

**Ben van Zyl** PhD MSc (Eng)

ACOUSTIC CONSULTING ENGINEER

T/A Acusolv

P O Box 70596

Die Wilgers

0041

Tel: 012 807 4924

Fax: 086 508 1122

*ben@acusolv.co.za*

542 Verkenner Ave ▶ Die Wilgers ▶ Pretoria

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Alutherm Thermal and Acoustic Blanket	Report No: G836-R1
Determination of random-incidence sound absorption coefficients	
For: Africa Thermal Insulations (Pty) Ltd	Issued: 27-May-2010

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## 1 Objective

To determine random-incidence sound absorption coefficients for an Alutherm Thermal and Acoustic Blanket.

## 2 Description of test sample

The test sample submitted for testing was specified as follows:

**Test Sample:** Alutherm

50 mm fibre glass blanket core with reflective foil facing one side and a bubble with aluminised plastic laminated to the other side

## 3 Test method

Sound absorption tests were conducted in accordance with ISO 354 "Measurement of sound absorption in a reverberation room".

### Test conditions

<b>Date of test</b>	: 27-May-2010	<b>Source positions</b>	: 3
<b>Test facility</b>	: SABS diffuse test chamber Groenkloof, Pretoria	<b>Microphone positions</b>	: 3
<b>Room volume</b>	: 217 m <sup>3</sup>	<b>Decays</b>	: 18
<b>Sample size</b>	: 11,32 m <sup>2</sup>	<b>Sound source</b>	: Impulse
<b>Mounting</b>	: Flat on floor No adhesive	<b>Excitation</b>	: Wide band
<b>Temperature</b>		<b>Temperature</b>	: 25 °C
<b>Relative humidity</b>		<b>Relative humidity</b>	: 32%
<b>Tested by</b>	: B G van Zyl	<b>Atmospheric pressure</b>	: 865 mb

### Test equipment

- 1 Brüel & Kjaer 2260 Modular Precision Sound Analyser SN 1875497
- 2 Brüel & Kjaer 4189 Measurement Microphone SN 1858498
- 3 Brüel & Kjaer BZ 7204 Building acoustics system software
- 4 Portable sound source - Loudspeaker with built-in power amplifier
- 5 Davis Weather Monitor II

Sound measuring equipment conforms to IEC 61672-1 Electro-acoustics – Sound Level Meters – Part 1: Specifications. Calibration: Calibration: De Beer Calibration Services Certificates No's 2009-336 & 2009-337

### Definition of the sound absorption rating determined in this test

Sound absorption coefficient is defined as the ratio of sound energy (or sound power) absorbed by a material and the energy (sound power) incident on it. It depends on frequency and on the angle of sound incidence. Under most practical conditions, i.e. inside buildings and in industrial environments, multiple reflections and reverberation result in sound incidence at all angles simultaneously. For this reason, it is desirable to test and rate the sound absorption performance of building materials in terms of the random-incidence sound absorption coefficient  $\alpha_r$ , defined as:

$$\alpha_r = \left( \frac{W_{abs}}{W_{In,r}} \right)$$

Where  $W_{abs}$  is the acoustic power absorbed by the material;

$W_{In,r}$  is the net sound power incident on the material.

The test is conducted in a diffuse reverberation test chamber excited with random pink noise. By measuring the reverberation times of the chamber with and without the sample, the sound absorption coefficients at a series of third-octave band centre frequencies are derived from

$$\alpha_r = \frac{55,3 V}{c S} \left( \frac{1}{T_2} - \frac{1}{T_1} \right)$$

Where  $V$  is the volume of the test chamber [ $m^3$ ];

$c$  is the speed of sound [ $m/s$ ];

$S$  is the surface area of the test sample [ $m^2$ ];

$T_2$  is the reverberation time of the room with the test sample;

$T_1$  is the reverberation time of the room without the test sample.

### NRC rating

For purposes of direct comparison of materials, the NRC coefficient is often used. This is a single value rating, calculated as the arithmetic average to the nearest multiple of 0,05, of the absorption coefficients at 250, 500, 1000 and 2000 Hz.

## 4 Test result

Random-incidence sound absorption coefficients determined in this test, are tabled and presented graphically in Figure 4.1.



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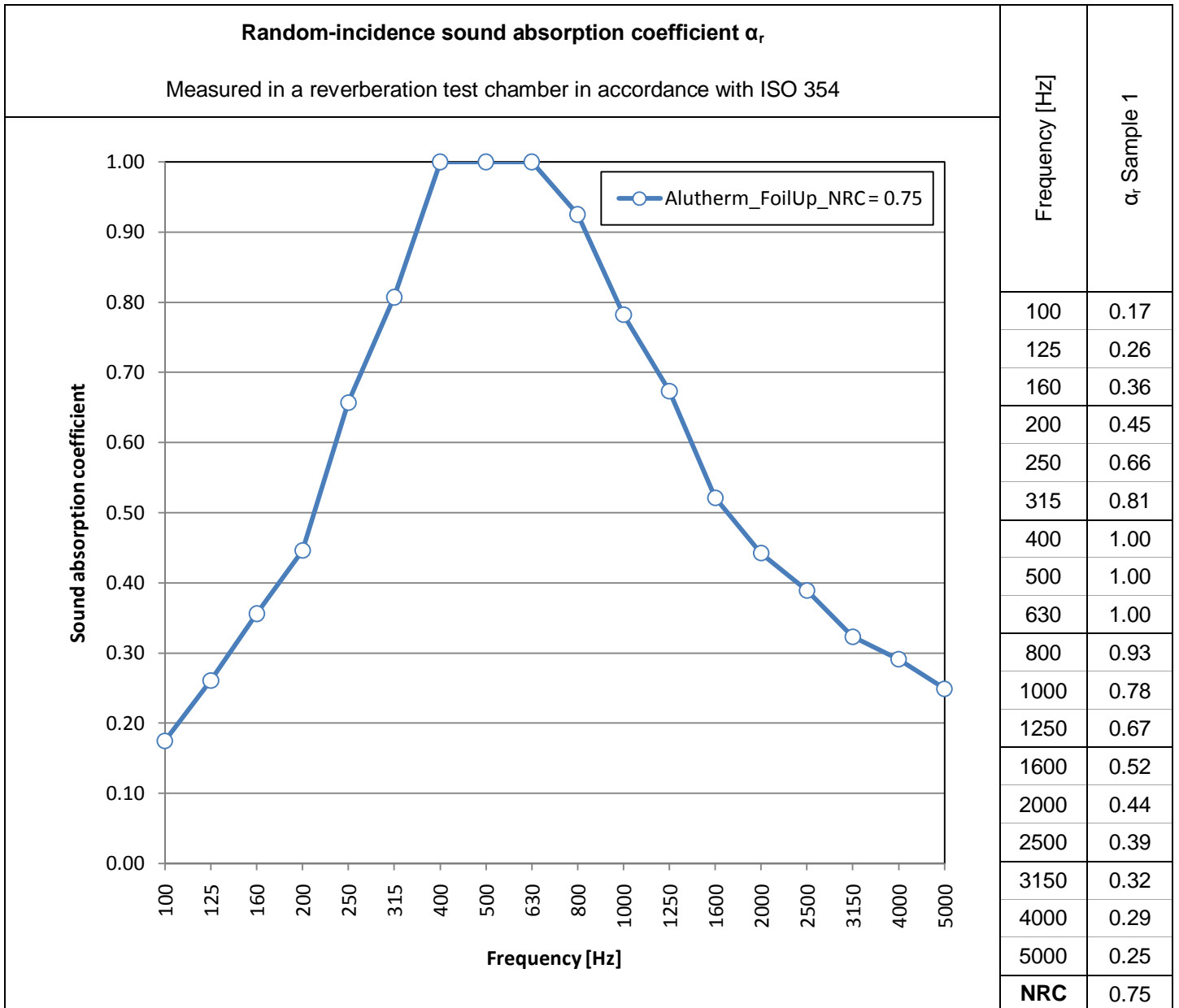


Figure 4.1

**Test Sample:** Alutherm  
50 mm fibre glass blanket core with reflective foil facing one side and a bubble with aluminised plastic laminated to the other side

<b>Date of test</b> :	27-May-2010	<b>Source positions</b> :	3
<b>Test facility</b> :	SABS diffuse test chamber Groenkloof, Pretoria	<b>Microphone positions</b> :	3
<b>Room volume</b> :	217 m <sup>3</sup>	<b>Decays</b> :	18
<b>Sample size</b> :	11,32 m <sup>2</sup>	<b>Sound source</b> :	Impulse
<b>Mounting</b> :	Flat on floor No adhesive	<b>Excitation</b> :	Wide band
<b>Tested by</b> :	B G van Zyl	<b>Temperature</b> :	25 °C
		<b>Relative humidity</b> :	32%
		<b>Atmospheric pressure</b> :	865 mb

## Curriculum Vitae

Barend Gideon van Zyl - ID No 4605105089082  
 P O Box 70 596, Die Wilgers, 0041; 542 Verkenner Ave, Die Wilgers, Pretoria

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Qualifications	Institution	Year Completed
(1) BSc (Eng) Elec	University of Pretoria	1970
(2) BSc (Eng) Hon Elec	University of Pretoria	1972
(3) MSc (Eng) (Cum Laude)	University of Pretoria	1974
(4) PhD	University of Natal	1986

MSc thesis: Sound intensity vector measurement

PhD thesis: Sound transmission analysis by measurement of sound intensity vector

### Professional registration and membership

- Southern African Acoustics Institute    Fellow (President 1994)    Member since 1974
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### Career

CSIR 1971 – 1989	<p>Join the Acoustics Division of the Council for Scientific and Industrial Research (CSIR) in 1971; Chief Specialist Research Engineer 1981 - 1989.</p> <ul style="list-style-type: none"> <li>Undertake basic and applied acoustic research &amp; development projects;</li> <li>Pioneer technique and instrumentation for measurement of sound intensity vector, leading to sponsored research &amp; consulting work in the Netherlands (TNO 1978) and Denmark (Brüel &amp; Kjaer 1981).</li> <li>Acoustic consulting engineering services rendered in the fields of building acoustics, industrial noise control, acoustic materials development &amp; environmental acoustics.</li> </ul>
Advena 1989 – 1990	<ul style="list-style-type: none"> <li>SA Space Programme: Manager Systems Integration &amp; Environmental Test Laboratories;</li> <li>Design and commissioning of ultra-high noise level simulation facilities for endurance testing of rocket launch vehicles, spacecraft, satellites, instrumentation and payload.</li> </ul>
SABS 1991 – 1994	<ul style="list-style-type: none"> <li>Acoustic consulting engineering services rendered to industry</li> <li>Building acoustics, industrial noise control and environmental acoustics.</li> </ul>
Private Practice Since 1995	<p>Private practice - Sole proprietor - Acoustic consulting engineering</p> <ul style="list-style-type: none"> <li>Noise studies; Environmental noise surveys; Blast noise measurement &amp; assessment</li> <li>Design &amp; problem solving: Building acoustics, Industrial &amp; machinery noise reduction, Vehicle noise reduction (road, rail &amp; air)</li> <li>Specialised services: Theoretical analysis &amp; design of multi-layered acoustic panels.</li> <li>SABS Laboratory &amp; field testing: Building systems and materials, Equipment &amp; machinery noise</li> </ul>

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### Papers and publications

- Several papers presented at international congresses and symposia.
- Several papers published in international acoustic journals, such as

*Journal of the Acoustical Society of America; Applied Acoustics; Noise Control Engineering Journal.*

- Several papers published in Southern African journals.

### Other

- Part-time lecturer: Architectural acoustics, Department of Architecture, University of Pretoria;
- Associate of and specialist advisor to SABS Laboratory for Sound and Vibration