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Technical Report

Ref Number **C09/5L/20941/R01**

Date **20 October 2009**

Project

**The Laboratory Determination of
The Airborne Sound Transmission
Of a Wall with Sockets and Putty Pads**

Prepared for

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By

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0444

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1.0 Summary

Tests have been done in SRL's Laboratory at Holbrook House, Sudbury, Suffolk, to determine the sound reduction index of a wall with sockets and putty pads in it, in accordance with BS EN ISO 140-3:1995.

From these measurements the required results have been derived and are presented in both tabular and graphic form in Data Sheets 1 to 7.

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.



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2.0 Details of Measurements

2.1 Location

Sound Research Laboratories Ltd
 Holbrook House
 Little Waldingfield
 Sudbury
 Suffolk
 CO10 0TH

2.2 Test Dates

15 October 2009

2.3 Instrumentation and Apparatus Used

Make	Description	Type
E D I	Microphone Multiplexer Microphone Power Supply Unit	
Norwegian Electronics	Real Time Analyser Rotating Microphone Boom	830 231
Brüel & Kjaer	12mm Condenser Microphones Windshields Pre Amplifiers Microphone Calibrator Omnipower Sound Source Power Amplifier	4166 UA0237 2639, 2669C 4231 4296 2716
Larson Davis	12mm Condenser Microphone	2560
Celestion	Loudspeakers	100w
Douglas Curtis	Rotating Microphone Boom	
Thermo Hygro	Temperature & Humidity Probe	
TOA	Graphic Equalizer	E-1231
QSC Audio	Power Amplifier	RMX 1450

2.4 References

BS EN ISO 140-3:1995	Laboratory measurement of airborne sound insulation of building elements
BS EN ISO 717-1:1997	Rating of sound insulation in buildings and of building elements. Airborne Sound Insulation.

2.5 Personnel Present

Andrew Scanlon	Everbuild
Gary Southerington	Everbuild

3.0 Description of Test

3.1 Description of Sample

A wall was tested with and without holes, sockets and putty pads. Details as follows:

Wall 3.85m wide by 2.94m high. Wall construction:

- 2 x 15mm Knauf Soundshield
- 70mm Knauf metal C stud
- 50mm cavity filled with 50mm thick RS33
- 70mm Knauf metal C stud
- 2 x 15mm Knauf Soundshield

Socket hole dimensions: 135mm wide by 75mm high.

Dry lining box: 2 gang 46mm by DETA, fitted with double electrical socket.

Putty Pads: Everbuild Firespan.

See Diagram 1 for socket/hole positions in wall and wall construction.

Sampling plan: Selected at Random

Sample condition: New

Details supplied by: Everbuild

Sample installed by: Wall: SRL – Other: Everbuild

3.2 Sample Delivery date

15 October 2009

3.3 Test Procedures

The sample was mounted/located and tested in accordance with the relevant standard. The method and procedure is described in Appendix 1. The measurement uncertainty is given in Appendix 2.

4.0 Results

The results of the measurements and subsequent analysis are given in Data Sheets 1 to 7 and summarised below.

Results relate only to the items tested.

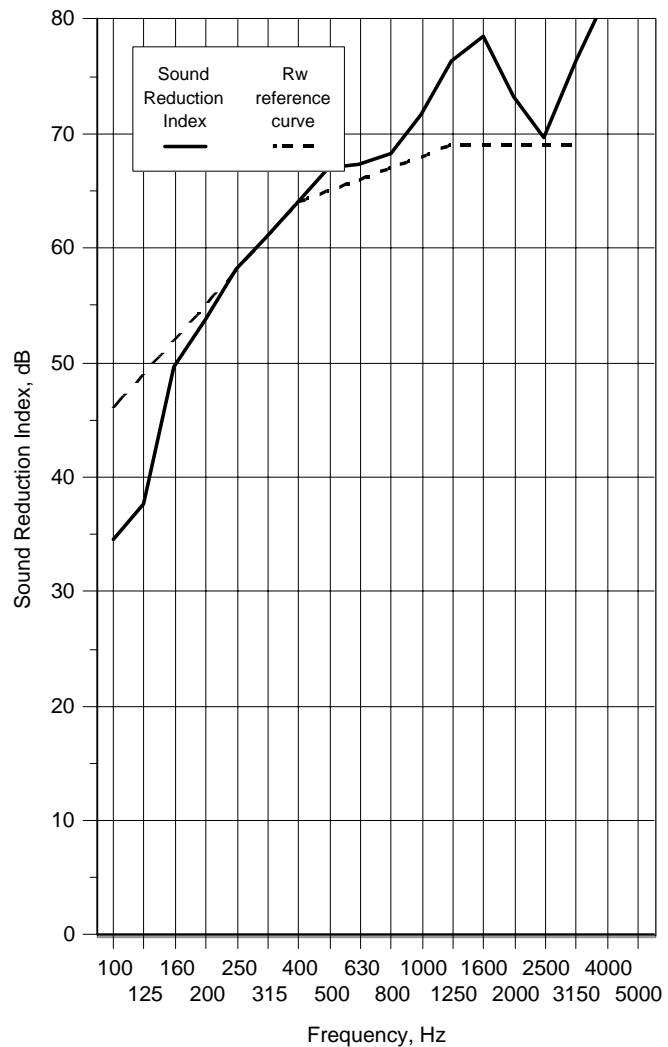
SRL Test No.	Description in Brief	R _w (C;C _{tr})
2	Wall with no penetrations	65 (-5;-13)
3	Wall with one hole	64 (-6;-13)
5	Wall with one socket + putty pad	65 (-6;-13)
6	Wall with one hole each side of wall (not back to back)	60 (-5;-12)
7	Wall with one socket + putty pad each side of wall (not back to back)	65 (-5;-12)
8	Wall with two holes on receive side of wall One hole on source side of wall. (Two holes back to back)	50 (-1;-5)
9	Wall with two sockets + putty pads on receive side of wall - One socket + putty pad on source side of wall. (Two back to back)	65 (-6;-13)

-----*End of Text*-----

Data Sheet 1

Test Number :	2	Air temperature:	13.2 °C
Client:	Everbuild	Air humidity:	59 %
Test Date:	15/10/2009	Receiving room volume	50 m ³
Sample height:	2.94 m	Source room volume:	55 m ³
Sample width:	3.85 m	Sample weight:	57.7 kg/m ²
Product	Wall with no penetrations		
Identification:			

Freq f Hz	Sound Reduction Index, dB	
	1/3 Oct	1/1 Oct
50+	24.1	28.2
63+	32.7	
80+	38.2	
100	34.5	37.5
125	37.7	
160	49.7	
200	53.9	56.7
250	58.2	
315	60.9	
400	64.1	65.9
500	67.1	
630	67.4	
800	68.3	71.0
1000	71.7	
1250	76.3	
1600	78.5	72.4
2000	73.2	
2500	69.6	
3150	76.4	79.9
4000	82.0	
5000	87.7	
6300+	92.5	78.7
8000+	83.1 *	
10000+	74.6 *	
Average 100-3150	63.0	



Rating according to BS EN ISO 717-1:1997

Rw(C;Ctr)= **65 (-5;-13)dB**

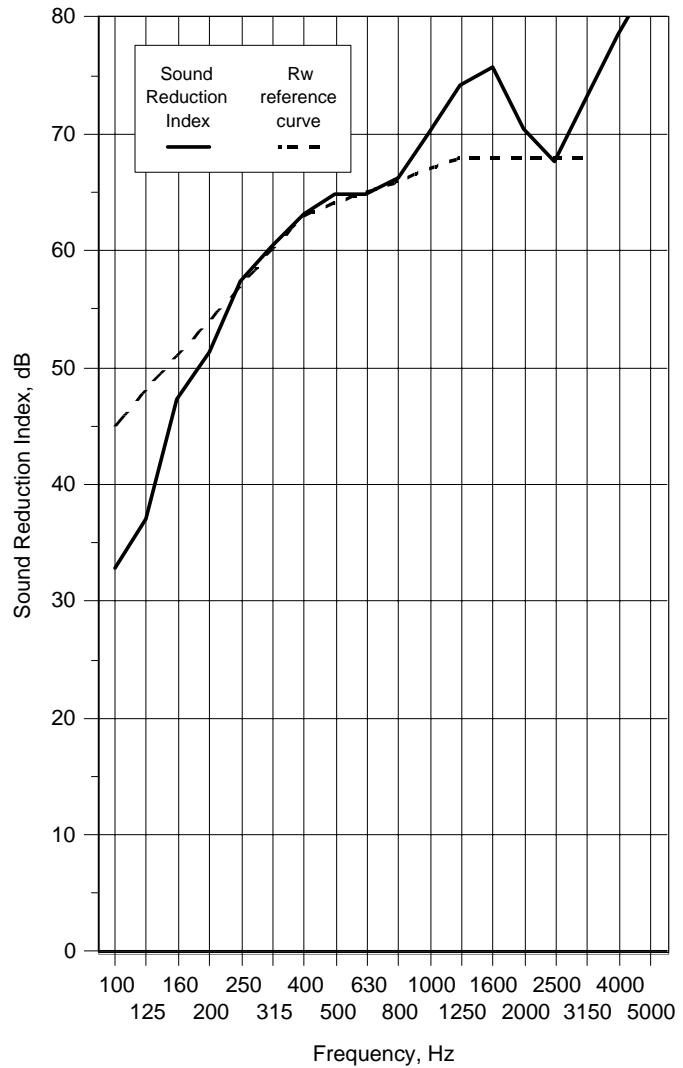
Notes * designates measurement corrected for background
 # designates limit of measurement due to background
 + designates frequency beyond standard and not UKAS accredited

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Data Sheet 2

Test Number :	3	Air temperature:	13.2 °C
Client:	Everbuild	Air humidity:	59 %
Test Date:	15/10/2009	Receiving room volume	50 m3
Sample height:	2.94 m	Source room volume:	55 m3
Sample width:	3.85 m	Sample weight:	57.7 kg/m2
Product	Wall with one hole		
Identification:			

Freq f Hz	Sound Reduction Index, dB	
	1/3 Oct	1/1 Oct
50+	25.0	28.8
63+	31.8	
80+	37.7	
100	32.8	36.1
125	37.1	
160	47.3	
200	51.4	54.8
250	57.4	
315	60.3	
400	63.1	64.1
500	64.8	
630	64.8	
800	66.3	69.1
1000	70.1	
1250	74.1	
1600	75.7	70.1
2000	70.4	
2500	67.6	
3150	73.2	76.6
4000	78.5	
5000	83.3	
6300+	88.4	79.1
8000+	82.9 *	
10000+	75.1 *	
Average 100-3150	61.0	



Rating according to BS EN ISO 717-1:1997

Rw(C;Ctr)= **64 (-6;-13)**dB

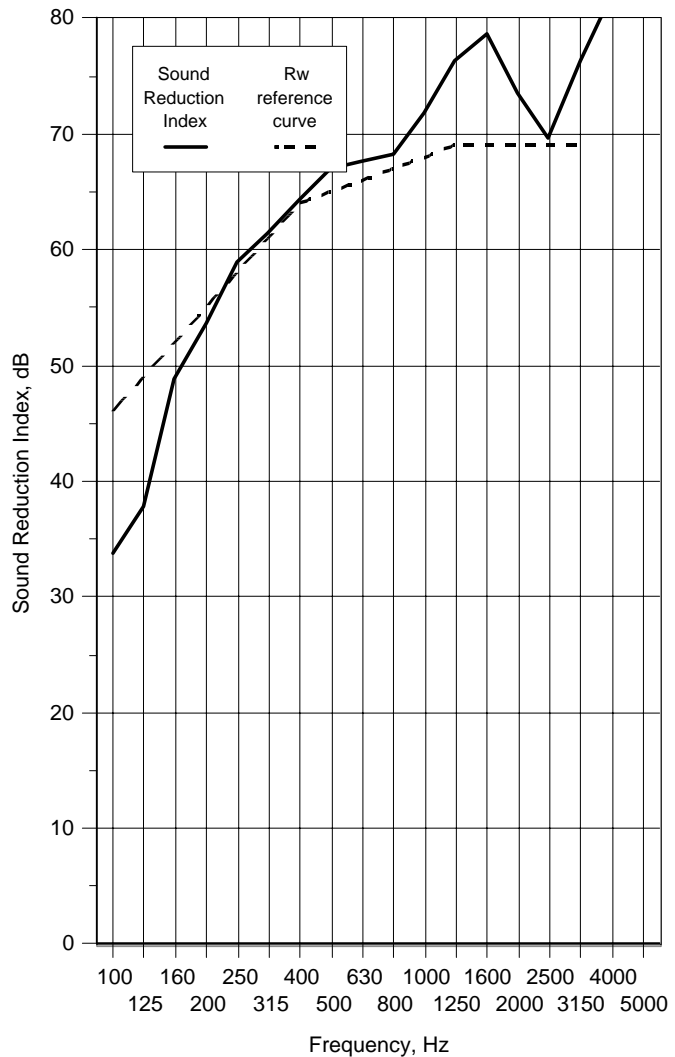
Notes * designates measurement corrected for background
 # designates limit of measurement due to background
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Data Sheet 3

Test Number :	5	Air temperature:	13.4 °C
Client:	Everbuild	Air humidity:	59 %
Test Date:	15/10/2009	Receiving room volume	50 m3
Sample height:	2.94 m	Source room volume:	55 m3
Sample width:	3.85 m	Sample weight:	57.7 kg/m2
Product	Wall with one socket+putty pad		
Identification:			

Freq f Hz	Sound Reduction Index, dB	
	1/3 Oct	1/1 Oct
50+	25.6	29.4
63+	33.1	
80+	38.3	
100	33.8	37.1
125	37.8	
160	48.8	
200	53.6	56.7
250	59.0	
315	61.5	
400	64.4	66.1
500	67.1	
630	67.6	
800	68.3	71.1
1000	71.9	
1250	76.4	
1600	78.7	72.6
2000	73.5	
2500	69.7	
3150	76.4	79.9
4000	82.0	
5000	87.7	
6300+	92.4	78.6
8000+	82.8 *	
10000+	74.4 *	
Average 100-3150	63.0	



Rating according to BS EN ISO 717-1:1997

Rw(C;Ctr)= **65 (-6;-13)**dB

Notes * designates measurement corrected for background

designates limit of measurement due to background

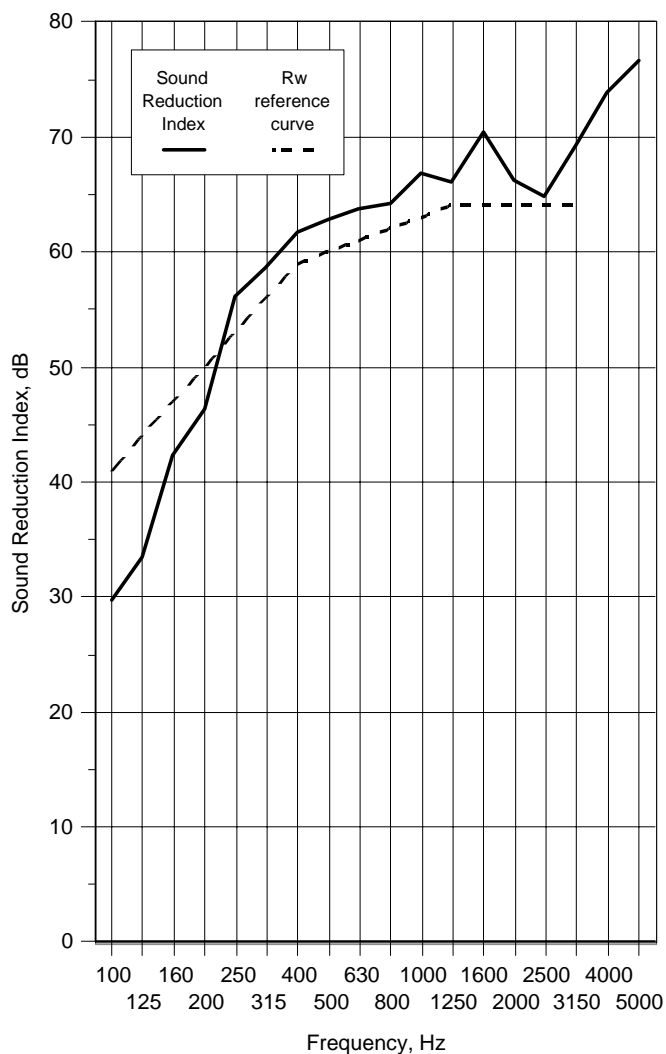
+ designates frequency beyond standard and not UKAS accredited

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Data Sheet 4

Test Number :	6	Air temperature:	13.4 °C
Client:	Everbuild	Air humidity:	59 %
Test Date:	15/10/2009	Receiving room volume	50 m3
Sample height:	2.94 m	Source room volume:	55 m3
Sample width:	3.85 m	Sample weight:	57.7 kg/m2
Product	Wall with one hole each side of wall (not back to back)		
Identification:			

Freq f Hz	Sound Reduction Index, dB	
	1/3 Oct	1/1 Oct
50+	24.8	28.5
63+	31.5	
80+	35.9	
100	29.7	32.8
125	33.5	
160	42.3	
200	46.3	50.4
250	56.2	
315	58.7	
400	61.8	62.7
500	62.9	
630	63.7	
800	64.3	65.6
1000	66.8	
1250	66.1	
1600	70.4	66.6
2000	66.3	
2500	64.8	
3150	69.4	72.3
4000	73.9	
5000	76.6	
6300+	75.8	74.5
8000+	75.8	
10000+	72.8 *	
Average 100-3150	57.7	



Rating according to BS EN ISO 717-1:1997

Rw(C;Ctr)= **60 (-5;-12)**dB

Notes * designates measurement corrected for background

designates limit of measurement due to background

+ designates frequency beyond standard and not UKAS accredited

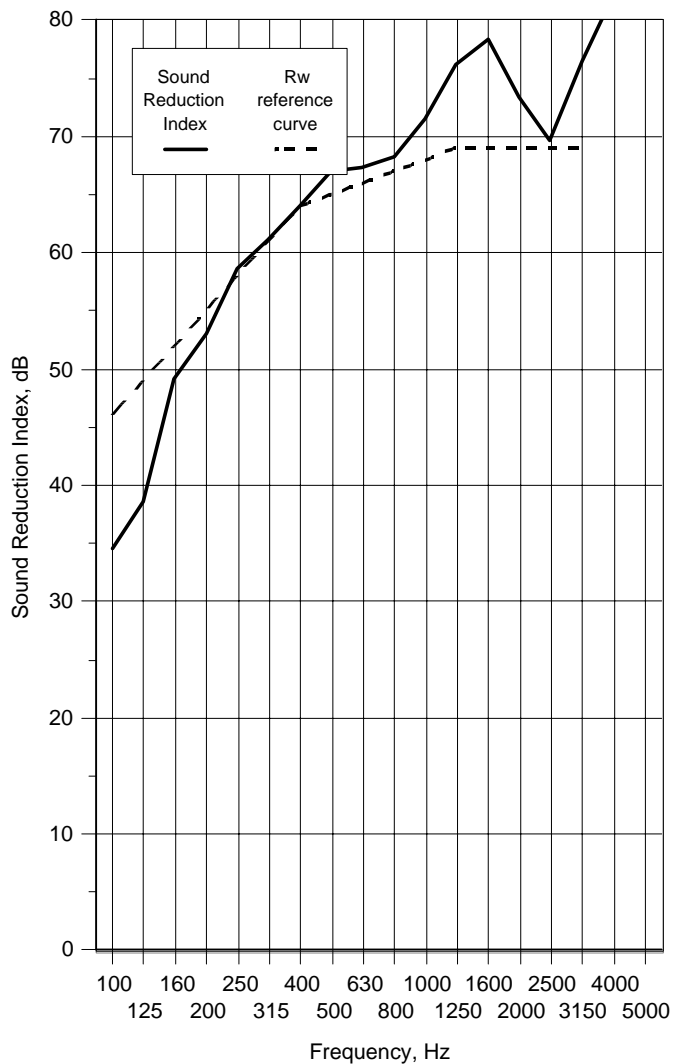
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Data Sheet 5

Test Number : 7
Client: Everbuild
Test Date: 15/10/2009
Sample height: 2.94 m
Sample width: 3.85 m
Product Identification: Wall with one socket+putty pad each side of wall (not back to back)

Air temperature: 13.5 °C
Air humidity: 60 %
Receiving room volume 50 m³
Source room volume: 55 m³
Sample weight: 57.7 kg/m²

Freq f Hz	Sound Reduction Index, dB	
	1/3 Oct	1/1 Oct
50+	25.3	29.3
63+	33.2	
80+	38.6	
100	34.5	37.7
125	38.6	
160	49.1	56.3
200	53.1	
250	58.7	
315	61.2	65.8
400	64.0	
500	67.0	
630	67.4	70.9
800	68.2	
1000	71.6	
1250	76.2	72.6
1600	78.3	
2000	73.4	
2500	69.7	79.9
3150	76.5	
4000	82.1	
5000	87.7	77.6
6300+	92.3	
8000+	82.2 *	
10000+	73.4 *	
Average 100-3150	63.0	



Rating according to BS EN ISO 717-1:1997

Rw(C;Ctr)= **65 (-5;-12)**dB

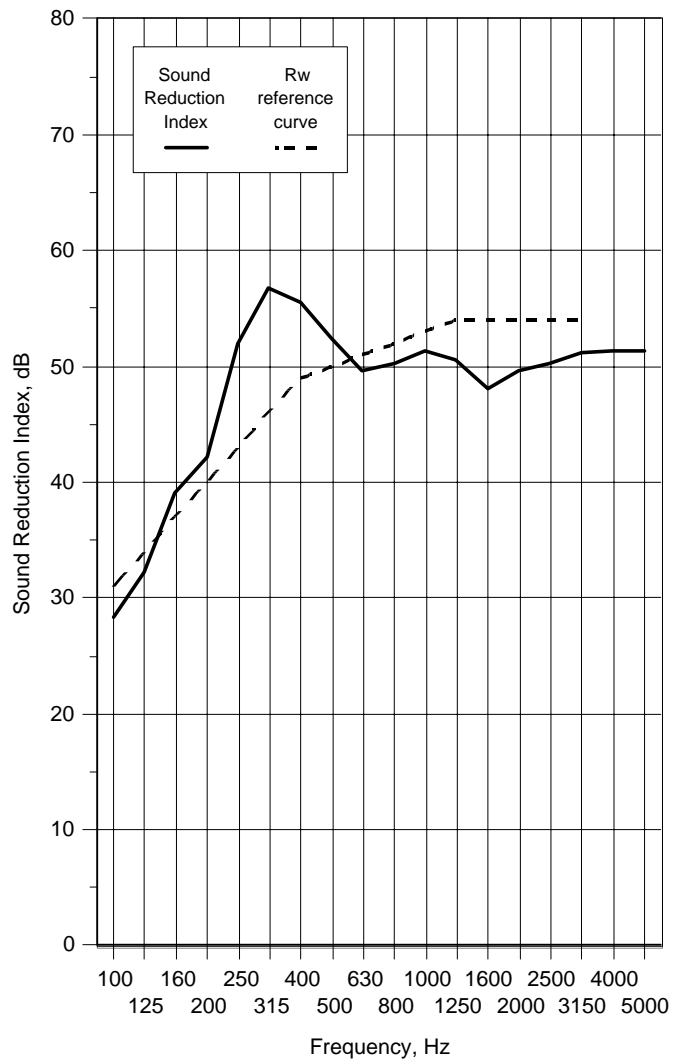
Notes * designates measurement corrected for background
 # designates limit of measurement due to background
 + designates frequency beyond standard and not UKAS accredited

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Data Sheet 6

Test Number :	8	Air temperature:	13.6 °C
Client:	Everbuild	Air humidity:	61 %
Test Date:	15/10/2009	Receiving room volume	50 m ³
Sample height:	2.94 m	Source room volume:	55 m ³
Sample width:	3.85 m	Sample weight:	57.7 kg/m ²
Product	Wall with two holes on receive side of wall		
Identification:	One hole on source side of wall. (Two holes back to back)		

Freq f Hz	Sound Reduction Index, dB	
	1/3 Oct	1/1 Oct
50+	23.6	27.4
63+	30.7	
80+	34.9	
100	28.3	31.4
125	32.3	
160	39.1	
200	42.1	46.3
250	51.9	
315	56.7	
400	55.6	51.9
500	52.4	
630	49.6	
800	50.2	50.7
1000	51.4	
1250	50.6	
1600	48.0	49.2
2000	49.6	
2500	50.2	
3150	51.2	51.2
4000	51.3	
5000	51.3	
6300+	54.0	53.9
8000+	53.3	
10000+	54.6	
Average 100-3150	47.5	



Rating according to BS EN ISO 717-1:1997

Rw(C;Ctr)= **50 (-1;-5) dB**

Notes * designates measurement corrected for background

designates limit of measurement due to background

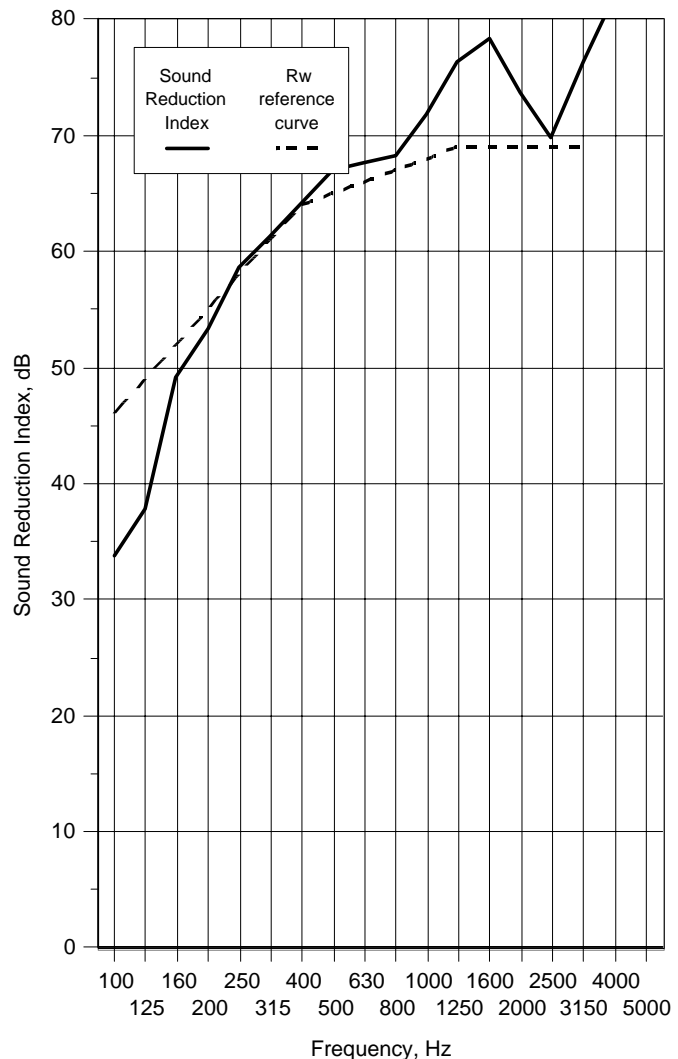
+ designates frequency beyond standard and not UKAS accredited

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Data Sheet 7

Test Number :	9	Air temperature:	13.7 °C
Client:	Everbuild	Air humidity:	62 %
Test Date:	15/10/2009	Receiving room volume	50 m ³
Sample height:	2.94 m	Source room volume:	55 m ³
Sample width:	3.85 m	Sample weight:	57.7 kg/m ²
Product	Wall with two sockets+putty pads on receive side of wall		
Identification:	One socket+putty pad on source side of wall. (Two back to back)		

Freq f Hz	Sound Reduction Index, dB	
	1/3 Oct	1/1 Oct
50+	25.5	29.5
63+	33.6	
80+	38.4	
100	33.8	37.1
125	37.9	
160	49.2	
200	53.3	56.5
250	58.7	
315	61.3	
400	64.3	66.1
500	67.1	
630	67.6	
800	68.3	71.0
1000	71.8	
1250	76.4	
1600	78.4	72.7
2000	73.7	
2500	69.8	
3150	76.4	79.8
4000	82.0	
5000	87.5	
6300+	92.2	77.9
8000+	82.7 *	
10000+	73.7 *	
Average 100-3150	63.0	



Rating according to BS EN ISO 717-1:1997

Rw(C;Ctr)= **65 (-6;-13)**dB

Notes * designates measurement corrected for background

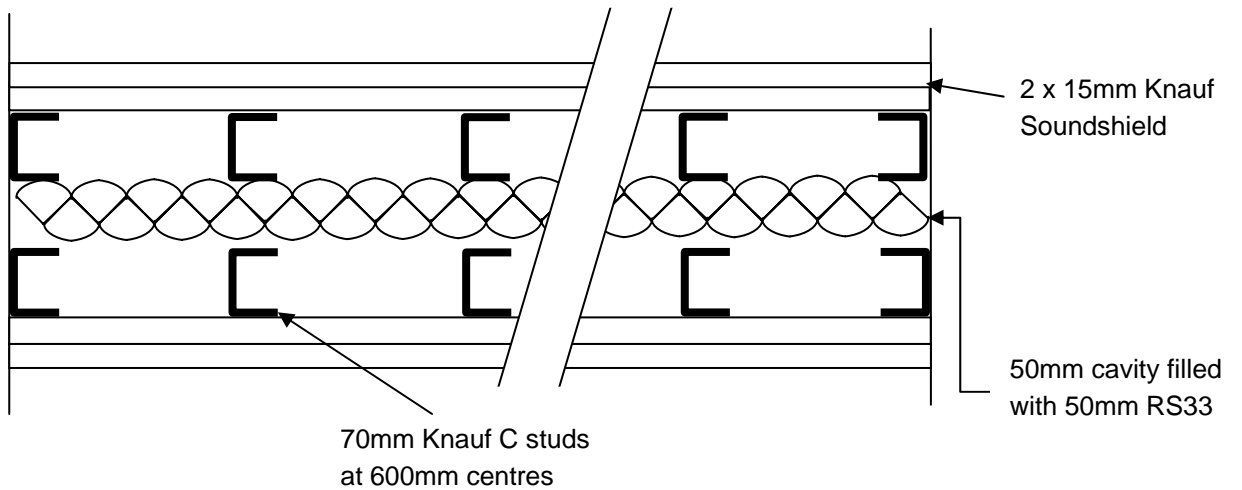
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+ designates frequency beyond standard and not UKAS accredited

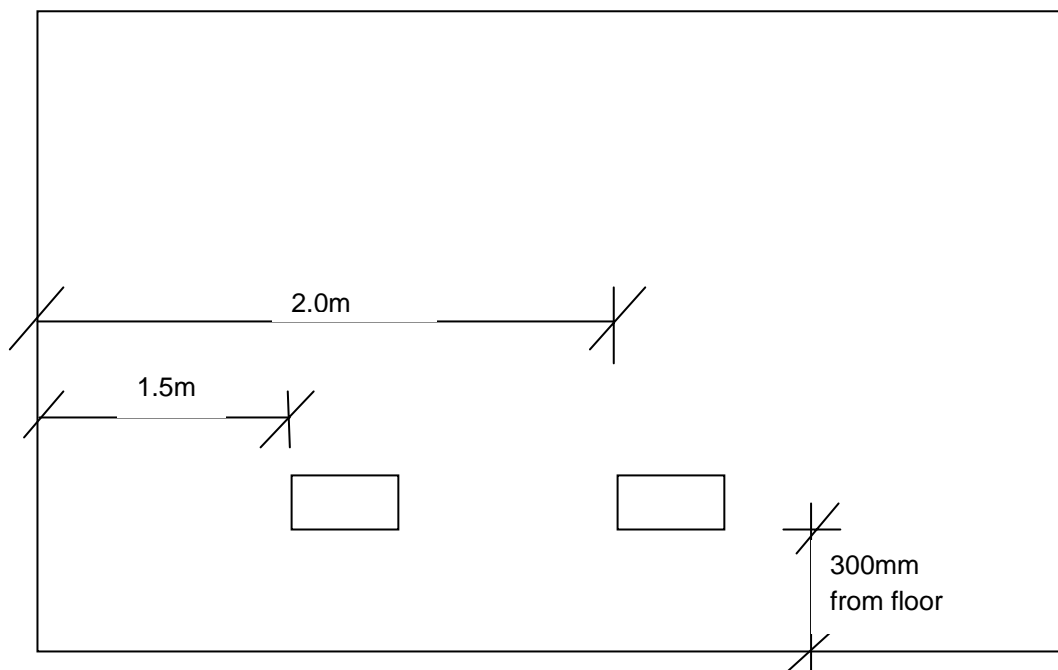
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Diagram 1

Section through wall



Location of sockets/holes in wall



NOT TO SCALE

Appendix 1

Test Procedure

Measurement of Sound Transmission in accordance with BS EN ISO 140-3 : 1995 - TP15

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 forms the whole of a 3.9m wide x 2.9m high dividing wall between the two rectangular reverberant rooms, both of which are constructed from 215mm brick with reinforced concrete floors and roofs.

One of the rooms is used as the receiving room and has a volume of 50 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:

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

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 :1997 from the results of laboratory tests carried out in accordance with BS EN ISO 140-3 : 1995.

Appendix 2

Measurement Uncertainty BS EN ISO 140-3:1995 - TP15

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, \pm dB
100	2.6
125	2.4
160	2.1
200	2.1
250	1.5
315	1.5
400	1.2
500	1.2
800	1.0
1000	1.0
1250	1.0
1600	1.0
2000	1.0
2500	1.0
3150	1.0



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Acoustics
Laboratory and Site Testing
Fire
BREEAM
Air Tightness

SRL's Laboratory is accredited for testing under UKAS Number 0444

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