the diffusion of the sound fields, both chambers are irregularly shaped and contain several reflecting diffuser panels.

If the test specimen is smaller than the test aperture, the test specimen is installed within a highly insulating infill partition, purpose built within the test aperture. When the test specimen is intended to be openable, then it is opened and closed five times immediately prior to testing.

A1.1 Impact Sound Transmission to BS EN ISO 10140-3:2010

The insulation of a specimen against impact sound is measured by use of an artificial source of impact sound, known as a tapping machine, which has a mass of approximately 16 kg and is supported on three legs.

A standard tapping machine which is located sequentially in five positions on the specimen is used as the impact source, and measurements of the transmitted sound level are made in the receiving chamber at one-third octave intervals from 100 Hz to 5000 Hz as prescribed in the Standard (ref 1). The measurements are made with a microphone attached to a rotating boom to obtain a good average of the sound pressure level in the chamber. Measurements are also made of the noise level in the receiving chamber in the absence of the noise source in order that corrections for background noise may be made if appropriate.

The Normalized Impact Sound Pressure Level (L_n) in decibels (dB) is calculated in each frequency band using the equation:

$$L_n = L_i + 10 \lg \frac{A}{A_0} \quad \text{dB} \qquad \text{Equation (iii)}$$

where L_i is the average sound pressure level in the receiving chamber (dB re 20 μPa)

A is the equivalent absorption area in the receiving chamber (m²)

A_0 is the reference absorption area, equal to 10 m²

The equivalent absorption area in the receiving chamber is determined from twelve sets of reverberation time measurements using a microphone connected to a rotating microphone boom. The measurements are made in accordance with International Standard ISO 3382-2:2008 (ref 3) and the value of 'A' determined using Sabine's formula:

$$A = \frac{0.16\,V}{T} \quad \text{m}^2 \qquad \text{Equation (ii)}$$

where: V is the volume of the receiving chamber (m³)

T is the reverberation time of the receiving chamber (seconds)

The Weighted Normalized Impact Sound Pressure Level ($L_{n,w}$) in decibels (dB) and the Spectrum Adaptation Term (C_I), also in decibels, are calculated in accordance with British Standard BS EN ISO 717-2 (ref 2) by comparison of the sixteen values of Normalized Impact Sound Pressure Level from 100 Hz to 3150 Hz with the relevant curves.

In this instance the measurement range was extended to include the 50 Hz one-third octave although it should be noted that the frequency bands below 100 Hz are outside the normal frequency range of the Standard, and because of their longer wavelengths of sound will have a lower order of accuracy.

A1.2 Calibration

The calibration of all equipment used in the above measurements is traceable via an unbroken chain to National Standards.

APPENDIX A2 - PRACTICAL APPLICATION OF TEST RESULTS

It should be noted that all the results in this report are properties of the test specimen alone. When the test specimen forms part of an enclosure, the impact sound insulation obtained will depend on additional factors such as the relative surface areas involved and the nature and acoustic characteristics of the receiving space. Also, in buildings the transmission of sound via alternative paths may not be negligible in comparison with transmission through the test specimen alone, particularly when the sound insulation of the test specimen is high. Such indirect sound transmission would result in a lower effective insulation.

APPENDIX A3 - REFERENCES

1. British Standard BS EN ISO 10140
Acoustics – Laboratory measurement of sound insulation of building elements

BS EN ISO 10140-3:2010
Measurement of impact sound insulation

2. British Standard BS EN ISO 717
Acoustics - Rating of sound insulation in buildings and of building elements

BS EN ISO 717-2:2013
Impact sound insulation

3 International Standard ISO 3382
Acoustics - Measurement of room acoustic parameters

ISO 3382-2:2008
Reverberation time in ordinary rooms

APPENDIX A4 - SCHEDULE OF EQUIPMENT

Use	Type	Serial No.
Noise Source	B&K 3204 Tapping Machine	351719
Measuring System	Nor850 Multi Channel Analyser	8501193
	B&K 4165 ½" Condenser Microphone	1042002
	B&K 2669 Microphone Pre-Amplifier	2221217
	NEAS 265 Rotating Microphone Boom	29465
Calibration	B&K 4228 Pistonphone	1704324