Technical Report

23751-SRL-RP-XT-004-P1

Project

The Laboratory Measurement of Airborne Sound Insulation of Various Barrier Materials

Prepared for

WSBL Ltd

By

Allen Smalls

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

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Client Address	Durbar Mill, Hereford Road, Blackburn, Lancashire, BB1 3JU
Author	Allen Smalls
Checker	George Thomson
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Report Version History

Version	Date	Comments
P1	07/08/2020	

Summary

Tests have been done in SRL's Laboratory at Holbrook House, Sudbury, Suffolk, to determine the sound reduction index of various barrier materials in accordance with BS EN ISO 10140-2:2010.

From these measurements, the required results have been derived and are presented in both tabular and graphic form in Data Sheets 1 to 4.

The results are given in 1/3rd octave bands over the frequency range 50Hz to 10kHz, which is beyond that required by the test standard. Measurements outside the standard frequency range are not UKAS accredited.

Allen Smalls
Quality Manager
For and on behalf of
SRL Technical Services Limited
Tel: 01787 247595
Email: asmalls@srltsl.com

George Thomson
Approved Signatory

Contents

1.0 Details of Measurements

1.1 Location

Sound Research Laboratories

Holbrook House

Little Waldingfield

Sudbury

Suffolk

CO10 0TF

1.2 Test Dates

22 August 2017

1.3 Tester

Richard Calvert of SRL Technical Services Limited

1.4 Instrumentation and Apparatus Used

Make	Description	Type
EDI	Microphone Multiplexer	
	Microphone Power Supply Unit	
Norwegian Electronics	Real Time Analyser	830
	Rotating Microphone Boom	231

Brüel & Kjaer	Windshields	UA0237
	Pre Amplifiers	2669C
	Microphone Calibrator	4231
	Omnipower Sound Source	4296
Larson Davis	12mm Condenser Microphone	2560
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 10140-2:2010	Laboratory measurement of sound insulation for building elements – Part 2: Measurement of airborne sound insulation.

2.0 Description of Test

2.1 Description of Sample

Various barrier materials were tested. See Data Sheets 1 to 4 and Drawings for details of construction tested.

Sampling plan:	Selected at random
Sample condition:	New
Details supplied by:	WSBL Ltd
Weights supplied by:	WSBL Ltd
Sample installed by:	SRL Technical Services Ltd

2.2 Sample Delivery date

21 August 2017

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 Sheet 1 to 4 and summarised below.

Results relate only to the items received and tested.

SRL Test No.	Description in Brief	R_w ($C;C_{tr}$)
3	18 SWG Steel Plate, 25kg/m³ 25mm Glass Quilt, Revac® Momentum 100 FF SGQ Thermoplastic Heavy Layer Foiled	38 (-3;-9)
5	18 SWG Steel Plate, 12kg/m³ 25mm, Revac® Momentum 100 FF Neptune® 3045 H Thermoplastic Heavy Layer Foiled	39 (-2;-8)
7	18 SWG Steel Plate, 25kg/m³ 25mm Glass Quilt, Revac® Momentum 50 FF SGQ Thermoplastic Heavy Layer Foiled	36 (-3;-8)
8	18 SWG Steel Plate, 12kg/m³ 25mm, Revac® Momentum 50 FF Neptune® 3045 H Thermoplastic Heavy Layer Foiled	36 (-3;-8)

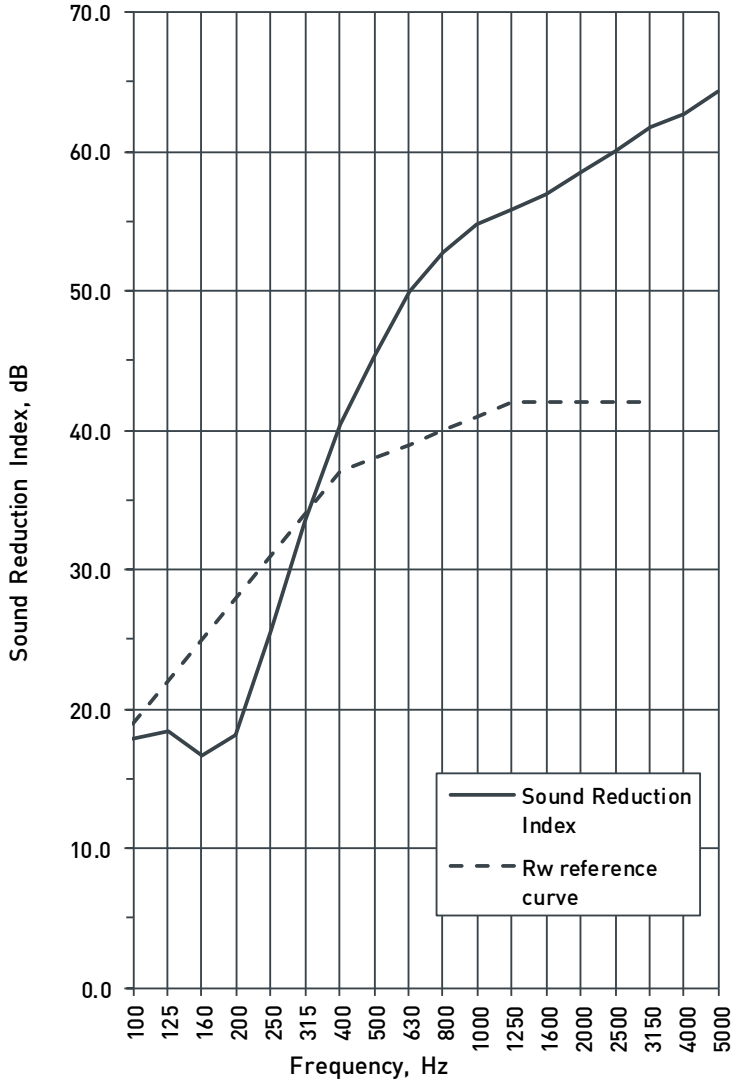
Data Sheet 1

Test Number:	3
Client:	WSBL Ltd
Test Date:	22/08/2017
Sample Height:	2.2 m
Sample Width:	2 m
Sample Weight:	20.53 kg/m²

Test Room:	**Source**	**Receiving**
Air Temperature:	19.1 °C	19.2 °C
Air Humidity:	73 %	73 %
Volume:	115 m³	300 m³
Air Pressure:	1013 mbar	

Product Identification: 18 SWG Steel Plate, 25kg/m3 25mm Glass Quilt, Revac® Momentum 100 FF SGQ Thermoplastic Heavy Layer Foiled

Freq, f Hz	Sound Reduction Index, dB	
	⅓ Oct	Octave
50+	20.5	17.8
63+	20.7	
80+	14.9	
100	17.9	17.6
125	18.4	
160	16.7	
200	18.2	22.1
250	25.7	
315	33.4	
400	40.4	43.6
500	45.2	
630	50.0	
800	52.8	54.3
1000	54.8	
1250	55.9	
1600	56.9	58.3
2000	58.5	
2500	60.0	
3150	61.8	62.8
4000	62.7	
5000	64.3 *	
6300+	67.8 *	60.2
8000+	62.9 *	
10000+	56.6 *	
Average 100-3150	41.7	Version v3.0



Rating according to BS EN ISO 717-1:2013

$R_w(C;C_{tr})$= 38 (-3 ; -9) dB

* shows measurement corrected for background

> shows measurement limited by background

\+ shows Frequency beyond standard and not UKAS accredited

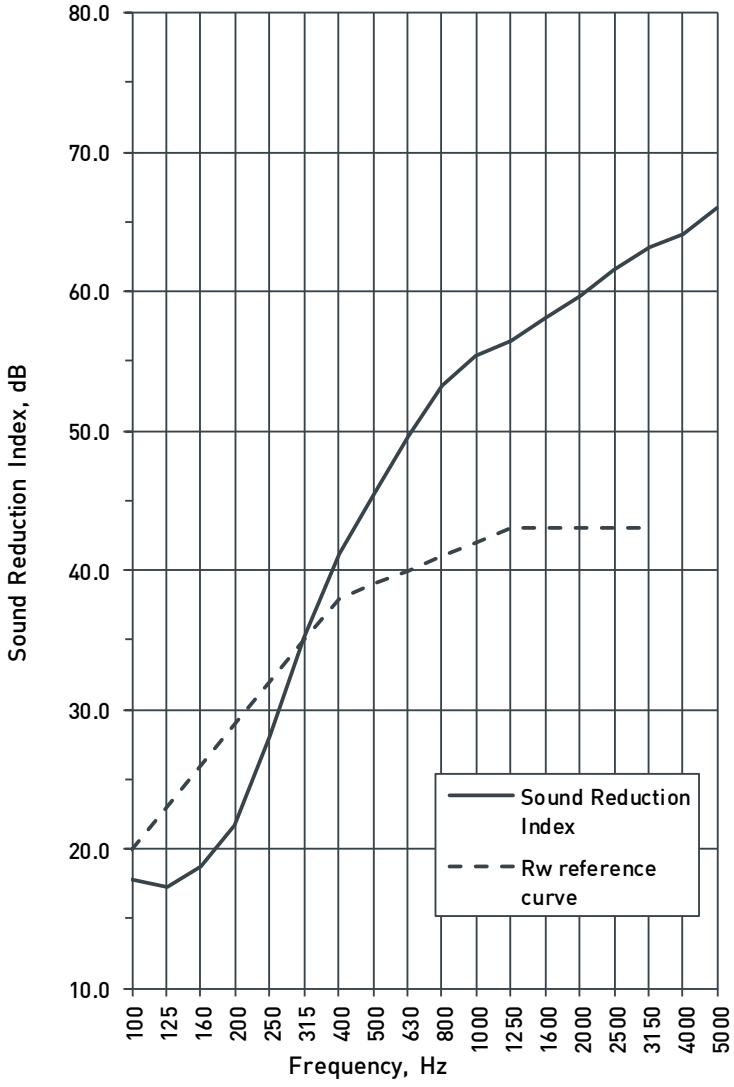
Data Sheet 2

Test Number:	5
Client:	WSBL Ltd
Test Date:	22/08/2017
Sample Height:	2.2 m
Sample Width:	2 m
Sample Weight:	20.2 kg/m²

Test Room:	**Source**	**Receiving**
Air Temperature:	19.2 °C	19.3 °C
Air Humidity:	72 %	75 %
Volume:	115 m³	300 m³
Air Pressure:	1013 mbar	

Product Identification: 18 SWG Steel Plate, 12kg/m3 25mm Revac® Momentum 100 FF Neptune® 3045 H Thermoplastic Heavy Layer Foiled

Freq, f Hz	Sound Reduction Index, dB	
	⅓ Oct	Octave
50+	21.6	17.6
63+	20.5	
80+	14.5	
100	17.8	17.9
125	17.3	
160	18.8	
200	21.7	25.4
250	28.2	
315	35.1	
400	41.1	44.1
500	45.3	
630	49.6	
800	53.2	54.8
1000	55.4	
1250	56.5	
1600	58.1	59.6
2000	59.7	
2500	61.6	
3150	63.1	64.2
4000	64.1	
5000	66.0 *	
6300+	69.2 *	60.1
8000+	63.0 *	
10000+	56.4 *	
Average 100-3150	42.7	Version v3.0



Rating according to BS EN ISO 717-1:2013

$R_w(C;C_{tr})$= **39 (-2 ; -8) dB**

* shows measurement corrected for background

> shows measurement limited by background

\+ shows Frequency beyond standard and not UKAS accredited

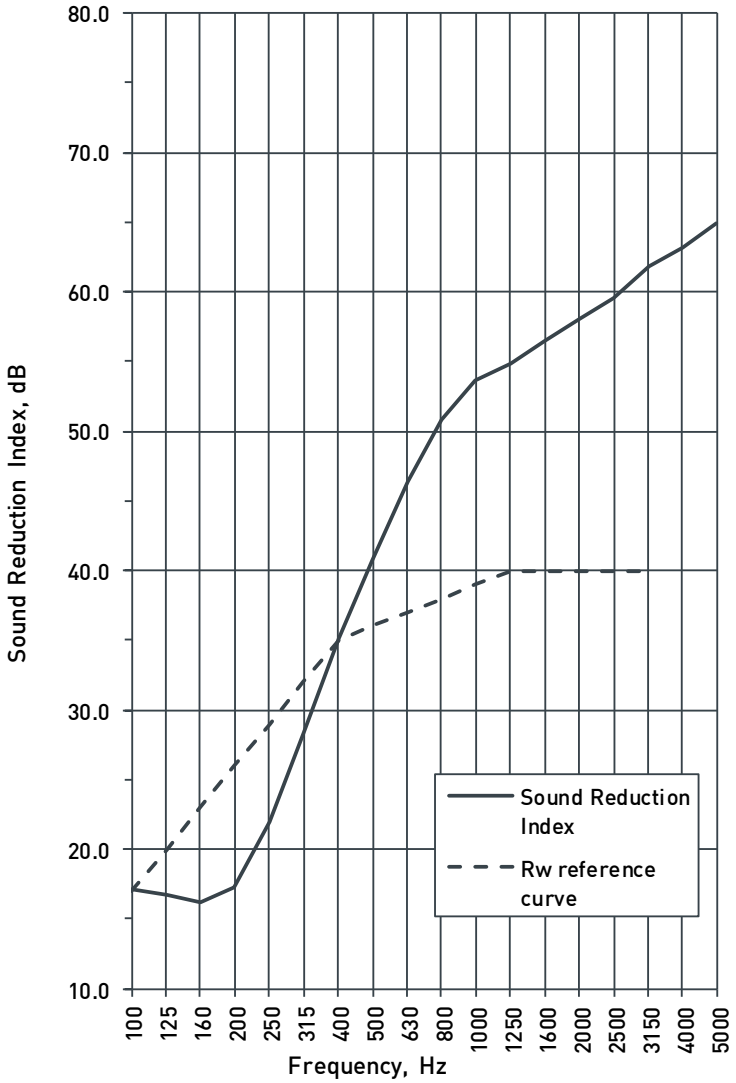
Data Sheet 3

Test Number:	7
Client:	WSBL Ltd
Test Date:	22/08/2017
Sample Height:	2.2 m
Sample Width:	2 m
Sample Weight:	15.53 kg/m²

Test Room:	**Source**	**Receiving**
Air Temperature:	19.3 °C	19.4 °C
Air Humidity:	72 %	76 %
Volume:	115 m³	300 m³
	Air Pressure:	1012 mbar

Product Identification: 18 SWG Steel Plate, 25kg/m3 25mm Glass Quilt, Revac® Momentum 50 FF SGQ Thermoplastic Heavy Layer Foiled

Freq, f Hz	Sound Reduction Index, dB	
	⅓ Oct	Octave
50+	19.1	16.6
63+	19.0	
80+	13.8	
100	17.1	16.7
125	16.8	
160	16.2	
200	17.3	20.5
250	22.0	
315	28.3	
400	35.1	38.6
500	40.8	
630	46.4	
800	50.8	52.8
1000	53.6	
1250	54.9	
1600	56.5	57.9
2000	58.0	
2500	59.5	
3150	61.8	63.1
4000	63.1	
5000	64.9 *	
6300+	67.9 *	59.6
8000+	62.5 *	
10000+	55.9 *	
Average 100-3150	39.7	Version v3.0



Rating according to BS EN ISO 717-1:2013

$R_w(C;C_{tr})$= 36 (-3 ; -8) dB

* shows measurement corrected for background

> shows measurement limited by background

\+ shows Frequency beyond standard and not UKAS accredited

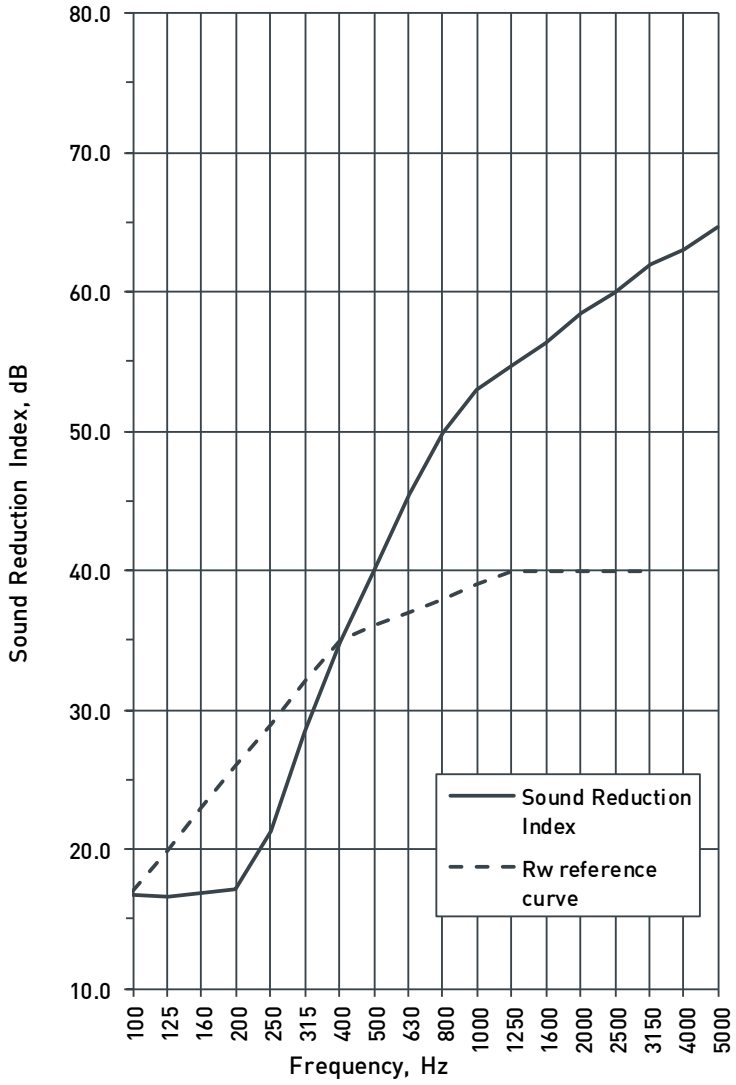
Data Sheet 4

Test Number:	8
Client:	WSBL Ltd
Test Date:	22/08/2017
Sample Height:	2.2 m
Sample Width:	2 m
Sample Weight:	15.2 kg/m²

Test Room:	**Source**	**Receiving**
Air Temperature:	19.3 °C	19.5 °C
Air Humidity:	71 %	77 %
Volume:	115 m³	300 m³
Air Pressure:	1012 mbar	

Product Identification: 18 SWG Steel Plate, 12kg/m3 25mm Neptune® 3045 H, Revac® Momentum 50 FF Neptune® 3045 H Thermoplastic Heavy Layer Foiled

Freq, f Hz	Sound Reduction Index, dB	
	⅓ Oct	Octave
50+	20.1	16.0
63+	19.3	
80+	12.7	
100	16.7	16.7
125	16.6	
160	16.9	
200	17.1	20.2
250	21.3	
315	28.4	
400	34.9	38.2
500	40.0	
630	45.4	
800	49.9	52.1
1000	53.0	
1250	54.7	
1600	56.3	58.0
2000	58.4	
2500	60.0	
3150	62.0	63.1
4000	63.0	
5000	64.7 *	
6300+	67.4 *	59.1
8000+	61.8 *	
10000+	55.5 *	
Average 100-3150	39.5	Version v3.0



Rating according to BS EN ISO 717-1:2013

$R_w(C;C_{tr})$= **36 (-3 ; -8) dB**

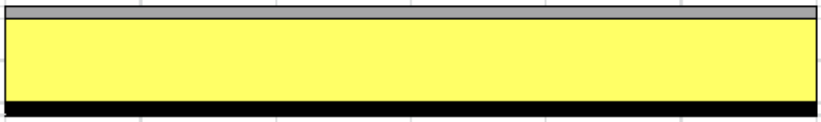
* shows measurement corrected for background

> shows measurement limited by background

\+ shows Frequency beyond standard and not UKAS accredited

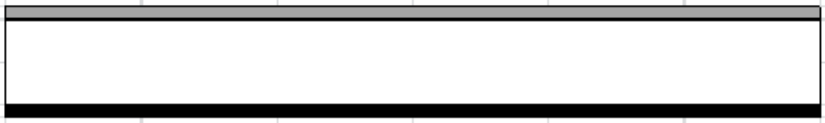
Drawings

TEST 3



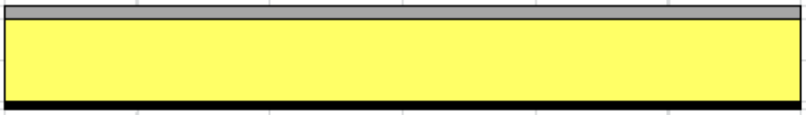
Layer A	18 SWG Steel Plate	9.9	kg/m2
Layer B	25kg/m3 25mm Glass Quilt	0.625	kg/m2
Layer C	Revac® Momentum 100 FF SGQ Thermoplastic Heavy Layer Foiled	10	kg/m2
	Total	**20.525**	kg/m2

TEST 5



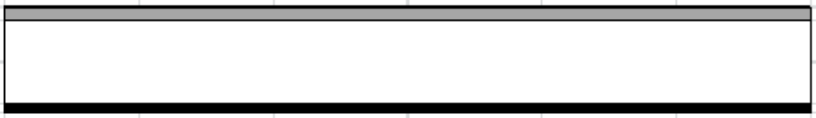
Layer A	18 SWG Steel Plate	9.9	kg/m2
Layer B	12kg/m3 25mm Neptune®3045 H	0.3	kg/m2
Layer C	Revac® Momentum 100 FF Neptune® 3045 H Thermoplastic Heavy Layer Foiled	10	kg/m2
	Total	**20.2**	kg/m2

TEST 7



Layer A	18 SWG Steel Plate	9.9	kg/m2
Layer B	25kg/m3 25mm Glass Quilt	0.625	kg/m2
Layer C	Revac® Momentum 50 FF SGQ Thermoplastic Heavy Layer Foiled	5	kg/m2
	Total	**15.525**	kg/m2

TEST 8



Layer A	18 SWG Steel Plate	9.9	kg/m2
Layer B	12kg/m3 25mm Neptune®3045 H	0.3	kg/m2
Layer C	Revac® Momentum 50 FF Neptune® 3045 H Thermoplastic Heavy Layer Foiled	5	kg/m2
	Total	**15.2**	kg/m2

Appendix A – Test Procedure

Measurement of Sound Transmission in accordance with BS EN ISO 10140-2: 2010 – TP33

In the laboratory, airborne sound transmission is determined from the difference in sound pressure levels measured across a test sample installed between two reverberant rooms. The difference in measured sound pressure levels is corrected for the amount of absorption in the receiving room. The test is done under conditions which restrict the transmission of sound by paths other than directly through the sample. The source sound field is randomly incident on the sample.

The test sample is located and sealed in an aperture within the brick dividing wall between the two rectangular reverberant (i.e. acoustically "live") room, both of which are constructed from 215mm brick with reinforced concrete floors and roofs. The brick wall has dimensions of 8m wide x 3.1m high and 550mm nominal thickness and forms the whole of the common area between the two rooms.

One of the rooms is used as the receiving room and has a volume of 300 cubic metres. It is isolated from the surrounding structure and the adjoining room by the use of resilient mountings and seals ensuring good acoustic isolation. The adjoining source room has a volume of 115 cubic metres.

Broad band noise is produced in the source room from an electronic generator, power amplifier and loudspeaker. The resulting sound pressure levels in both rooms are sampled using a microphone mounted on an oscillating boom and connected to a real time analyser. The signal is filtered into one third octave band widths, integrated and averaged. The value obtained at each frequency is known as the average sound pressure level for either the source or the receiving room. The change in level across the test sample is termed the sound pressure level difference, i.e.

$$D = L_1 - L_2$$

where

D is the equivalent Sound Pressure level difference, dB

L_1 is the equivalent Sound Pressure level in the source room, dB

L_2 is the equivalent Sound Pressure level in the receiving room, dB

The Sound Reduction Index (R), also known by the American terminology Sound Transmission Loss, is defined as the number of decibels by which sound energy randomly incident on the test sample is reduced in transmitting through it and is given by the formula:

$$R = D + 10\log_{10}\frac{S}{A} \text{..... in decibels}$$

where

S is the area of the sample, m^2

A is the total absorption in the receiving room, m^2

The Sound Reduction Index is an expression of the laboratory sound transmission performance of a particular element or construction. It is a function of the mass, thickness, sealing, method of mounting etc. and is independent of the overall area of the sample.

However, when an example of this construction is installed on site, the sound insulation obtained will depend upon its surface area, as well as the absorption in the receiving room. The larger the area the greater the sound energy transmitted. Also, the overall sound insulation is affected by the sound transmission through other building elements, some of which may have an inferior performance to the sample tested. In practice, therefore, the potential sound reduction index of a construction is not fully realised on site. Furthermore, the sound reduction index of a particular sample of that construction can only be measured accurately in a laboratory, because only under such controlled conditions can the sound transmission path be limited to the sample under test.

R_w, C and C_{tr} have been calculated in accordance with the relevant section of BS EN ISO 717-1:2013 from the results of laboratory tests carried out in accordance with BS EN ISO 10140-2:2010.

Appendix B – Measurement Uncertainty

BS EN ISO 10140-2: 2010 – TP33

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	3.2
125	2.9
160	2.5
200	2.5
250	1.8
315	1.8
400	1.5
500	1.5
630	1.2
800	1.2
1000	1.2
1250	1.2
1600	1.2
2000	1.2
2500	1.2
3150	1.0

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

Manchester Consultancy
Suite 1.9, Canada House
Chepstow Street
Manchester
M1 5FW
Tel: +44 (0)161 929 5585

London Consultancy
07-106
8 Devonshire Square
London
EC2M 4PL
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
102 Heritage House
20 Dreyer Street
Claremont
Cape Town
7708
South Africa
Tel: +27 (0)21 205 9201

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

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

SRL offers services in:
Acoustics
Air Quality
BREEAM
Laboratory and Site Testing

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

Registered Number: 907694 England