Technical Report

Ref Number ***C/21387/R01a***

Date ***06 April 2011***

Project

The Laboratory Determination of The Random Incidence sound Absorption Coefficient of VertiQ Panels

Prepared for

Rockfon
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By

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SRL

1.0 Summary

Tests have been done in SRL's Laboratory at Holbrook House, Sudbury, Suffolk, to determine the sound absorption of VertiQ panels in accordance with BS EN ISO 354:2003.

From these measurements the required results have been derived and are presented in both tabular and graphic form in Test Certificate 6510a.

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
Holbrook House
Little Waldingfield
Sudbury
Suffolk
CO10 OTH

2.2 Test Dates

2 December 2010

2.3 Instrumentation and Apparatus Used

Make	Description	Type
E D I	Microphone Multiplexer Microphone Power Supply Unit	
Norwegian Electronics	Real Time Analyser	830
Brüel & Kjaer	12mm Condenser Microphones Windshields Pre Amplifiers Microphone Calibrator Omnipower Sound Source	4166 UA0237 2639, 2669C 4231 4296
Larson Davis	12mm Condenser Microphone	2560
Darton	Fortin Barometer	P411
Thermo Hygro	Temperature & Humidity Probe	
TOA	Graphic Equalizer	E-1231
QSC Audio	Power Amplifier	RMX 1450

2.4 References

BS EN ISO 11654:1997	Sound absorbers for use in buildings. Rating of sound absorption.
ATSM C423-01	Sound Absorption and sound Absorption Coefficients by the Reverberation Room Method
BS EN ISO 354:2003	Measurement of sound absorption in a reverberation room

2.5 Personnel Present

F Montalan	Rockfon

3.0 Description of Test

3.1 Description of Sample

VertiQ 1200x1200x40mm panels laid directly onto floor of test room.

Relevant BCCA sampling form; BCI-533-1817 dated 30/11/2010.
(copy in Appendix 3)

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

3.2 Sample Delivery date

25 November 2010

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 Test Certificate 6510a.

Results relate only to the items tested.

_____ *End of Text* _____

Appendix 1

Test Procedure

Measurements of Random Incidence Sound Absorption Coefficients to BS EN ISO 354:2003 - TP14 (Plane Absorbers)

In the laboratory, random incidence sound absorption coefficients are determined from the rate of decay of a sound field in a reverberation room, with and without a test sample installed. The rate of decay is described by the time a sound field takes to decay by 60dB, known as the reverberation time.

The reverberation room is constructed from 215mm brick, which is internally plastered with a reinforced concrete roof and floor. The reverberation room is rectangular, measuring 8.3 metres long, 6.7 metres wide, 5.4 metres high. The volume is 300m^3, the total surface area, 275m^2. From the ceiling hang 10 randomly positioned diffusers, each measuring 1.2m x 2.14m. The room is isolated from the surrounding structure by the use of resilient mountings and seals, ensuring good acoustic isolation.

Using at least two omnidirectional loudspeaker positions, broad band random noise is produced in the room using an electronic generator and power amplifier. When the amplification system is switched off, the decay of sound is filtered into one-third octave band widths and the reverberation times measured. This process is repeated for each of six microphone positions and the values arithmetically averaged to obtain a final value for each frequency.

The sample area should normally be between 10m^2 and 15.7m^2, this may be larger if it is suspected that the absorption properties will be low. The sample is laid on the floor of the reverberation room so that no part of it is closer than one metre from any edge of the boundaries. The procedure of measuring the reverberation times then repeated.

The sound absorption coefficients are calculated from the difference in decay rates for each frequency according to the formula:

$$\alpha_s = \frac{A_T}{S}$$

where

- α_s is the random incidence absorption coefficient
- A_T is the increase in equivalent sound absorption area of the test specimen (m^2)
- S is the area covered by the test specimen (m^2)

The equivalent absorption area of the test specimen is further defined as:

$$A_T = 55.3V\left(\frac{1}{c_{2T}T_2} - \frac{1}{c_1T_1}\right) - 4V(m_2 - m_1)$$

where

- V is the volume of the empty reverberation room (m^3)
- c_1 is the speed of sound in the empty room (m/sec)
- T_1 is the reverberation time in the empty room (sec)
- m_1 is the power attenuation coefficient calculated according to ISO 9613-1 using the climatic conditions that have been present in the empty rooms during the measurement.

c_2, T_2 and m_2 have the same meanings as c_1, $T_1$and m_1 but with the test specimen in the room.

It is occasionally found that the absorption coefficient derived in this manner reaches a value greater than unity. This is impossible, by definition, and investigation has shown that this anomaly is due to diffraction of the impinging sound waves at the edges of the sample. In practical terms this is insignificant.

Appendix 2

Measurement Uncertainty
BS EN ISO 354:2003 - TP14

1. Introduction

The estimated 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%.

Table 1: Uncertainty For Equivalent Absorption Area Measurement

Frequency, Hz	Expanded uncertainty K = 2, 95% % of A_1 or A_2
100	9.0
125	8.1
160	5.6
200	6.7
250	4.3
315	8.1
400	4.6
500	5.0
630	5.3
800	3.2
1000	3.5
1250	3.1
1600	2.8
2000	2.7
2500	2.2
3150	1.8
4000	1.6
5000	1.6

2. Estimation of Expanded Uncertainty For Sample Equivalent Sound Absorption Area

The expanded uncertainty, U_A,m^2 is estimated by using the following formulae:-

$$U_A=\sqrt{\left(\frac{uA_1}{100}\right)^2+\left(\frac{uA_2}{100}\right)^2}$$

where

U_A is the expanded uncertainty for the sample equivalent sound absorption area, for K = 2, 95%, m^2

u is the estimated expanded uncertainty for the equivalent sound absorption area, taken from Table 1 above, K = 2, 95%, % of A_1 or A_2

A_1 is the equivalent sound absorption area of the empty room, m^2

A_2 is the equivalent sound absorption area of the room with the sample, m^2

3. Estimation of expanded Uncertainty For Sound Absorption Coefficients

The expanded uncertainty for sound absorption coefficients, U_{α_s} , is estimated using the following formulae:-

$$U_{\alpha_s}=\frac{\alpha_s U_A}{A}$$

where

U_{α_s} is the expanded uncertainty for sound absorption coefficients, K=2, 95%

α_s is the sound absorption coefficient

U_A is the expanded uncertainty for the sample equivalent sound absorption area, K=2, 95%, m^2

A is the sample equivalent sound absorption area, m^2

Appendix 3 – Sampling Form

BELGIAN CONSTRUCTION CERTIFICATION ASSOCIATION asbl
BCCA

Founder : BBRI and SECO

SAMPLING FORM

Sampling is done by the manufacturer based on a prearranged sampling plan. Data concerning identification and traceability are handed over by the manufacturer to BCCA.

Product:	mineral wool, thermal insulation for buildings, EN 13162	Mark:	CE

File n° BCCA:	BC1-533-1817	Sampling n°:	/
		Date:	30/11/2010
Representative:	Marian Van den Bergh	Location:	Roermond (NL)
		Visit n°:	/

Manufacturer:	Rockwool Lapinus Productie BV	Contact person:	Kim Palmen
address:	Industrieweg 15 6045 JG Roermond Netherlands	Tel.:	0031 (0)475 353682
		Fax:	0031 (0)475 353681
		Email:	kim.palmen@rockfon.nl

Nature of samples:	Dimensions:	Identification:	Production date: (production code)
VertiQ Density 120 kg/m³	1200 x 1200 x 40 mm 2 boxes of 8 panels	BCCA	26/11/2010 Proef 257

	Tests	Test method	Number of tests	Dimensions of test samples	Identification
X	Sound Absorption	EN ISO 354 : 2003	1		BCCA

Laboratory:	Sound Research Laboratories Ltd to the attention of Mr A. Smalls Holbrook House Little Waldingfield Sudbury UK – Suffolk CO10 0TH
Test reports available before:	1/2/2011
Invoice must be send to:	Rockfon BV Industrieweg 15 NL – 6045 JG Roermond
Number of reports (+ language):	4 (ENGLISH)
Reports must be send to:	Marian Van den Bergh (BCCA) Kim Palmen (Rockfon BV)
Remarks:	

Representative BCCA:	Manufacturer: (2) for approval	Carrier: (3) For execution of the mission	Laboratory: (4) For reception of the samples and acception of the execution
Name *Marian Van den Bergh*	Name *Kim Palmen*	Name	Name Allen Smalls
signature	signature	signature	signature
date *30/11/2010*	date 30/11/2010	date	date 2/12/2010

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

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

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