SRL

UKAS TESTING
0444

Technical Report

C/23373/T02a

Project

The Laboratory Measurement of Sound Reduction Index of Various Panels

Prepared for

Clark Wright Ltd

By

Allen Smalls

Published

2 June 2016

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Quality Assurance

Project Title	The Laboratory Measurement of Sound Reduction Index of Various Panels
Prepared for	Clark Wright Ltd
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Author	Allen Smalls
Checker	Gareth Young
Report Number	C/23373/T02a

Summary

Tests have been done in SRL's Laboratory at Holbrook House, Sudbury, Suffolk, to determine the sound reduction index of various panels 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 Test Certificates 9718a to 9726a.

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

Allen Smalls
Quality Manger
For and on behalf of
SRL Technical Services Limited
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Email: asmalls@srltsl.com

Gareth Young
Assessment Manager

Contents

1.0 Details of Measurements

1.1 Location

Sound Research Laboratories

Holbrook House

Little Waldingfield

Sudbury

Suffolk

CO10 0TF

1.2 Test Date

28 April 2016

1.3 Tester

Allen Smalls of SRL Technical Services Limited

1.4 Personnel Present

Will Burton	Clark Wright
Gary Hammatt	Clark Wright
Sharon Hammatt	Clark Wright

1.5 Instrumentation and Apparatus Used

Make	Description	Type
E D I	Microphone Multiplexer	
	Microphone Power Supply Unit	
Norwegian Electronics	Real Time Analyser	830
	Rotating Microphone Boom	231
Brüel & Kjaer	12mm Condenser Microphones	4166
	Windshields	UA0237
	Pre Amplifiers	2639, 2669C
	Microphone Calibrator	4231
	Omnipower Sound Source	4296
Larson Davis	12mm Condenser Microphone	2560
Celestion	Loudspeakers	100w
Douglas Curtis	Rotating Microphone Boom	
Oregon Scientific	Temperature & Humidity & Probe	THGR810
TOA	Graphic Equalizer	E-1231
QSC Audio	Power Amplifier	RMX 1450

1.6 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 panels. See section 3 for details and Drawing 1.

Sampling plan: Enough for test only

Sample condition: New

Details supplied by: SRL

Sample installed by: SRL

2.2 Sample Delivery date

28 April 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.

2.0 Description of Test

2.1 Description of Sample

Various panels. See section 3 for details and Drawing 1.

Sampling plan:	Enough for test only
Sample condition:	New
Details supplied by:	Siderise
Sample installed by:	Siderise

2.2 Sample Delivery date

28 April 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.

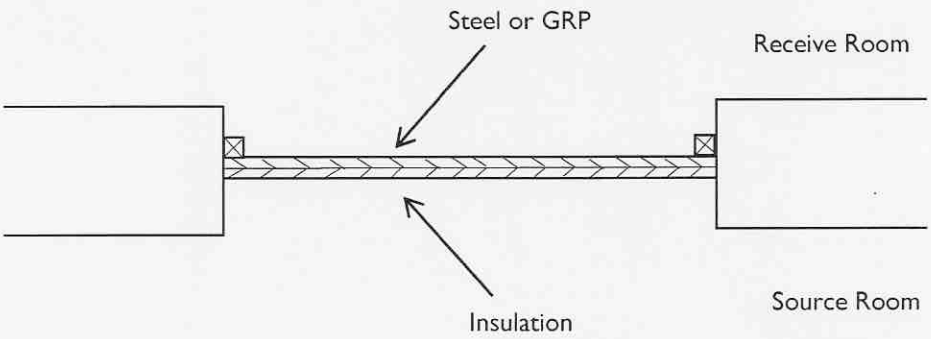
3.0 Results

The results of the measurements and subsequent analysis are given in Test Certificates 9718a to 9726a and summarised below.

Results relate only to the items tested.

SRL Test No.	Description in Brief	R_w ($C;C_{tr}$)
2	ADL insulation (nominal 40mm) fixed to GRP with hangers and washers	36 (-2; -6)
3	eQuilt2_B5 manufactured by C W LTD fixed to GRP with hangers and washers	37 (-2; -5)
4	eQuilt2_B3 manufactured by C W LTD fixed to GRP with hangers and washers	36 (-2; -6)
5	eQuilt2_B5_SL manufactured by C W LTD v1 fixed to GRP with hangers and washers	38 (-2; -7)
6	eQuiltBW_B3_SL manufactured by C W LTD fixed to GRP with hangers and washers	37 (-2; -7)
7	eQuilt2_B5_SL manufactured by C W LTD v2 fixed to GRP with hangers and washers	39 (-3; -8)
8	WBL insulation fixed to steel with hangers and washers	37 (-2; -5)
9	eQuilt2_B0 manufactured by C W LTD fixed to steel with hangers and washers	38 (-2; -7)
10	eQuiltBW_B0 manufactured by C W LTD fixed to steel with hangers and washers	39 (-2; -7)

4.0 Drawing 1: Typical Test Panel



Not to scale

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 4.8m 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 55 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 in dB

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

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

A is the total absorption in the receiving room

both dimensions being in consistent units

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

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	1.2

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UKAS TESTING 0444

Test Certificate No: 9718a

Contract: C/23373/T02a

Date: 02 June 2016

Confidential

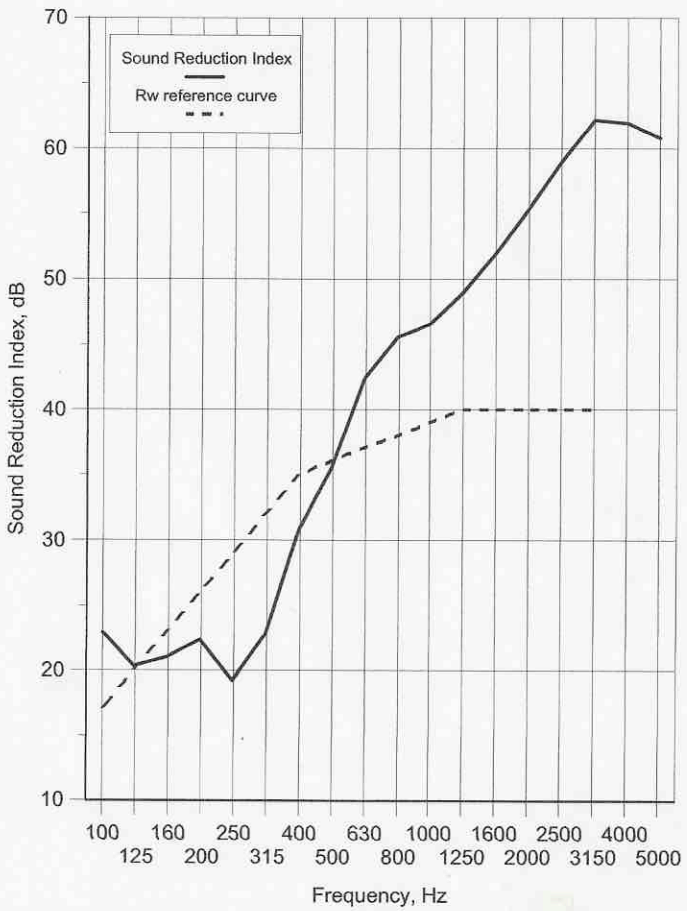
See SRL report C/23373/T02a for full details

The Laboratory Measurement of Sound reduction Index to BS EN ISO 10140-2:2010

Test Number :	2	**Test Room:**	**Source**	**Receiving**
		Air temperature:	9.3 °C	10.9 °C
Test Date:	28/04/2016	**Air humidity:**	52 %	48 %
Sample height:	0.53 m	**Volume:**	115 m3	300 m3
Sample width:	0.855 m			
			Air Pressure:	1005 mbar

Product Identification: 4mm GRP (6.8 kg/m2)
ADL insulation (7.4 kg/m2, nominal 40mm) fixed to GRP with hangers and washers

Freq f Hz	Sound Reduction Index, dB 1/3 Oct	1/1 Oct
50+	24.5	
63+	24.6	24.2
80+	23.6	
100	22.9	
125	20.3	21.3
160	21.0	
200	22.4	
250	19.2	21.1
315	22.8	
400	30.8	
500	35.4	34.1
630	42.4	
800	45.6	
1000	46.6	46.8
1250	49.0	
1600	52.0	
2000	55.4	54.6
2500	59.0 *	
3150	62.2 *	
4000	62.0 *	61.7
5000	60.8 *	
6300+	62.0 *	
8000+	51.8 *	47.5
10000+	43.3 *	
Average 100-3150	37.9	Version v2.1



Rating according to BS EN ISO 717-1:2013
Rw(C;Ctr)= **36 (-2;-6) dB**

* shows measurement corrected for background
+ shows frequency beyond standard and not UKAS accredited

Allen Smalls
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UKAS TESTING 0444

Test Certificate No: 9719a

Contract: C/23373/T02a

Date: 02 June 2016

Confidential

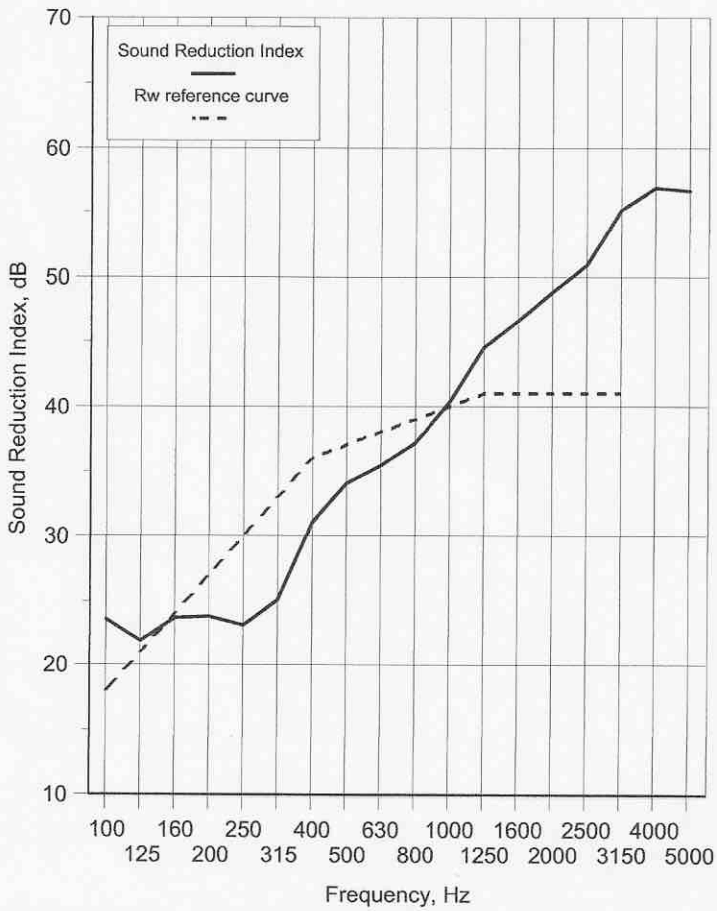
See SRL report C/23373/T02a for full details

The Laboratory Measurement of Sound reduction Index to BS EN ISO 10140-2:2010

Test Number :	3	**Test Room:**	**Source**	**Receiving**
		Air temperature:	9.3 °C	10.9 °C
Test Date:	28/04/2016	**Air humidity:**	52 %	48 %
Sample height:	0.53 m	**Volume:**	115 m3	300 m3
Sample width:	0.855 m			
			Air Pressure:	1005 mbar

Product Identification: 4mm GRP (6.8kg /m2) eQuilt2_B5 (8.6kg/m2) manufactured by fixed to GRP with hangers and washers

Freq f Hz	Sound Reduction Index, dB 1/3 Oct	1/1 Oct
50+	24.5	
63+	24.4	24.2
80+	23.8	
100	23.6	
125	21.9	23.0
160	23.7	
200	23.8	
250	23.1	23.9
315	25.1	
400	31.1	
500	34.0	33.1
630	35.4	
800	37.1	
1000	40.4	39.7
1250	44.6	
1600	46.7	
2000	48.8	48.5
2500	50.9	
3150	55.2	
4000	56.9	56.1
5000	56.6	
6300+	58.3 *	
8000+	53.2 *	49.2
10000+	45.2 *	
Average 100-3150	35.3	Version v2.1



Rating according to BS EN ISO 717-1:2013
Rw(C;Ctr)= **37 (-2;-5) dB**

* shows measurement corrected for background
\+ shows frequency beyond standard and not UKAS accredited

Allen Smalls
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Test Certificate No: 9720a

Contract: C/23373/T02a

Date: 02 June 2016

Confidential

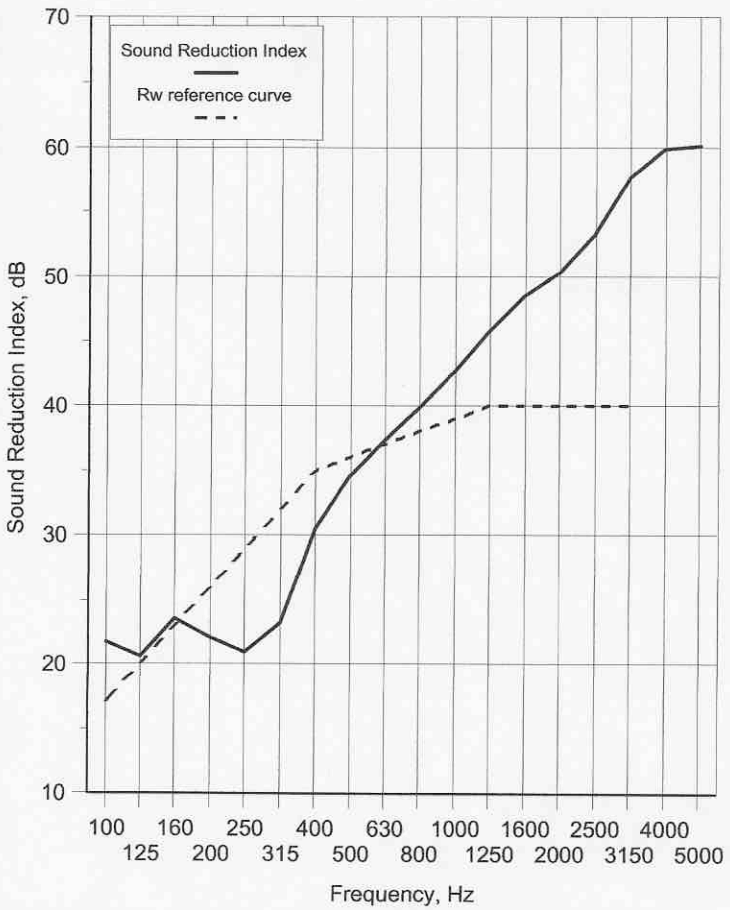
See SRL report C/23373/T02a for full details

The Laboratory Measurement of Sound reduction Index to BS EN ISO 10140-2:2010

			Test Room:	Source	Receiving
Test Number :	4		**Air temperature:**	9.9 °C	11.7 °C
Test Date:	28/04/2016		**Air humidity:**	51 %	49 %
Sample height:	0.53 m		**Volume:**	115 m3	300 m3
Sample width:	0.855 m				
			Air Pressure:	1005 mbar	

Product Identification: 4mm GRP (6.8 kg/m2) eQuilt2_B3 (6.6 kg/m2) manufactured by [redacted] fixed to GRP with hangers and washers

Freq f Hz	Sound Reduction Index, dB 1/3 Oct	1/1 Oct
50+	24.7	
63+	24.2	24.1
80+	23.6	
100	21.8	
125	20.6	21.8
160	23.6	
200	22.1	
250	20.9	22.0
315	23.3	
400	30.5	
500	34.5	33.2
630	37.4	
800	39.9	
1000	42.7	42.2
1250	45.8	
1600	48.5	
2000	50.3	50.3
2500	53.2	
3150	57.7 *	
4000	59.9 *	59.1
5000	60.1 *	
6300+	61.3 *	
8000+	51.8 *	47.3
10000+	43.2 *	
Average 100-3150	35.8	Version v2.1



Rating according to BS EN ISO 717-1:2013
Rw(C;Ctr)= **36 (-2;-6) dB**

* shows measurement corrected for background
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UKAS TESTING 0444

Test Certificate No: 9721a

Contract: C/23373/T02a

Date: 02 June 2016

Confidential

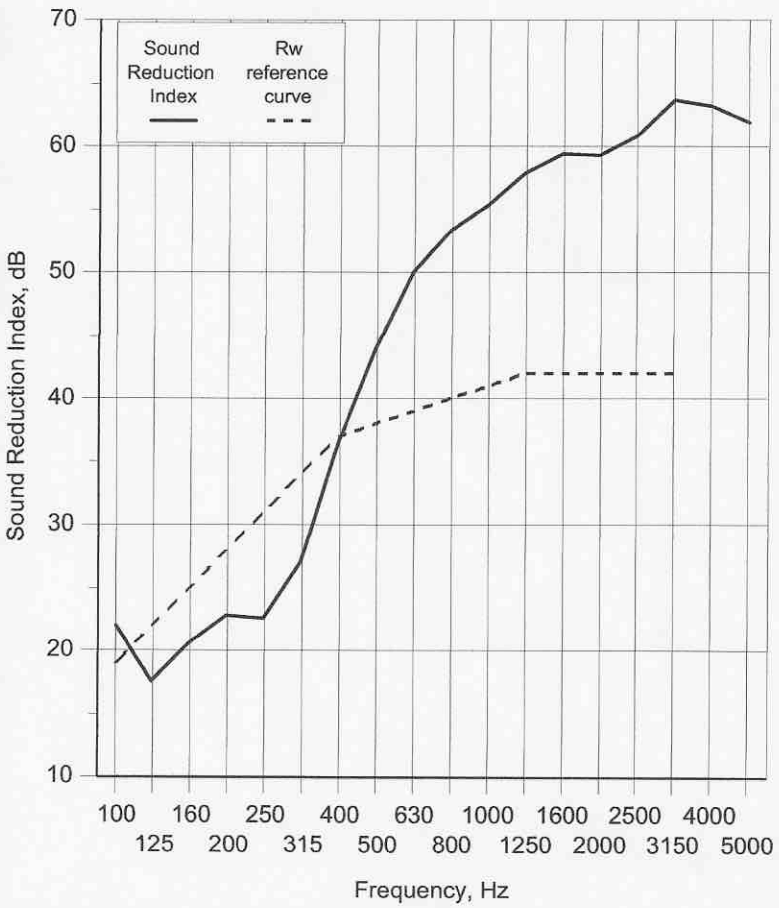
See SRL report C/23373/T02a for full details

The Laboratory Measurement of Sound reduction Index to BS EN ISO 10140-2:2010

			Source	Receiving
Test Number :	5	**Test Room:**		
		Air temperature:	9.9 °C	11.7 °C
Test Date:	28/04/2016	**Air humidity:**	51 %	49 %
Sample height:	0.53 m	**Volume:**	115 m3	300 m3
Sample width:	0.855 m			
		Air Pressure:	1005 mbar	

Product Identification: 4mm GRP (6.8 kg/m2)
eQuilt2_B5_SL (9.0 kg/m2) manufactured by [redacted] v1, fixed to GRP with hangers and washer

Freq f Hz	Sound Reduction Index, dB 1/3 Oct	1/1 Oct
50+	24.8	
63+	24.1	24.0
80+	23.3	
100	22.0	
125	17.6	19.7
160	20.7	
200	22.9	
250	22.6	23.8
315	27.1	
400	36.5	
500	44.0	40.4
630	50.0	
800	53.4	
1000	55.4 *	55.2
1250	57.9 *	
1600	59.5 *	
2000	59.4 *	59.9
2500	60.9 *	
3150	63.7 *	
4000	63.2 *	62.9
5000	61.9 *	
6300+	63.4 *	
8000+	51.8 *	47.4
10000+	43.2 *	
Average 100-3150	42.1	Version v2.1



Rating according to BS EN ISO 717-1:2013
Rw(C;Ctr)= **38 (-2;-7) dB**

* shows measurement corrected for background
\+ shows frequency beyond standard and not UKAS accredited

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Test Certificate No: 9722a

Contract: C/23373/T02a

Date: 02 June 2016

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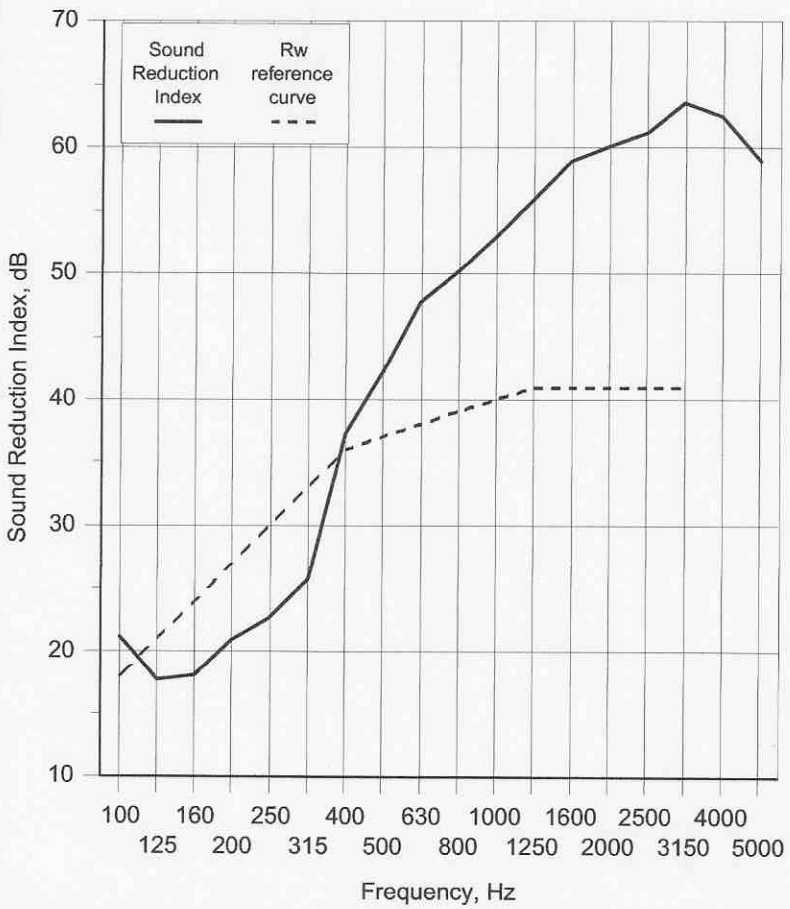
The Laboratory Measurement of Sound reduction Index to BS EN ISO 10140-2:2010

Test Number :	6	**Test Room:**	**Source**	**Receiving**
		Air temperature:	10.1 °C	11.7 °C
Test Date:	28/04/2016	**Air humidity:**	50 %	49 %
Sample height:	0.53 m	**Volume:**	115 m3	300 m3
Sample width:	0.855 m			
		Air Pressure:	1005 mbar	

Product Identification: 4mm GRP (6.8 kg/m2)
eQuiltBW_B3_SL (7.5 kg/m2) manufactured by [redacted] fixed to GRP with hangers and washers

Freq f Hz	Sound Reduction Index, dB 1/3 Oct	1/1 Oct
50+	24.3	
63+	23.7	23.9
80+	23.7	
100	21.1	
125	17.7	18.8
160	18.1	
200	20.9	
250	22.7	22.7
315	25.7	
400	37.3	
500	42.2	40.5
630	47.8	
800	50.3	
1000	53.0	52.5
1250	55.9	
1600	59.0 *	
2000	60.1 *	60.0
2500	61.2 *	
3150	63.6 *	
4000	62.5 *	61.2
5000	59.0 *	
6300+	61.1 *	
8000+	51.8 *	47.3
10000+	43.2 *	
Average 100-3150	41.0	Version v2.1



Rating according to BS EN ISO 717-1:2013
Rw(C;Ctr)= **37 (-2;-7) dB**

* shows measurement corrected for background
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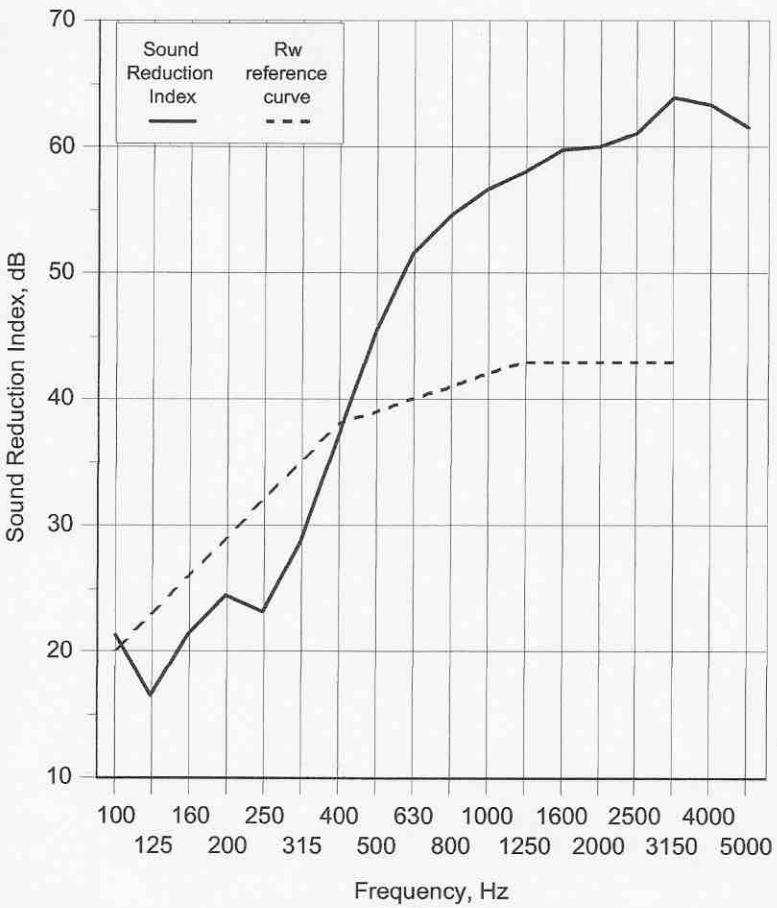
The Laboratory Measurement of Sound reduction Index to BS EN ISO 10140-2:2010

			Source	Receiving
Test Number :	7	**Test Room:**		
		Air temperature:	10.1 °C	11.7 °C
Test Date:	28/04/2016	**Air humidity:**	50 %	49 %
Sample height:	0.53 m	**Volume:**	115 m3	300 m3
Sample width:	0.855 m			
		Air Pressure:	1005 mbar	

Product Identification: 4mm GRP (6.8 kg/m2)
eQuilt2_B5_SL (9.0 kg/m2) manufactured by [redacted] /2, fixed to GRP with hangers and washer

Freq f Hz	Sound Reduction Index, dB 1/3 Oct	1/1 Oct
50+	24.9	
63+	24.3	23.8
80+	22.6	
100	21.4	
125	16.5	19.1
160	21.5	
200	24.5	
250	23.2	24.9
315	28.8	
400	37.0	
500	45.3	41.1
630	51.6	
800	54.5	
1000	56.7 *	56.2
1250	58.1 *	
1600	59.8 *	
2000	60.0 *	60.3
2500	61.1 *	
3150	63.9 *	
4000	63.3 *	62.8
5000	61.6 *	
6300+	61.1 *	
8000+	51.6 *	47.3
10000+	43.1 *	
Average 100-3150	42.7	Version v2.1



Rating according to BS EN ISO 717-1:2013
Rw(C;Ctr)= **39 (-3;-8) dB**

* shows measurement corrected for background
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INVESTORS IN PEOPLE

UKAS TESTING 0444

Test Certificate No: 9724a

Contract: C/23373/T02a

Date: 02 June 2016

Confidential

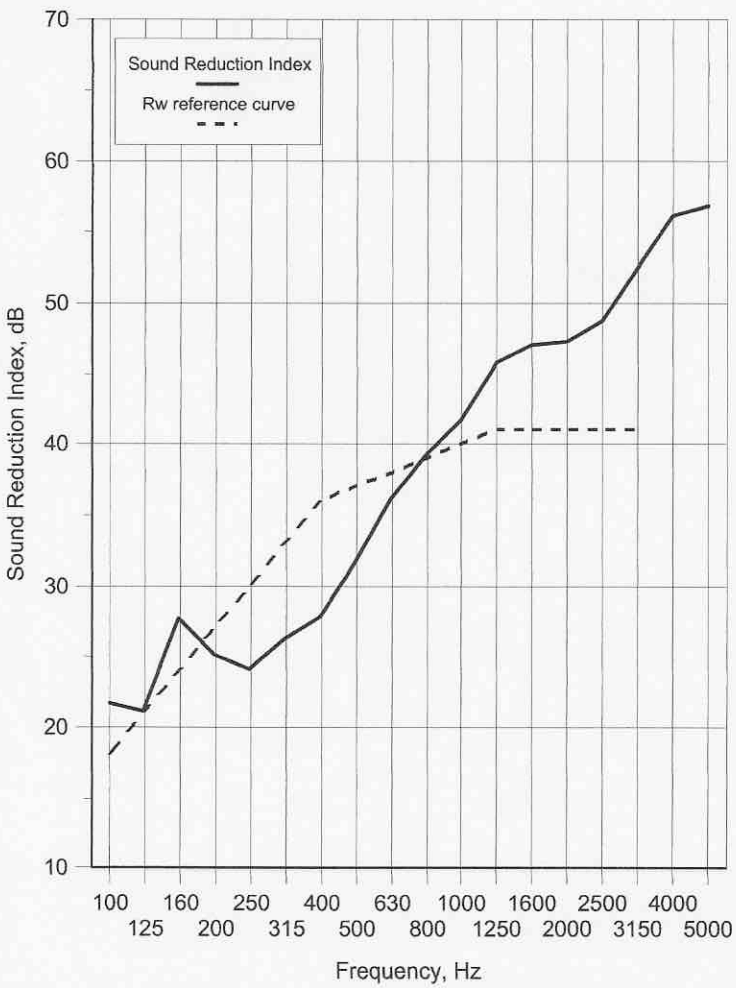
See SRL report C/23373/T02a for full details

The Laboratory Measurement of Sound reduction Index to BS EN ISO 10140-2:2010

Test Number :	8	**Test Room:**	**Source**	**Receiving**
		Air temperature:	10.2 °C	11.5 °C
Test Date:	28/04/2016	**Air humidity:**	50 %	48 %
Sample height:	0.53 m	**Volume:**	115 m3	300 m3
Sample width:	0.855 m			
		Air Pressure:		1005 mbar

Product Identification: 2mm steel (14.6 kg/m2) WBL insulation (2.1 kg/m2) fixed to steel with hangers and washers

Freq f Hz	Sound Reduction Index, dB 1/3 Oct	1/1 Oct
50+	20.3	
63+	25.0	23.2
80+	26.9	
100	21.7	
125	21.1	22.7
160	27.7	
200	25.1	
250	24.1	25.1
315	26.2	
400	27.8	
500	31.7	30.7
630	36.1	
800	39.2	
1000	41.7	41.5
1250	45.8	
1600	47.1	
2000	47.3	47.7
2500	48.8	
3150	52.5	
4000	56.2	54.7
5000	56.9	
6300+	53.5	
8000+	49.9 *	46.7
10000+	43.1 *	
Average 100-3150	35.2	Version v2.1



Rating according to BS EN ISO 717-1:2013

Rw(C;Ctr)= **37 (-2;-5) dB**

* shows measurement corrected for background

\+ shows frequency beyond standard and not UKAS accredited

Allen Smalls
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INVESTORS IN PEOPLE

UKAS TESTING 0444

Test Certificate No: 9725a

Contract: C/23373/T02a

Date: 02 June 2016

Confidential

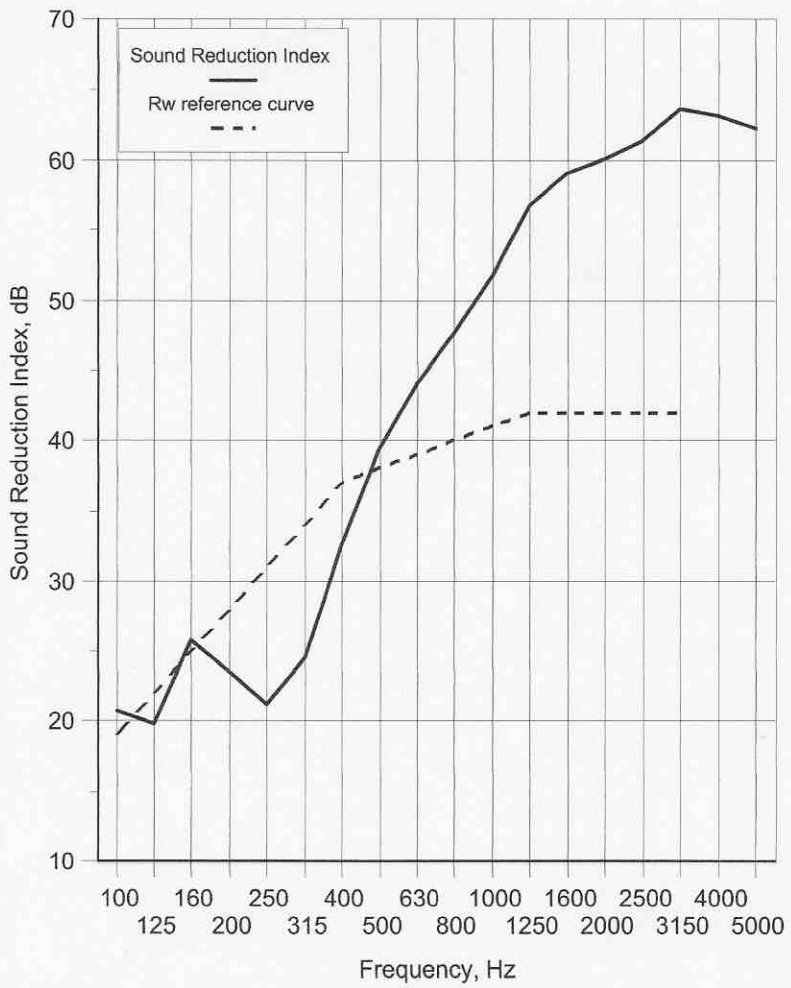
See SRL report C/23373/T02a for full details

The Laboratory Measurement of Sound reduction Index to BS EN ISO 10140-2:2010

Test Number :	9	**Test Room:**	**Source**	**Receiving**
		Air temperature:	10.2 °C	11.6 °C
Test Date:	28/04/2016	**Air humidity:**	50 %	47 %
Sample height:	0.53 m	**Volume:**	115 m3	300 m3
Sample width:	0.855 m			
			Air Pressure:	1005 mbar

Product Identification: 2mm steel (14.6 kg/m2) eQuilt2_B0 (3.6 kg/m2) manufactured by fixed to steel with hangers and washers

Freq f Hz	Sound Reduction Index, dB 1/3 Oct	1/1 Oct
50+	22.4	
63+	24.6	23.9
80+	25.2	
100	20.7	
125	19.8	21.4
160	25.8	
200	23.5	
250	21.2	22.8
315	24.5	
400	32.7	
500	39.3	36.4
630	44.1	
800	47.7	
1000	51.8	50.7
1250	56.8 *	
1600	59.0 *	
2000	60.1 *	60.0
2500	61.3 *	
3150	63.6 *	
4000	63.2 *	63.0
5000	62.2 *	
6300+	62.6 *	
8000+	51.5 *	46.9
10000+	42.7 *	
Average 100-3150	40.7	Version v2.1



Rating according to BS EN ISO 717-1:2013

Rw(C;Ctr)= **38 (-2;-7) dB**

* shows measurement corrected for background

\+ shows frequency beyond standard and not UKAS accredited

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Gareth Young
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UKAS TESTING 0444

Test Certificate No: 9726a

Contract: C/23373/T02a

Date: 02 June 2016

Confidential

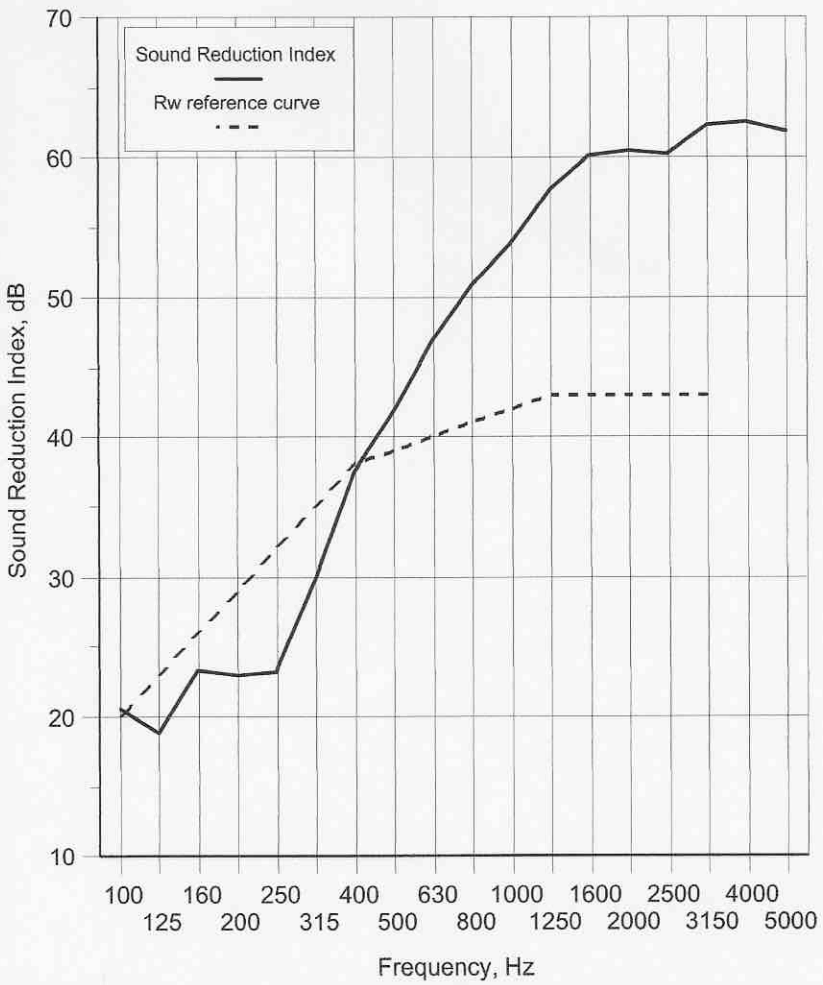
See SRL report C/23373/T02a for full details

The Laboratory Measurement of Sound reduction Index to BS EN ISO 10140-2:2010

Test Number :	10	**Test Room:**	**Source**	**Receiving**
		Air temperature:	10.2 °C	11.7 °C
Test Date:	28/04/2016	**Air humidity:**	50 %	48 %
Sample height:	0.53 m	**Volume:**	115 m3	300 m3
Sample width:	0.855 m			
			Air Pressure:	1005 mbar

Product Identification: 2mm steel (14.6 kg/m2) eQuiltBW_B0 (4.1 kg/m2) manufactured by fixed to steel with hangers and washers

Freq f Hz	Sound Reduction Index, dB 1/3 Oct	1/1 Oct
50+	22.5	
63+	24.8	24.0
80+	25.1	
100	20.5	
125	18.8	20.5
160	23.3	
200	23.0	
250	23.2	24.4
315	30.0	
400	37.5	
500	41.9	40.6
630	46.9	
800	50.9	
1000	53.8	53.3
1250	57.7 *	
1600	60.2 *	
2000	60.5 *	60.3
2500	60.3 *	
3150	62.3 *	
4000	62.6 *	62.3
5000	61.9 *	
6300+	60.8 *	
8000+	51.4 *	47.1
10000+	43.0 *	
Average 100-3150	41.9	Version v2.1



Rating according to BS EN ISO 717-1:2013

Rw(C;Ctr)= **39 (-2;-7) dB**

* shows measurement corrected for background

\+ shows frequency beyond standard and not UKAS accredited

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Quality Manager

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SRL offers services in:
Acoustics
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