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Technical Report

24795-SRL-RP-XT-001-P1

Project

The Laboratory Measurement of the Sound Reduction Index a Window

Prepared for

Hansen Facades

By

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Published

17 May 2021

Template Ref: Lab Edition 5 – Mar 2021

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Quality Assurance	
Project Title	The Laboratory Measurement of the Sound Reduction Index a Window
Document Title	Laboratory Test Report
Client	Hansen Facades
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Report Number	24795-SRL-RP-XT-001-P1

Report Version History

Version	Date	Comments
P1	17/05/2021	

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Contents

1.0 Description of Test

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

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.

1.1 Description of Sample

Various glazing specifications were tested in a window frame. See Data Sheets 1 to 3, Drawing 1 and Photograph 1 for details.

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

1.2 Sample Delivery Date

27 April 2021

1.3 Test Procedures

The sample was mounted/located and tested in accordance with the relevant standard. The details of measurements are given in Appendix A. The method and procedure are described in Appendix B. The measurement uncertainty is given in Appendix C.

2.0 Results

The results of the measurements and subsequent analysis are given in Data Sheets 1 to 3 and summarised below.

Results relate only to the items as received and tested.

SRL Test No.	Description in Brief	R_w (C; C_{tr})
1	39.5mm thick DG unit, 8mm heat strengthened outer, 18mm argon filled spacer, 13.5mm PVB laminated inner	37 (0; -2) dB
4	39.5mm thick DG unit, 8mm heat strengthened outer, 18mm argon filled spacer, 13.5mm acoustic interlayer laminated inner	40 (0; -3) dB
5	40.3mm thick DG unit, 8.8mm PVB laminate outer, 18mm argon filled spacer, 13.5mm acoustic interlayer laminated inner	44 (-2; -5) dB

Data Sheet 1

See SRL Report 24795-SRL-RP-XT-001-P1 for full details

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

Test Number:	1	**Test Room:**	**Source**	**Receiving**
Client:	Hansen Facades	**Air Temperature:**	12.3 °C	12.5 °C
Test Date:	27/04/2021	**Air Humidity:**	51 %	52 %
Sample Height:	2.05 m	**Volume:**	54.6 m³	52.8 m³
Sample Width:	2.37 m	**Air Pressure:**	1002 mbar	
Sample Weight:	47.9 kg/m²			

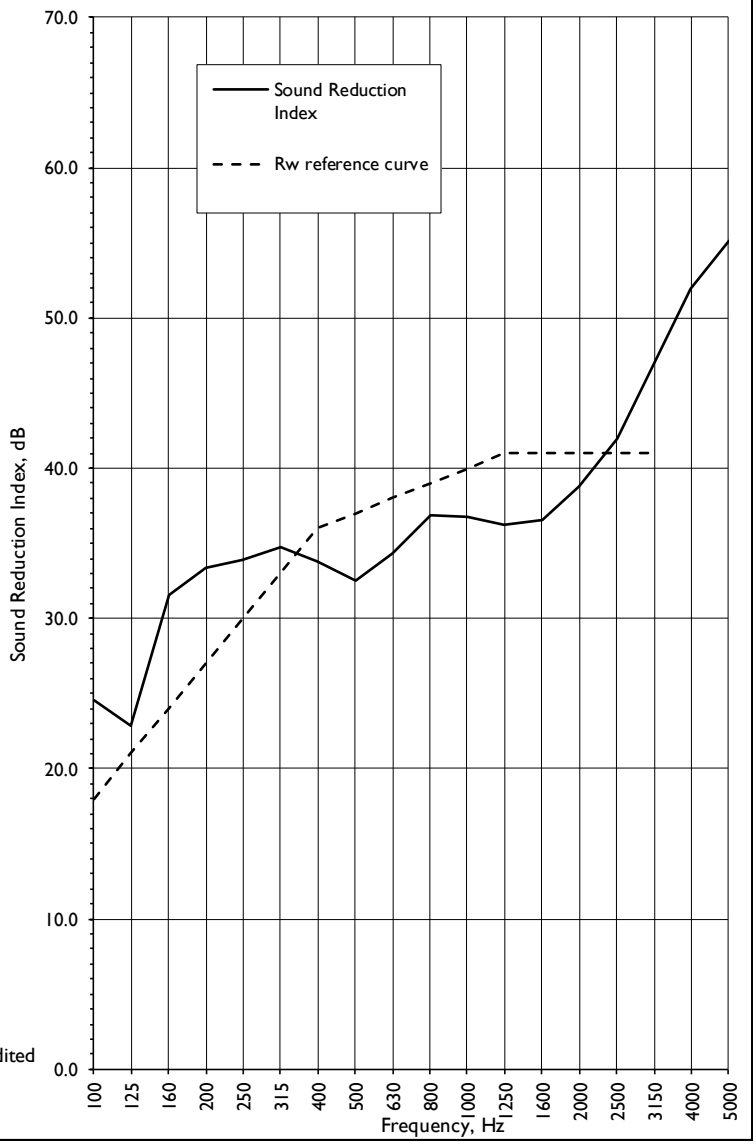
Product Identification: **39.5mm thick DG unit, 8mm heat strengthened outer, 18mm argon filled spacer, 13.5mm PVB laminated inner**

Frequency Hz	Sound Reduction Index, dB	
	⅓ Oct	Octave
50+	34.0	28.9
63+	27.6	
80+	27.6	
100	24.6	25.1
125	22.9	
160	31.6	
200	33.4	34.0
250	33.9	
315	34.7	
400	33.8	33.5
500	32.5	
630	34.3	
800	36.9	36.6
1000	36.8	
1250	36.2	
1600	36.6	38.6
2000	38.8	
2500	42.0	
3150	47.0	50.1
4000	51.9	
5000	55.1	
6300+	55.8	55.9
8000+	57.5	
10000+	54.9	
Average 100-3150	34.8	SRL Version 20.1124.15.09

* shows measurement corrected for background

> shows measurement limited by background

\+ shows Frequency beyond standard and not UKAS accredited



Rating according to BS EN ISO 717-1:2013

$R_w(C;C_{tr})$= 37 (0;-2) dB

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Data Sheet 2

See SRL Report 24795-SRL-RP-XT-001-P1 for full details

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

			Source	Receiving
Test Number:	4	**Test Room:**		
Client:	Hansen Facades	**Air Temperature:**	12.8 °C	13 °C
Test Date:	27/04/2021	**Air Humidity:**	54 %	55 %
Sample Height:	2.05 m	**Volume:**	54.6 m³	52.8 m³
Sample Width:	2.37 m	**Air Pressure:**	1000 mbar	
Sample Weight:	N/A kg/m²			

Product Identification: **39.5mm thick DG unit, 8mm heat strengthened outer, 18mm argon filled spacer, 13.5mm acoustic interlayer laminated inner**

Frequency Hz	Sound Reduction Index, dB	
	⅓ Oct	Octave
50+	35.4	30.8
63+	28.7	
80+	30.6	
100	25.5	26.0
125	23.9	
160	31.4	
200	35.1	36.5
250	37.8	
315	37.1	
400	35.8	36.8
500	38.0	
630	37.0	
800	40.6	40.0
1000	39.3	
1250	40.2	
1600	40.3	41.9
2000	41.6	
2500	44.8	
3150	48.9	51.6
4000	52.3	
5000	56.6	
6300+	55.7	55.5
8000+	57.5	
10000+	54.0	
Average 100-3150	37.3	SRL Version 20.11.24.15.09

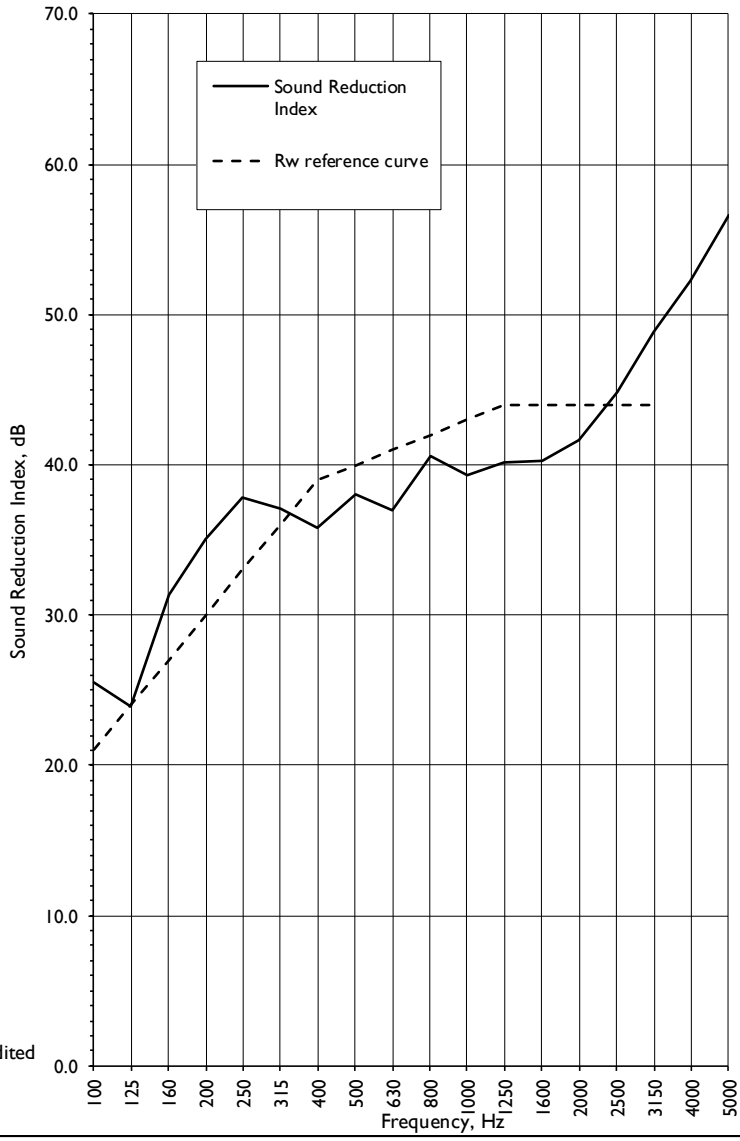
* shows measurement corrected for background

> shows measurement limited by background

\+ shows Frequency beyond standard and not UKAS accredited

Rating according to BS EN ISO 717-1:2013

$R_w(C;C_{tr})$= 40 (0;-3) dB



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Data Sheet 3

See SRL Report 24795-SRL-RP-XT-001-P1 for full details

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

			Source	Receiving
Test Number:	5	**Test Room:**		
Client:	Hansen Facades	**Air Temperature:**	12.4 °C	12.5 °C
Test Date:	28/04/2021	**Air Humidity:**	51 %	51 %
Sample Height:	2.05 m	**Volume:**	54.6 m³	52.8 m³
Sample Width:	2.37 m	**Air Pressure:**	997 mbar	
Sample Weight:	N/A kg/m²			

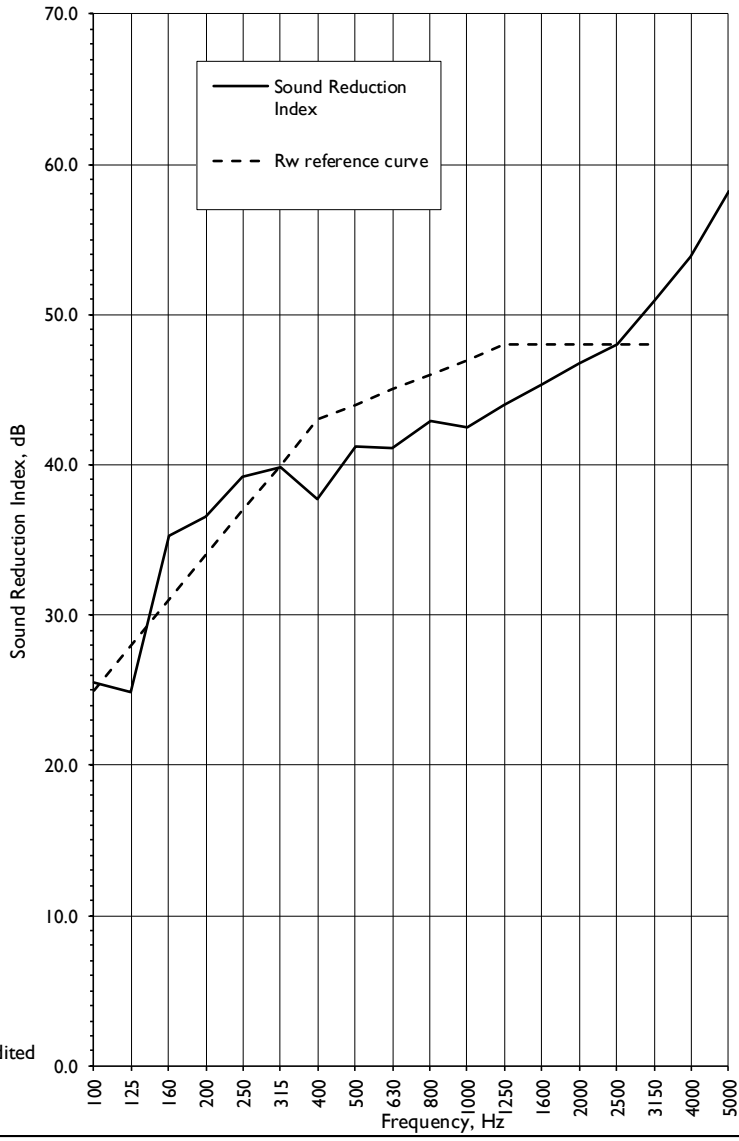
Product Identification: **40.3mm thick DG unit, 8.8mm PVB laminate outer, 18mm argon filled spacer, 13.5mm acoustic interlayer laminated inner**

Frequency Hz	Sound Reduction Index, dB	
	⅓ Oct	Octave
50+	35.7	30.2
63+	27.3	
80+	31.4	
100	25.5	26.7
125	24.9	
160	35.3	
200	36.6	38.3
250	39.2	
315	39.8	
400	37.7	39.7
500	41.2	
630	41.1	
800	42.9	43.1
1000	42.5	
1250	44.0	
1600	45.4	46.6
2000	46.7	
2500	48.0	
3150	50.9	53.4
4000	53.9	
5000	58.2	
6300+	57.8	56.8
8000+	59.1	
10000+	54.8	
Average 100-3150	40.1	SRL Version 20.11.24.15.09

* shows measurement corrected for background

> shows measurement limited by background

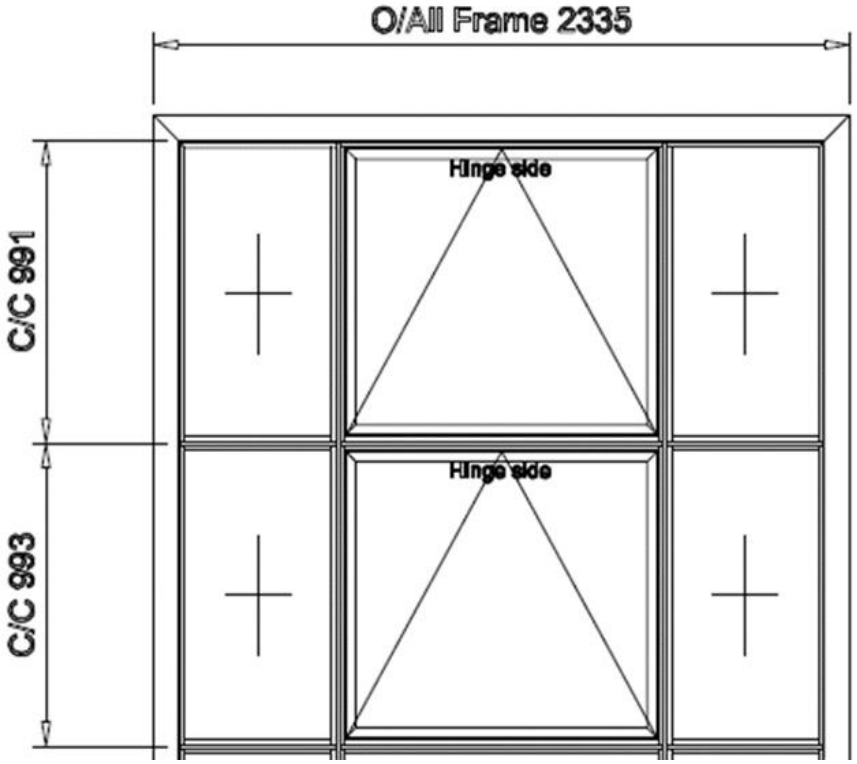
\+ shows Frequency beyond standard and not UKAS accredited

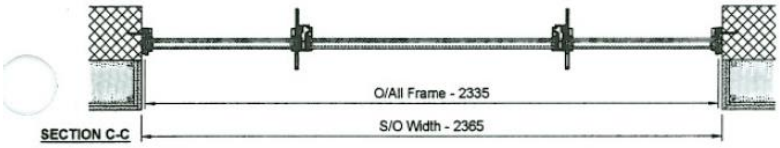


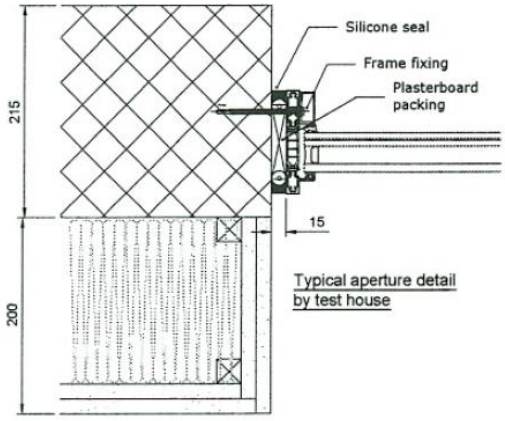
Rating according to BS EN ISO 717-1:2013

$R_w(C;C_{tr})$= 44 (-2;-5) dB

Drawing 1 – Frame Details







Photograph 1 – Test Sample

Appendix A - Details of Measurements

A1. Location

Sound Research Laboratories

Holbrook House

Little Waldingfield

Sudbury

Suffolk

CO10 0TF

A2. Test Dates

27 & 28 April 2021

A3. Tester

Kieron Farrow of SRL Technical Services Limited

A4. Instrumentation and Apparatus Used

Make	Description	Type
Abtronix	Microphone Multiplexer	
EDI	Microphone Power Supply Unit	
Norwegian Electronics	Multichannel Sound Level Meter	Nor850
	Rotating Microphone Boom	265

Brüel & Kjaer	Windshields	UA0237
	Pre Amplifiers	2669C
	Microphone Calibrator	4231
	Omnipower Sound Source	4296
Larson Davis	12mm Condenser Microphone	2560, 377A60
Oregon Scientific	Temperature & Humidity & Probe	THGR810
TOA	Graphic Equalizer	E-1231
Crown	Class D Amplifier	XLS 1502
G.R.A.S	Pre Amplifier	26AK
ntek	Rotating microphone boom	MB01

A5. 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.

Appendix B – 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 block and plasterboard wall between the two rectangular reverberant or acoustically "live" rooms, both of which are constructed from 215mm brick with reinforced concrete floors and roofs. The brick wall has dimensions of 3.9m wide x 2.9m high and forms the whole of the common area between the two rooms.

One of the rooms termed the source room has a nominal volume of 55 cubic metres and is isolated by the use of resilient mountings and seals, from the surrounding structure and the adjoining room. The adjoining receiving room has a nominal volume of 53 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, filtered into one third octave band widths, integrated and averaged by means of a Real Time Analyser using a microphone on an oscillating microphone boom. The value obtained at any particular frequency is known as the equivalent sound pressure level for either source or receiving rooms. The change in level across the test sample is termed the equivalent 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 C – 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
Temperature	±0.8 °C
Humidity	±10 %RH
Static Pressure	±1 mbar

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