CAMBRIDGE ACOUSTIC

LABORATORY LTD

ACOUSTIC TEST REPORT

Report Date: 30th July 2021

Document Ref: 21005-R01-A

Test

Laboratory sound insulation measurements of Thermoprotect Sucraseal™ tested in accordance with BS EN ISO 10140-2:2010 and BS EN ISO 10140-1:2016 Annex G

Sponsor

Thermoprotect Ltd,
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Bodmin
Cornwall
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Cambridge Acoustic Laboratory Limited
Brewery Road, Pampisford, Cambridge, CB22 3HG
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Date	Revision	Description	Author	Reviewer
30th July 2021	A	Initial Report	James Ambrose	Richard Woolnough

Contents

Summary

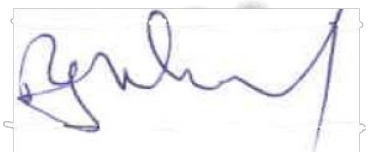
Tests have been undertaken by Cambridge Acoustic Laboratory Limited at Brewery Road, Pampisford, Cambridge, CB22 3HG to determine the sound reduction index of Thermoprotect Sucraseal™ in accordance with BS EN ISO 10140-2:2010 and BS EN ISO 10140-1:2016 Annex G.

Following the installation and the completion of tests on the 23rd to 26th July 2021, the results can be found in section 5.

Author

James Ambrose AMIOA
Acoustic Engineer
BEng(Hons)

Reviewer



Richard Woolnough
QSHE Manager

Authorised Date: 30th July 2021

1. Introduction

Thermoprotect Ltd has commissioned Cambridge Acoustic Laboratory Ltd to determine the sound reduction index of Thermoprotect Sucraseal™ in accordance with BS EN ISO 10140-2:2010 and BS EN ISO 10140-1:2016 Annex G. The element was supplied and installed into the test chamber by Thermoprotect Ltd.

1.1 Test Details

The elements were tested to BS EN ISO 10140-2:2010 Acoustics - Laboratory measurement of sound insulation of building elements. Airborne sound insulation measurements were conducted at Cambridge Acoustic Laboratory Ltd, Brewery Road, Pampisford, Cambridge, CB22 3HG on the 23rd to 26th July 2021.

For details of the testing methodology see section 4 of this report.

2. Laboratory

The specified elements were installed by Thermoprotect Ltd for the determination of the airborne sound insulation in the test stand belonging to Cambridge Acoustic laboratory Ltd, with suppressed flanking transmission compliant with BS EN ISO 10140-5:2010 +A1 2014.

The laboratory can be pre-configured to 5 (A-E) different reduced test openings see Figure 2. The appropriate arrangement was decided by the sponsor.

A drawing of the test chamber with dimensions is displayed in Figure 1.

The test elements were installed into pre-configured arrangement "A" see Figure 3..

Environmental test conditions were recorded in both measurement rooms.

In the source room temperature was recorded at 23.8°C (±0.8°C), relative humidity was recorded at 58.7% (±4%) and static air pressure was recorded at 1018.2HPa (±0.3 HPa).

In the receiving room temperature was recorded at 24.8°C (±0.8°C), relative humidity was recorded at 67.2% (±4%) and static air pressure was recorded at 1017.8 HPa (±0.3 HPa).

Test environmental conditions were recorded in both measurement rooms before each test. These are documented in appendix B.

The R'_{max} of the facility is limited by the construction of the laboratory which was tested to achieve 80dB. See Table 1 for frequency response of R'_{max}.

A breezeblock wall was constructed in aperture A which was used as the baseline measurement for the foam spray to adhere on to. Sound reduction index results can be seen in Appendix A and B.

Table 1- Supporting partition frequency response.

Frequency Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz
R'_{max}	54.1	53.6	65.7	67.4	71.4	72.4	77.7	84.8	89.2	92.3	92.9	92.2

Frequency Hz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
R'_{max}	92.9	93.4	95.8	96.3	95	90.2	80.7	68.7	49.8	36.1	30.7	26.2

Overall max sound reduction index of test stand	R'_{max} = 80dB

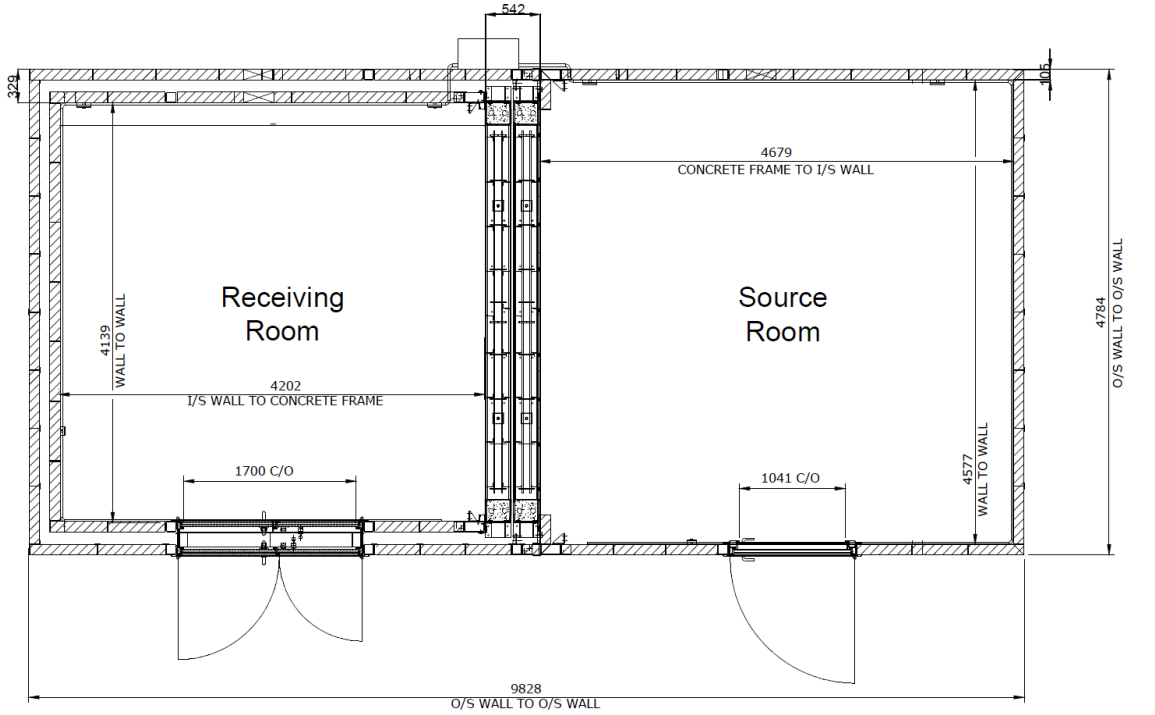


Figure 1- Sound transmission suite plan

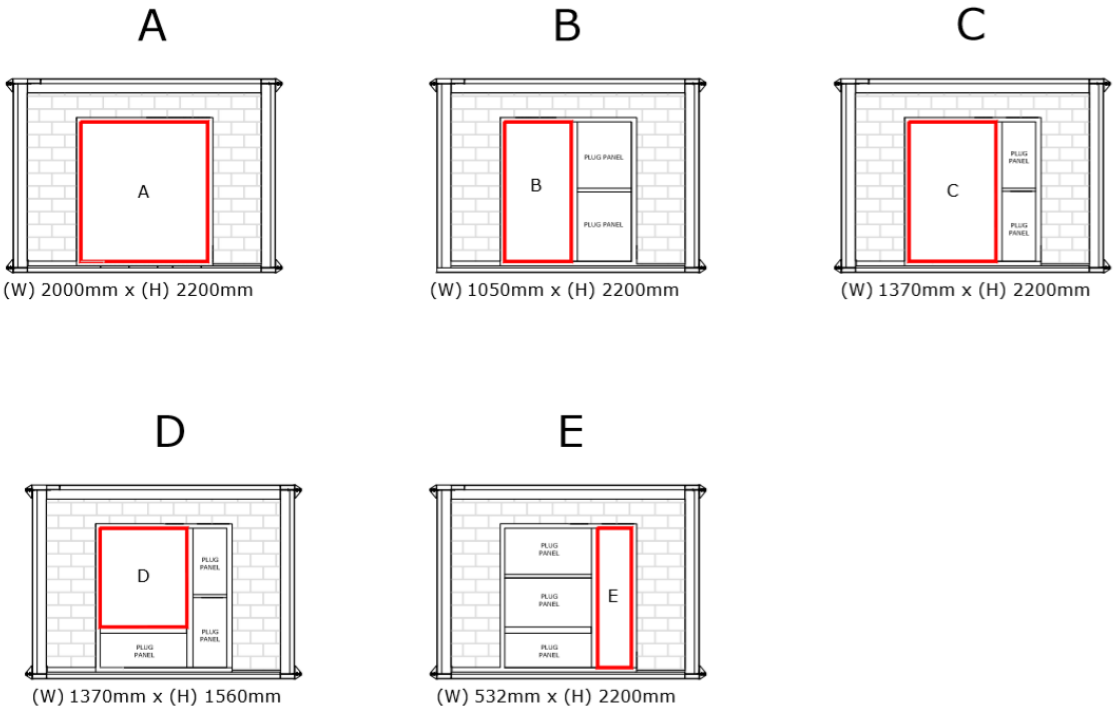


Figure 2- All possible pre-configured reduced test openings (A-E)

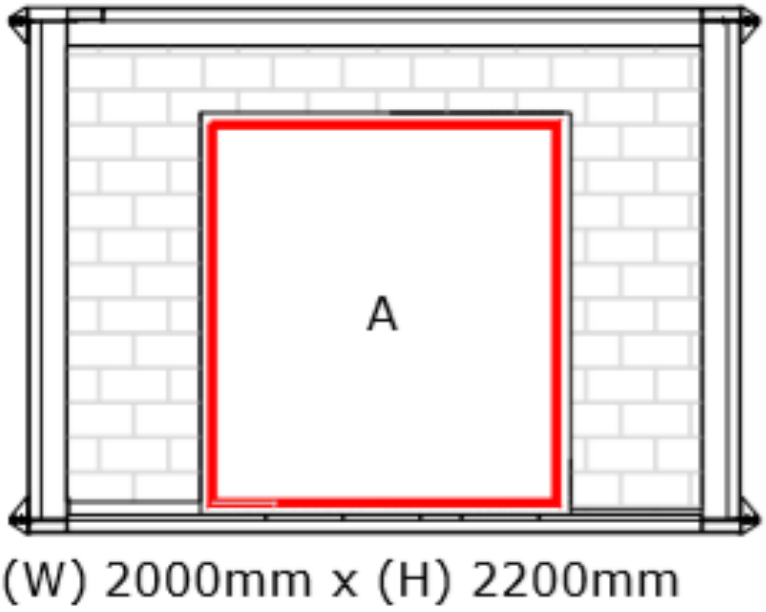


Figure 3- Laboratory test opening configuration "A"

3. Tested Element

Test elements were received on the 23rd to 26th July 2021 and were installed by Thermoprotect Ltd on the same day. There were no visible issues or damage recorded prior to testing as inspected by Thermoprotect Ltd.

Sample selection and product information is not verified by Cambridge Acoustic Laboratory Ltd.

Product information summary supplied by sponsor is presented in Table 2.

Images of the element installed in the test chamber are shown in Figure 4.

Table 2 -Test element details (provided by client)

Product Information	Product
Product(s) Name:	Sucraseal™
Product Type (e.g., Door, window, etc):	Spray foam ASTM E-84 (NFPA 255, UL723) class 1 (class A) spray foam insulation.
Products(s) Overall Dimensions (H×W):	2200mm x 2000 mm (Same as test opening area)
Product(s) Thickness:	100 mm, 150 mm, 200 mm, 250 mm, 300 mm
Product(s) Mass Per Unit Area (kg/m^3):	8.00923
Construction Information	**Product**
Test Opening Aperture Size Configuration (Please See Enclosed; Laboratory Test Opening Configuration)	A
Custom Test Opening Configuration *(If yes; Specify Dimensions)*	-
Installation of Product: *(CALL or Sponsor)*	Thermoprotect Ltd
Installation of Supporting Structure: *(CALL or Sponsor)*	Cambridge Acoustic Laboratory Ltd

Test	Product Name	Details
001	Baseline	Baseline test, no foam applied
004	Sucraseal™	Total of 100 mm of spray foam applied
005	Sucraseal™	Total of 150 mm of spray foam applied
006	Sucraseal™	Total of 200 mm of spray foam applied
007	Sucraseal™	Total of 250 mm of spray foam applied
008	Sucraseal™	Total of 300 mm of spray foam applied

Figure 4.1- Photograph images of breezeblock wall (Left image is source room) (right image is recover room)

Figure 5.2- Photograph of spray foam applied 100 mm, first application

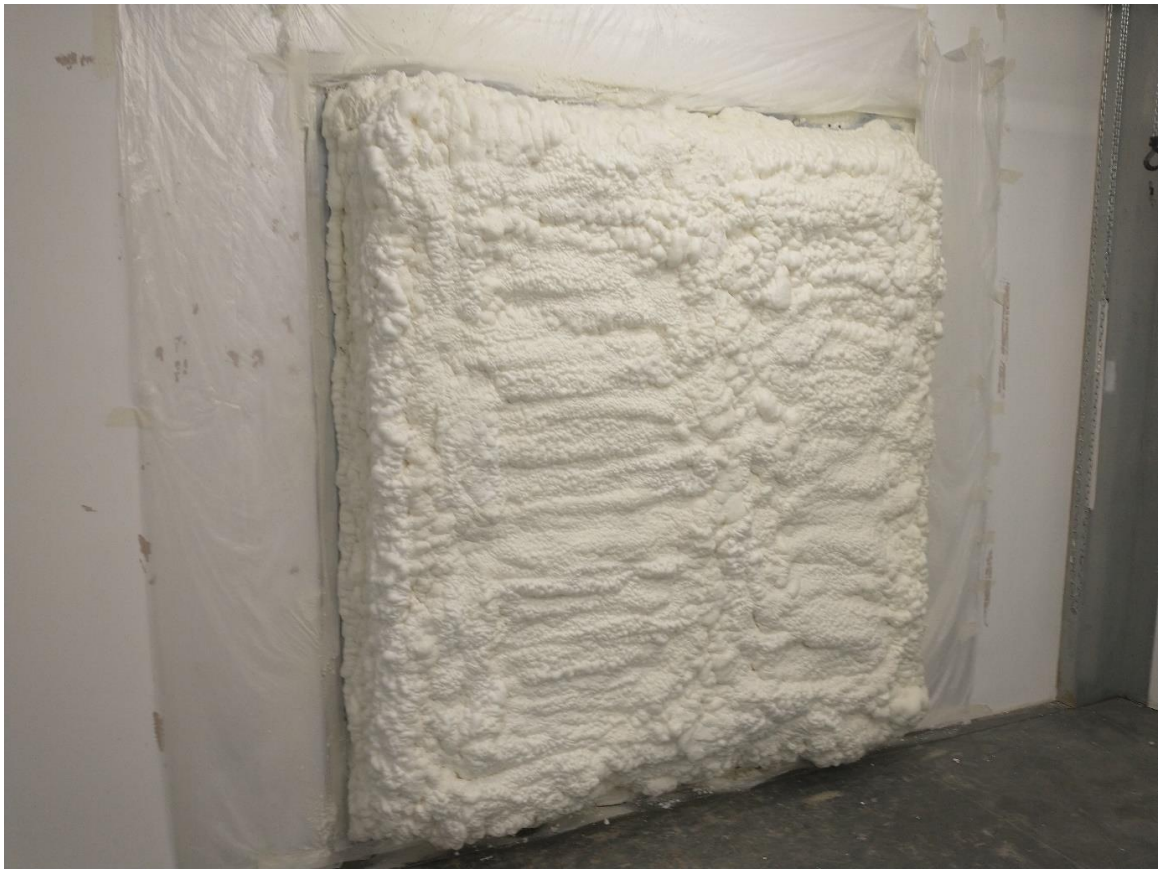


Figure 4.3- Photograph of spray foam applied 300 mm, last application. Plastic surround was removed before measurement was taken.

4. Methodology

Measurement of Sound Transmission in accordance with BS EN ISO 10140-2: 2010 and BS EN ISO 10140-1:2016 Annex G.

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 absorption in the receiving room. The test is conducted 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") rooms.

One of the rooms is used as the receiving room and has a volume of 50.2 m^3. It is isolated from the surrounding structure and the adjoining room, using resilient mountings and seals to ensure good acoustic isolation. The adjoining source room has a volume of 67.5 m^3.

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 Sound Reduction Index (R), 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:

$$R_W = L_1 - L_2 + 10Log\left(\frac{S}{A}\right) dB$$

Where:

S is the area of the sample.

A is the total absorption in the receiving room.

The Sound Reduction Index is an expression of the laboratory sound transmission performance of an 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.

For acoustical linings on walls and floors, a different calculation has to be made. The quantity determined is the sound reduction improvement index, ΔR, in decibels which is defined as the difference between the sound reduction indices of the basic element with and without the lining for each one-third octave band. Given as:

$\Delta R = R_{with} - R_{without}$ dB.

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 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 Ctr have been calculated in accordance with the relevant section of BS EN ISO 717-1:2020.

From the results of laboratory tests carried out in accordance with BS EN ISO 10140-2:2010 and BS EN ISO 10140-1:2016 Annex G.

4.1 Equipment

Table 3- Equipment table

Equipment	Reference	Serial Number	Brand	Date of Calibration	Certificate Number
Sound Level Analyser	Nor850- SG1	8501203-CH1	Norsonic	31/10/2019	U33227
Sound Level Analyser	Nor850- SG1	8501203-CH2	Norsonic	31/10/2019	U33230
Microphone	Nor1225	305274	Norsonic	31/10/2019	33225
Microphone	Nor1225	358254	Norsonic	31/10/2019	33228
Preamplifier	Nor1209	22364	Norsonic	31/10/2019	U33227
Preamplifier	Nor1209	22365	Norsonic	31/10/2019	U33230
Microphone Boom	Nor265	29494	Norsonic	11/01/2021	Nor265_29494
Microphone Boom	Nor265	29495	Norsonic	11/01/2021	Nor265_29495
Speaker	Nor276	2766184	Norsonic	25/09/2019	53878
Speaker	Nor276	2766185	Norsonic	25/09/2019	53879
Calibrator	Nor1255	125525258	Norsonic	31/10/2020	U33224
Environmental Sensor	Temp_S	R087467	PCE	01/03/2021	WK2021030009
Environmental Sensor	Temp_R	R087540	PCE	01/03/2021	WK2021030008
Counterbalance	CPWplus 200L	AE63603751	ADAM	24/02/2021	1670723

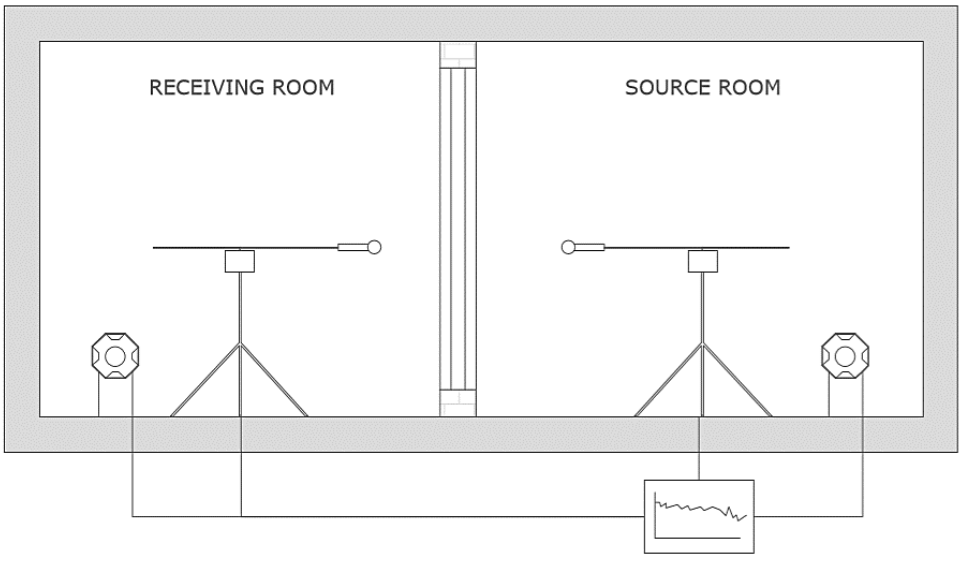


Figure 6- Example of typical equipment arrangement for testing

5. Test Results

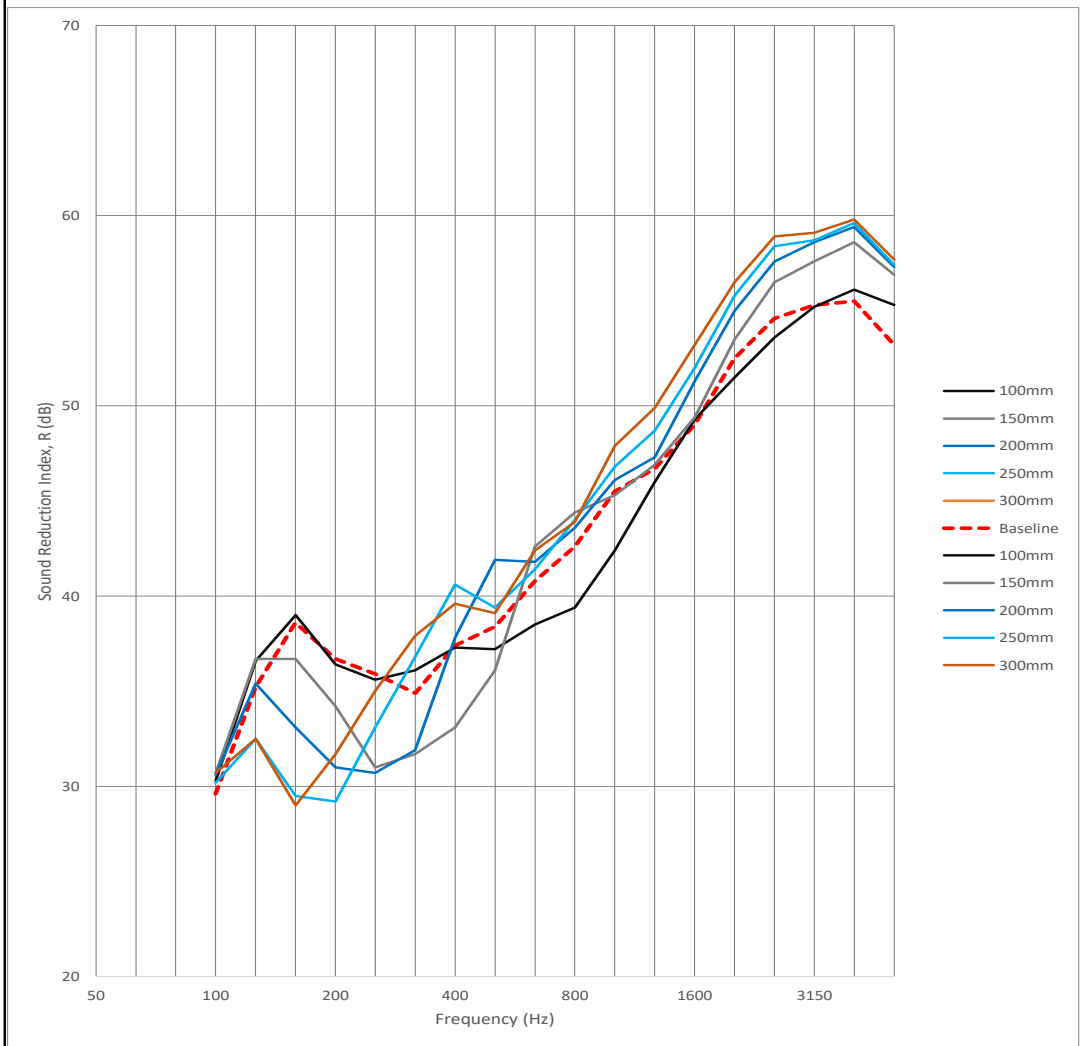
The weighted sound reduction index of the setup tested on 23rd to 26th July 2021 was installed in functional condition and was determined without influence of the flanking. The results are seen in Figures 6 and 7. Figure 6 shows the Sound reduction Index of all tests overlayed in one graph in 1/3rd octave band frequencies. Figure 7 shows the sound reduction improvement Index

Figure 7- SRI- Overlayed

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Client:	Thermo Protect Ltd	Date of test:	26/07/2021
Manufacturer:	Thermo Protect Ltd		
Test room identification:			
Test specimen mounted by:	Thermo Protect Ltd		
Product identification:	Sucraseal™		
Description of the specimen:	Breezeblock wall.		



Name of test institute:	Cambridge Acoustic Laboratory Ltd
No. of test report:	001

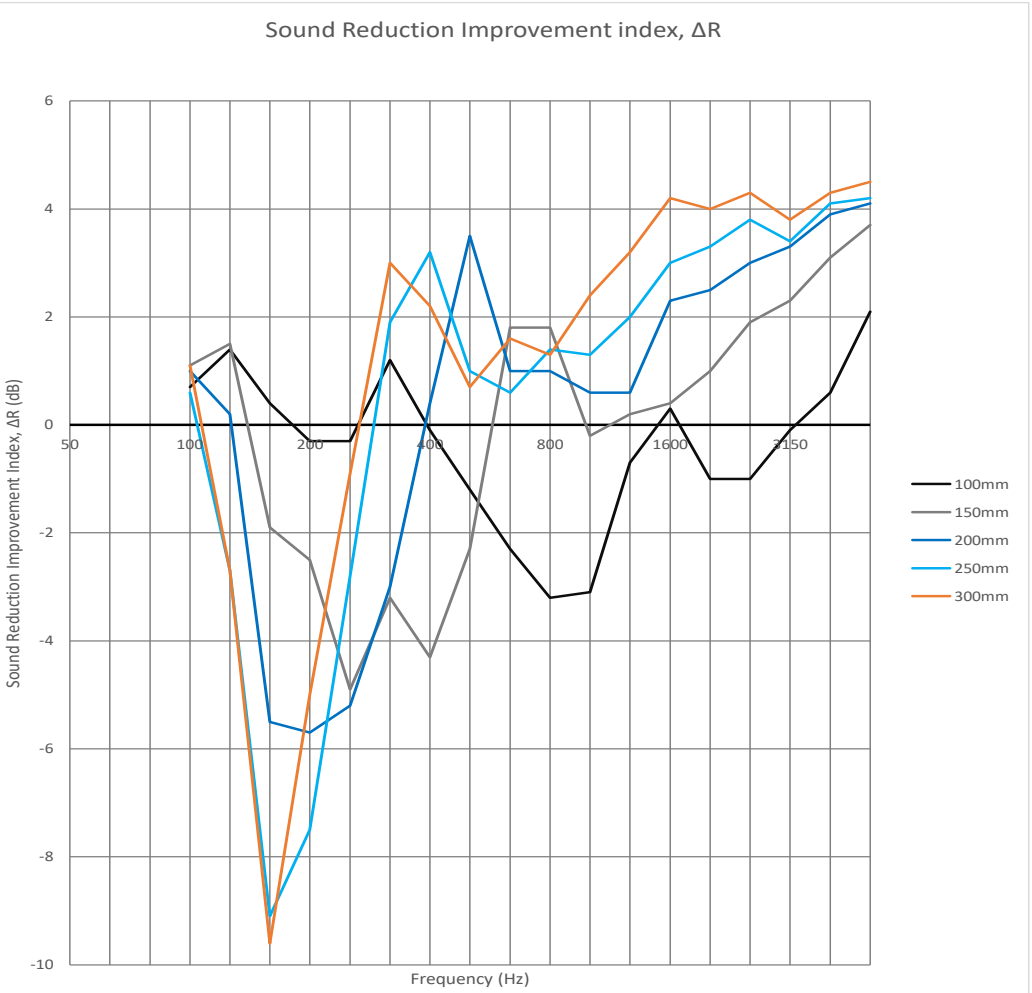
Date: 26/07/2021 Signature: James A.

Figure 8- Sound Reduction Improvement Index

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Client:	Thermo Protect Ltd	Date of test:	26/07/2021
Manufacturer:	Thermo Protect Ltd		
Test room identification:			
Test specimen mounted by:	Thermo Protect Ltd		
Product identification:	Sucraseal™		
Description of the specimen:	Breezeblock wall.		



Name of test institute:	Cambridge Acoustic Laboratory Ltd		
No. of test report:	001		
Date: 26/07/2021		Signature:	James A.

Individual test results and graphs are presented in accordance with BS EN ISO 10140-2:2010, see appendix A and B, respectively.

Results apply to the sample as received.

6. Parameters & Limitations

6.1 Parameters

The test fulfilled all criteria required of BS EN ISO 10140-2:2010 and BS EN ISO 10140-1:2016 Annex G, including:

- R'max of the test chambers was measured to be 62dB .
- The test chambers are two cuboid rooms. Volumes of the chambers for testing are reported with the individual test data.

6.2 Limitations

- The results only relate to the behaviour of the specimen submitted for test, as described in Section 3, and under the particular conditions of test.
- The results are not intended to be the sole criteria for assessing the acoustic performance of the element in use, nor do they necessarily reflect the actual behaviour once installed on site.
- The results are solely for use by the sponsor, and the stated purpose.
- Extracts from the report are not permitted.

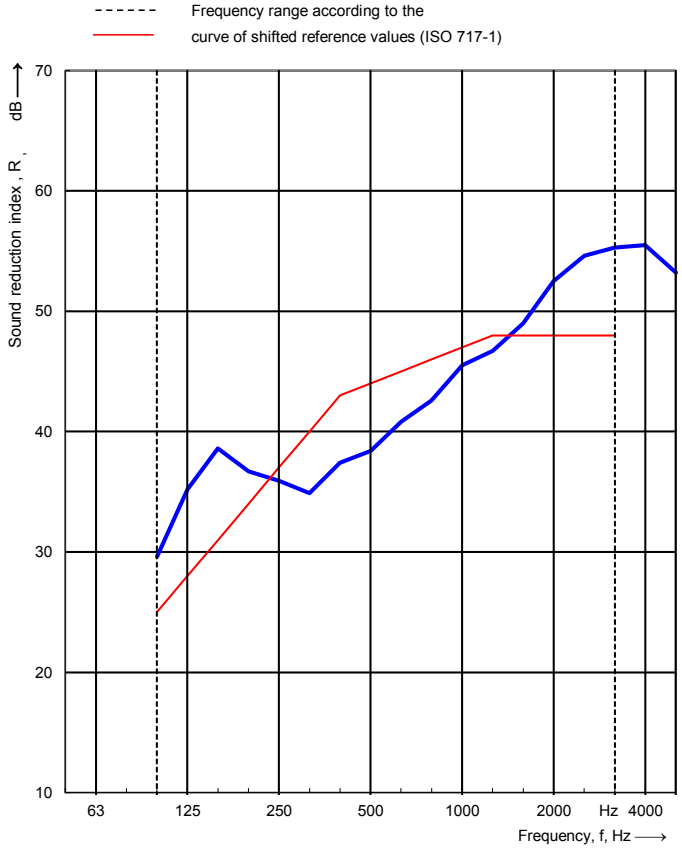
Appendix A- Graphs

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Client:	Thermo Protect Ltd	Date of test:	23/07/2021
Manufacturer:			
Test room identification:			
Test specimen mounted by:	N/A		
Product identification:			
Description of the specimen:	Breezeblock wall. Baseline measurement (R,without)		
Static pressure:	1014.9 hPa		
Air temperature:	59.5 °C		
Relative air humidity:	24.5 %		
Mass per unit area:			
Area, S, of test element:	4.40 m²		
Source room volume:	67.5 m³		
Receiving room volume:	50.2 m³		

Frequency f [Hz]	R 1/3 octave [dB]
50	
63	
80	
100	29.6
125	35.2
160	38.6
200	36.7
250	35.9
315	34.9
400	37.4
500	38.4
630	40.8
800	42.6
1000	45.5
1250	46.7
1600	49.0
2000	52.5
2500	54.6
3150	55.3
4000	55.5
5000	53.2



Rating according to ISO 717-1

R_W $(C;C_{tr})$ = 44 (-1 ; -3) dB

$C_{50\text{-}3150}$ = dB $C_{50\text{-}5000}$ = dB $C_{100\text{-}5000}$ = dB

$C_{tr,50\text{-}3150}$ = dB $C_{tr,50\text{-}5000}$ = dB $C_{tr,100\text{-}5000}$ = dB

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.

Name of test institute:	Cambridge Acoustic Laboratory Ltd
No. of test report:	001

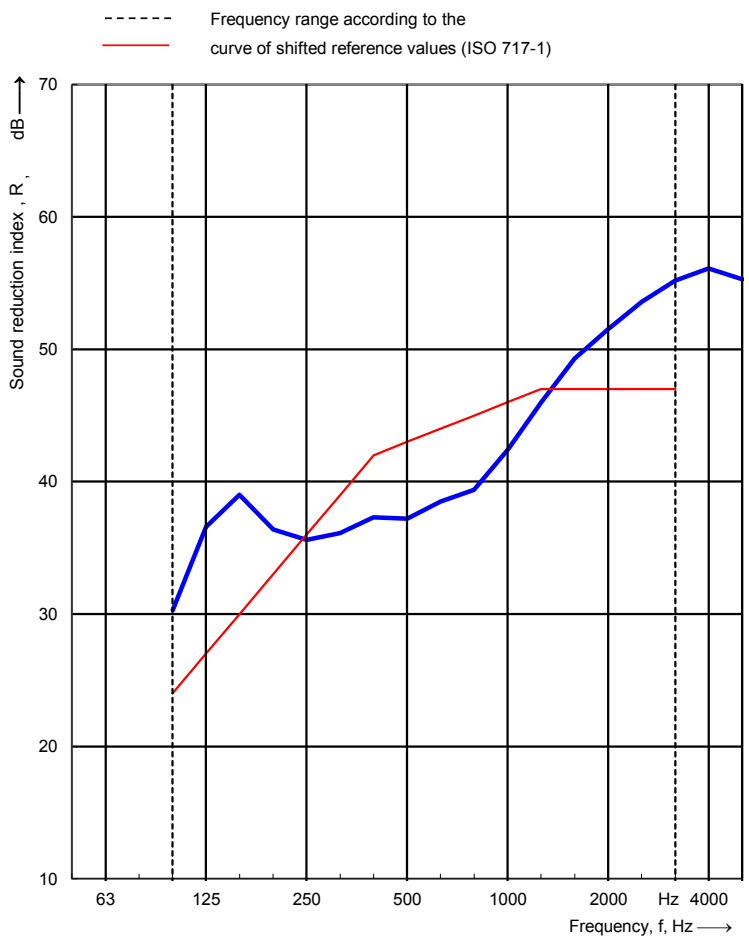
Date: 23/07/2021 Signature: James A.

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Client:	Thermo Protect Ltd	Date of test:	23/07/2021
Manufacturer:	Thermo Protect Ltd		
Test room identification:			
Test specimen mounted by:	Thermo Protect Ltd		
Product identification:	Sucraseal™		
Description of the specimen:	Breezeblock wall. (R,With) 100mm Thick		
Static pressure:	1013.7 hPa		
Air temperature:	24.7 °C		
Relative air humidity:	62.8 %		
Mass per unit area:			
Area, S, of test element:	4.40 m²		
Source room volume:	67.5 m³		
Receiving room volume:	50.2 m³		

Frequency f [Hz]	R 1/3 octave [dB]
50	
63	
80	
100	30.3
125	36.6
160	39.0
200	36.4
250	35.6
315	36.1
400	37.3
500	37.2
630	38.5
800	39.4
1000	42.4
1250	46.0
1600	49.3
2000	51.5
2500	53.6
3150	55.2
4000	56.1
5000	55.3



Rating according to ISO 717-1

R_w $(C;C_{tr})$ = 43 (-1 ; -3) dB

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.

$C_{50\text{-}3150}$ = dB $C_{50\text{-}5000}$ = dB $C_{100\text{-}5000}$ = dB

$C_{tr,50\text{-}3150}$ = dB $C_{tr,50\text{-}5000}$ = dB $C_{tr,100\text{-}5000}$ = dB

Name of test institute:	Cambridge Acoustic Laboratory Ltd
No. of test report:	004

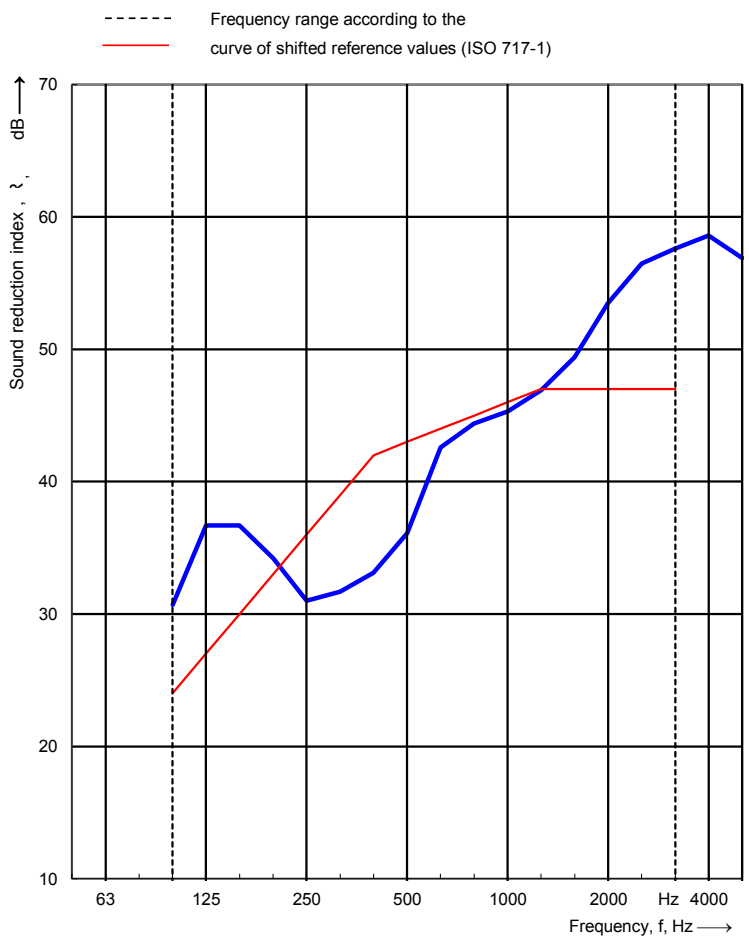
Date: 23/07/2021 Signature: James A.

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Client:	Thermo Protect Ltd	Date of test:	26/07/2021
Manufacturer:	Thermo Protect Ltd		
Test room identification:			
Test specimen mounted by:	Thermo Protect Ltd		
Product identification:	Sucraseal™		
Description of the specimen:	Breezeblock wall. (R,With) 150mm thick		
Static pressure:	1005.3 hPa		
Air temperature:	23.8 °C		
Relative air humidity:	70.2 %		
Mass per unit area:			
Area, S, of test element:	4.40 m²		
Source room volume:	67.5 m³		
Receiving room volume:	50.2 m³		

Frequency f [Hz]	R 1/3 octave [dB]
50	
63	
80	
100	30.7
125	36.7
160	36.7
200	34.2
250	31.0
315	31.7
400	33.1
500	36.1
630	42.6
800	44.4
1000	45.3
1250	46.9
1600	49.4
2000	53.5
2500	56.5
3150	57.6
4000	58.6
5000	56.9



Rating according to ISO 717-1

R_w $(C;C_{tr})$ = 43 (-2 ; -4) dB

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.

$C_{50\text{-}3150}$ = dB $C_{50\text{-}5000}$ = dB $C_{100\text{-}5000}$ = dB

$C_{tr,50\text{-}3150}$ = dB $C_{tr,50\text{-}5000}$ = dB $C_{tr,100\text{-}5000}$ = dB

Name of test institute:	Cambridge Acoustic Laboratory Ltd
No. of test report:	005

Date: 26/07/2021 Signature: James A.

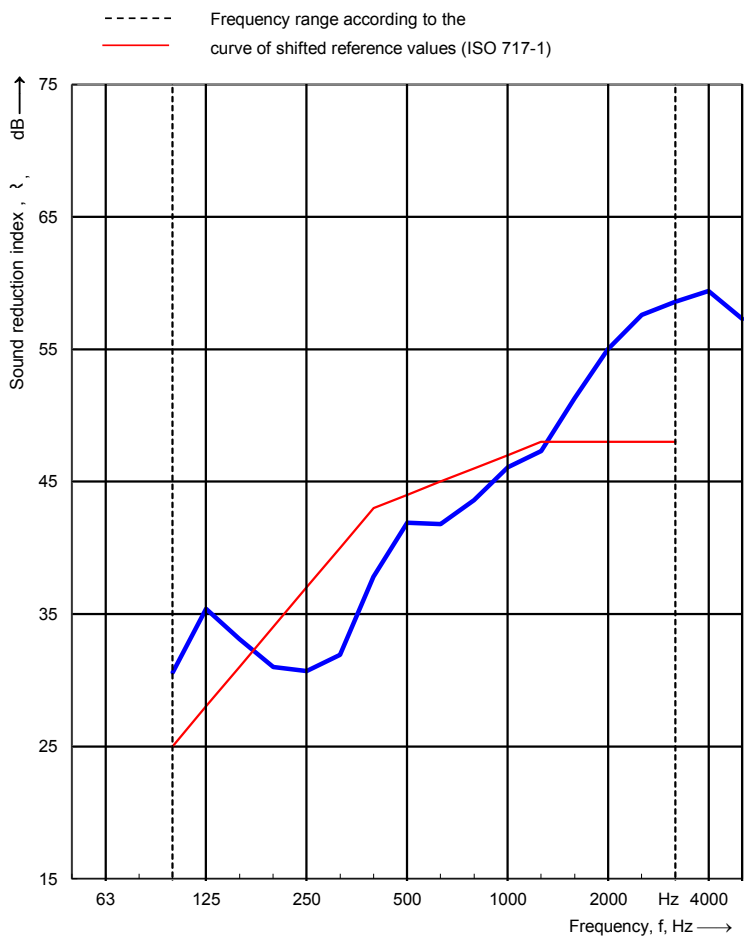
Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Client:	Thermo Protect Ltd	Date of test:	26/07/2021
Manufacturer:	Thermo Protect Ltd		
Test room identification:			
Test specimen mounted by:	Thermo Protect Ltd		
Product identification:	Sucraseal™		
Description of the specimen:	Breezeblock wall.		
	200mm Thick		

Static pressure:	1005.2	hPa
Air temperature:	23.5	°C
Relative air humidity:	71.6	%
Mass per unit area:		
Area, S, of test element:	4.40	m²
Source room volume:	67.5	m³
Receiving room volume:	50.2	m³

Frequency f [Hz]	R 1/3 octave [dB]
50	
63	
80	
100	30.6
125	35.4
160	33.1
200	31.0
250	30.7
315	31.9
400	37.8
500	41.9
630	41.8
800	43.6
1000	46.1
1250	47.3
1600	51.3
2000	55.0
2500	57.6
3150	58.6
4000	59.4
5000	57.3



Rating according to ISO 717-1

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

$C_{50\text{-}3150}$ = dB $C_{50\text{-}5000}$ = dB $C_{100\text{-}5000}$ = dB

$C_{tr,50\text{-}3150}$ = dB $C_{tr,50\text{-}5000}$ = dB $C_{tr,100\text{-}5000}$ = dB

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.

Name of test institute:	Cambridge Acoustic Laboratory Ltd
No. of test report:	006

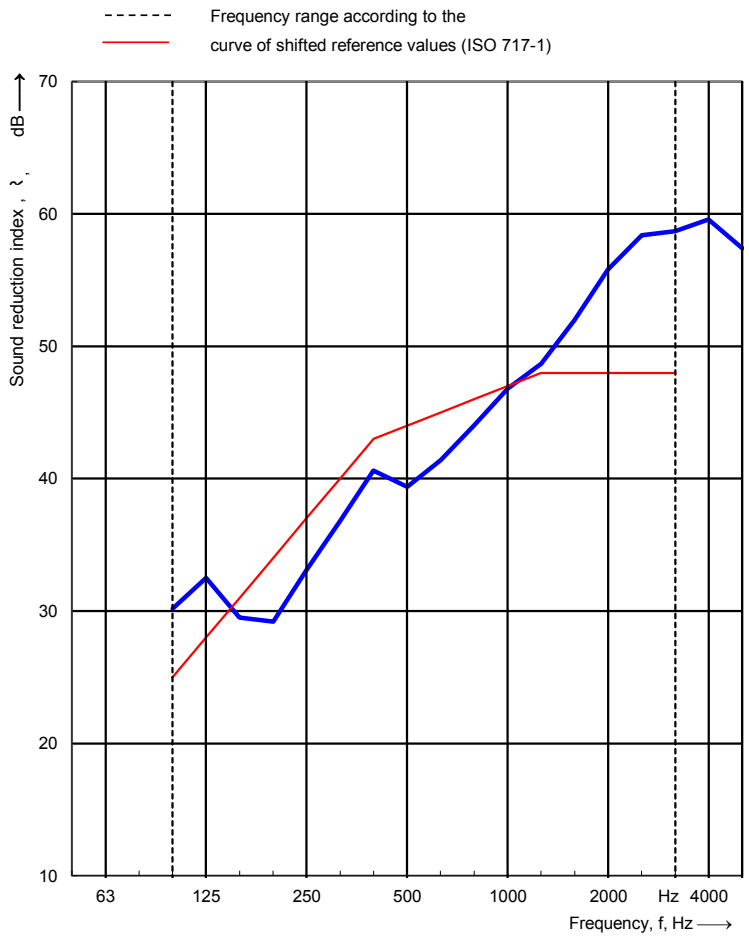
Date: 26/07/2021 Signature: James A.

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Client:	Thermo Protect Ltd	Date of test:	26/07/2021
Manufacturer:	Thermo Protect Ltd		
Test room identification:			
Test specimen mounted by:	Thermo Protect Ltd		
Product identification:	Sucraseal™		
Description of the specimen:	Breezeblock wall.		
	250mm Thick		
Static pressure:	1005.1 hPa		
Air temperature:	23.5 °C		
Relative air humidity:	72.1 %		
Mass per unit area:			
Area, S, of test element:	4.40 m²		
Source room volume:	67.5 m³		
Receiving room volume:	50.2 m³		

Frequency f [Hz]	R 1/3 octave [dB]
50	
63	
80	
100	30.2
125	32.5
160	29.5
200	29.2
250	33.1
315	36.8
400	40.6
500	39.4
630	41.4
800	44.0
1000	46.8
1250	48.7
1600	52.0
2000	55.8
2500	58.4
3150	58.7
4000	59.6
5000	57.4



Rating according to ISO 717-1

R_w $(C;C_{tr})$ = 44 (-1 ; -5) dB

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.

$C_{50\text{-}3150}$ = dB $C_{50\text{-}5000}$ = dB $C_{100\text{-}5000}$ = dB

$C_{tr,50\text{-}3150}$ = dB $C_{tr,50\text{-}5000}$ = dB $C_{tr,100\text{-}5000}$ = dB

Name of test institute:	Cambridge Acoustic Laboratory Ltd
No. of test report:	007

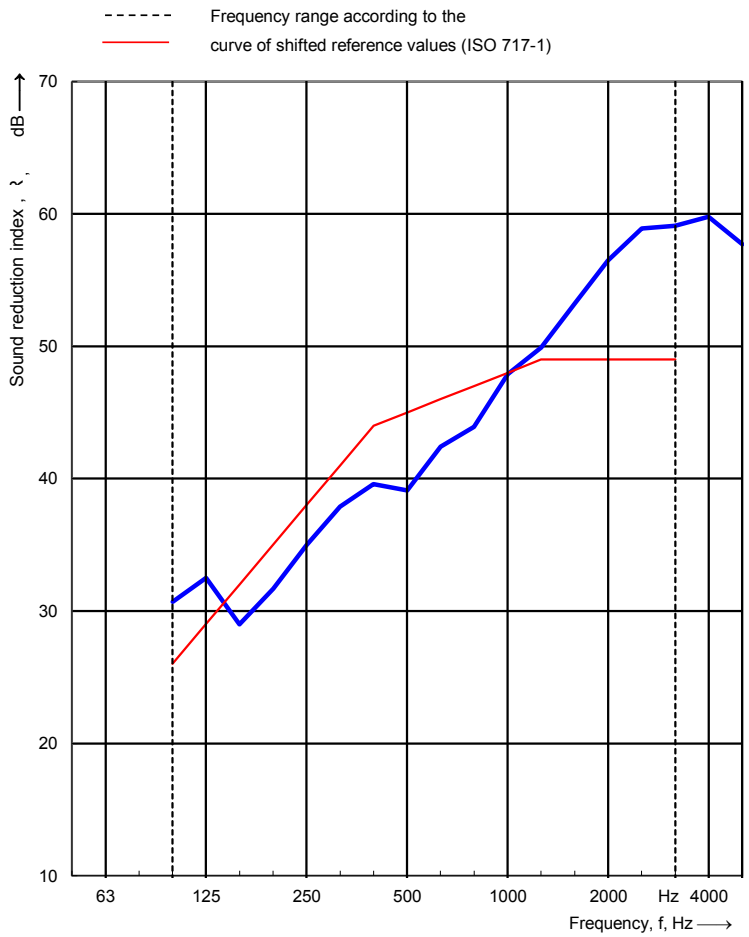
Date: 26/07/2021 Signature: James A.

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Client:	Thermo Protect Ltd	Date of test:	26/07/2021
Manufacturer:	Thermo Protect Ltd		
Test room identification:			
Test specimen mounted by:	Thermo Protect Ltd		
Product identification:	Sucraseal™		
Description of the specimen:	Breezeblock wall.		
	300mm Thick		
Static pressure:	1005.1 hPa		
Air temperature:	23.5 °C		
Relative air humidity:	72.6 %		
Mass per unit area:			
Area, S, of test element:	4.40 m²		
Source room volume:	67.5 m³		
Receiving room volume:	50.2 m³		

Frequency f [Hz]	R 1/3 octave [dB]
50	
63	
80	
100	30.7
125	32.5
160	29.0
200	31.7
250	35.0
315	37.9
400	39.6
500	39.1
630	42.4
800	43.9
1000	47.9
1250	49.9
1600	53.2
2000	56.5
2500	58.9
3150	59.1
4000	59.8
5000	57.7



Rating according to ISO 717-1

R_w $(C;C_{tr})$ = 45 (-1 ; -5) dB

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.

$C_{50\text{-}3150}$ = dB $C_{50\text{-}5000}$ = dB $C_{100\text{-}5000}$ = dB

$C_{tr,50\text{-}3150}$ = dB $C_{tr,50\text{-}5000}$ = dB $C_{tr,100\text{-}5000}$ = dB

Name of test institute:	Cambridge Acoustic Laboratory Ltd
No. of test report:	008

Date: 26/07/2021 Signature: James A.

Appendix B- Tables

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Rating according to ISO 717-1

R_w $(C;C_{tr})$ = 44 (-1 ; -3) dB

$C_{50\text{-}3150}$ = dB $C_{50\text{-}5000}$ = dB $C_{100\text{-}5000}$ = dB

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

$C_{tr,50\text{-}3150}$ = dB $C_{tr,50\text{-}5000}$ = dB $C_{tr,100\text{-}5000}$ = dB

Sum of unfavourable deviations : 27.8 dB

Max. unfavourable deviation : 5.6 dB at 400 Hz

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50								
63								
80								
100	29.6			1.18				
125	35.2			1.55				
160	38.6			1.14				
200	36.7			1.49				
250	35.9			1.21		1.1		
315	34.9			1.06		5.1		
400	37.4			1.23		5.6		
500	38.4			1.11		5.6		
630	40.8			1.16		4.2		
800	42.6			1.13		3.4		
1000	45.5			1.19		1.5		
1250	46.7			1.09		1.3		
1600	49.0			1.01				
2000	52.5			1.04				
2500	54.6			1.01				
3150	55.3			1.05				
4000	55.5			0.99				
5000	53.2			0.94				

Receiving room volume: 50.2 m³

Source room volume: 67.5 m³

Area, S, of test element: 4.40 m²

Air temperature: 59.5 °C

Relative air humidity: 24.5 %

Static pressure: 1014.9

Mass per unit area:

Breezeblock wall.

Baseline measurement
(R,without)

No. of test report: 001

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Rating according to ISO 717-1

R_w $(C;C_{tr})$ = 43 (-1 ; -3) dB

$C_{50\text{-}3150}$ = dB $C_{50\text{-}5000}$ = dB $C_{100\text{-}5000}$ = dB

$C_{tr,50\text{-}3150}$ = dB $C_{tr,50\text{-}5000}$ = dB $C_{tr,100\text{-}5000}$ = dB

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

Sum of unfavourable deviations : 29.5 dB

Max. unfavourable deviation : 5.8 dB at 500 Hz

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50								
63								
80								
100	30.3			1.18				
125	36.6			1.51				
160	39.0			1.21				
200	36.4			1.49				
250	35.6			1.21		0.4		
315	36.1			1.04		2.9		
400	37.3			1.28		4.7		
500	37.2			1.14		5.8		
630	38.5			1.17		5.5		
800	39.4			1.12		5.6		
1000	42.4			1.17		3.6		
1250	46.0			1.07		1.0		
1600	49.3			1.02				
2000	51.5			1.06				
2500	53.6			1.01				
3150	55.2			1.05				
4000	56.1			0.99				
5000	55.3			0.93				

Receiving room volume: 50.2 m³

Source room volume: 67.5 m³

Area, S, of test element: 4.40 m²

Air temperature: 24.7 °C

Relative air humidity: 62.8 %

Static pressure: 1013.7

Mass per unit area:

Breezeblock wall.

(R,With)
100mm Thick

No. of test report: 004

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Rating according to ISO 717-1

R_w $(C;C_{tr})$ = 43 (-2 ; -4) dB

$C_{50\text{-}3150}$ = dB $C_{50\text{-}5000}$ = dB $C_{100\text{-}5000}$ = dB

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

$C_{tr,50\text{-}3150}$ = dB $C_{tr,50\text{-}5000}$ = dB $C_{tr,100\text{-}5000}$ = dB

Sum of unfavourable deviations : 30.9 dB

Max. unfavourable deviation : 8.9 dB at 400 Hz

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50								
63								
80								
100	30.7			1.19				
125	36.7			1.48				
160	36.7			1.16				
200	34.2			1.40				
250	31.0			1.19		5.0		
315	31.7			1.05		7.3		
400	33.1			1.23		8.9		
500	36.1			1.08		6.9		
630	42.6			1.13		1.4		
800	44.4			1.10		0.6		
1000	45.3			1.17		0.7		
1250	46.9			1.11		0.1		
1600	49.4			1.00				
2000	53.5			1.06				
2500	56.5			1.03				
3150	57.6			1.03				
4000	58.6			0.97				
5000	56.9			0.94				

Receiving room volume: 50.2 m³

Source room volume: 67.5 m³

Area, S, of test element: 4.40 m²

Air temperature: 23.8 °C

Relative air humidity: 70.2 %

Static pressure: 1005.3

Mass per unit area:

Breezeblock wall.

(R,With)
150mm thick.

No. of test report: 005

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Rating according to ISO 717-1

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

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

$C_{50\text{-}3150}$ = dB $C_{50\text{-}5000}$ = dB $C_{100\text{-}5000}$ = dB

$C_{tr,50\text{-}3150}$ = dB $C_{tr,50\text{-}5000}$ = dB $C_{tr,100\text{-}5000}$ = dB

Sum of unfavourable deviations : 31.9 dB

Max. unfavourable deviation : 8.1 dB at 315 Hz

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50								
63								
80								
100	30.6			1.14				
125	35.4			1.51				
160	33.1			1.19				
200	31.0			1.52		3.0		
250	30.7			1.22		6.3		
315	31.9			1.05		8.1		
400	37.8			1.26		5.2		
500	41.9			1.13		2.1		
630	41.8			1.16		3.2		
800	43.6			1.17		2.4		
1000	46.1			1.16		0.9		
1250	47.3			1.06		0.7		
1600	51.3			1.03				
2000	55.0			1.05				
2500	57.6			1.04				
3150	58.6			1.05				
4000	59.4			0.99				
5000	57.3			0.94				

Receiving room volume: 50.2 m³

Source room volume: 67.5 m³

Area, S, of test element: 4.40 m²

Air temperature: 23.5 °C

Relative air humidity: 71.6 %

Static pressure: 1005.2

Mass per unit area:

Breezeblock wall.

200mm Thick

No. of test report: 006

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Rating according to ISO 717-1

R_w $(C;C_{tr})$ = 44 (-1 ; -5) dB

$C_{50\text{-}3150}$ = dB $C_{50\text{-}5000}$ = dB $C_{100\text{-}5000}$ = dB

$C_{tr,50\text{-}3150}$ = dB $C_{tr,50\text{-}5000}$ = dB $C_{tr,100\text{-}5000}$ = dB

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

Sum of unfavourable deviations : 26.2 dB

Max. unfavourable deviation : 4.8 dB at 200 Hz

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50								
63								
80								
100	30.2			1.19				
125	32.5			1.50				
160	29.5			1.20		1.5		
200	29.2			1.37		4.8		
250	33.1			1.19		3.9		
315	36.8			1.06		3.2		
400	40.6			1.26		2.4		
500	39.4			1.10		4.6		
630	41.4			1.20		3.6		
800	44.0			1.18		2.0		
1000	46.8			1.19		0.2		
1250	48.7			1.05				
1600	52.0			1.02				
2000	55.8			1.08				
2500	58.4			1.07				
3150	58.7			1.04				
4000	59.6			0.99				
5000	57.4			0.94				

Receiving room volume: 50.2 m³

Source room volume: 67.5 m³

Area, S, of test element: 4.40 m²

Air temperature: 23.5 °C

Relative air humidity: 72.1 %

Static pressure: 1005.1

Mass per unit area:

Breezeblock wall.

250mm Thick

No. of test report: 007

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Rating according to ISO 717-1

R_w $(C;C_{tr})$ = 45 (-1 ; -5) dB

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

$C_{50\text{-}3150}$ = dB $C_{50\text{-}5000}$ = dB $C_{100\text{-}5000}$ = dB

$C_{tr,50\text{-}3150}$ = dB $C_{tr,50\text{-}5000}$ = dB $C_{tr,100\text{-}5000}$ = dB

Sum of unfavourable deviations : 29.5 dB

Max. unfavourable deviation : 5.9 dB at 500 Hz

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50								
63								
80								
100	30.7			1.27				
125	32.5			1.56				
160	29.0			1.23		3.0		
200	31.7			1.51		3.3		
250	35.0			1.21		3.0		
315	37.9			1.06		3.1		
400	39.6			1.26		4.4		
500	39.1			1.12		5.9		
630	42.4			1.19		3.6		
800	43.9			1.11		3.1		
1000	47.9			1.16		0.1		
1250	49.9			1.08				
1600	53.2			1.02				
2000	56.5			1.06				
2500	58.9			1.04				
3150	59.1			1.05				
4000	59.8			0.99				
5000	57.7			0.92				

Receiving room volume: 50.2 m³

Source room volume: 67.5 m³

Area, S, of test element: 4.40 m²

Air temperature: 23.5 °C

Relative air humidity: 72.6 %

Static pressure: 1005.1

Mass per unit area:

Breezeblock wall.

300mm Thick

No. of test report: 008

Appendix C- Measuring Standards

The measurements were established according to the following standards:

BS EN ISO 10140-1:2016 Acoustics – Laboratory measurement of sound insulation of building elements – Part 1: Application rules for specific products.

BS EN ISO 10140-2:2010 Acoustics – Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation.

BS EN ISO 10140-4:2010 Acoustics – Laboratory measurement of sound insulation of building elements – Part 4: Measurement procedures and requirements.

BS EN ISO 10140-5:2010 +A1 2014 Acoustics – Laboratory measurement of sound insulation of building elements – Part 5: Requirements for test facilities and equipment.

BS EN ISO 717-1:2020 Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation.

BS EN ISO 12999-1:2020 Acoustics – Determination and application of measurement uncertainties in building acoustics– Part 1: Sound insulation.