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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

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

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

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

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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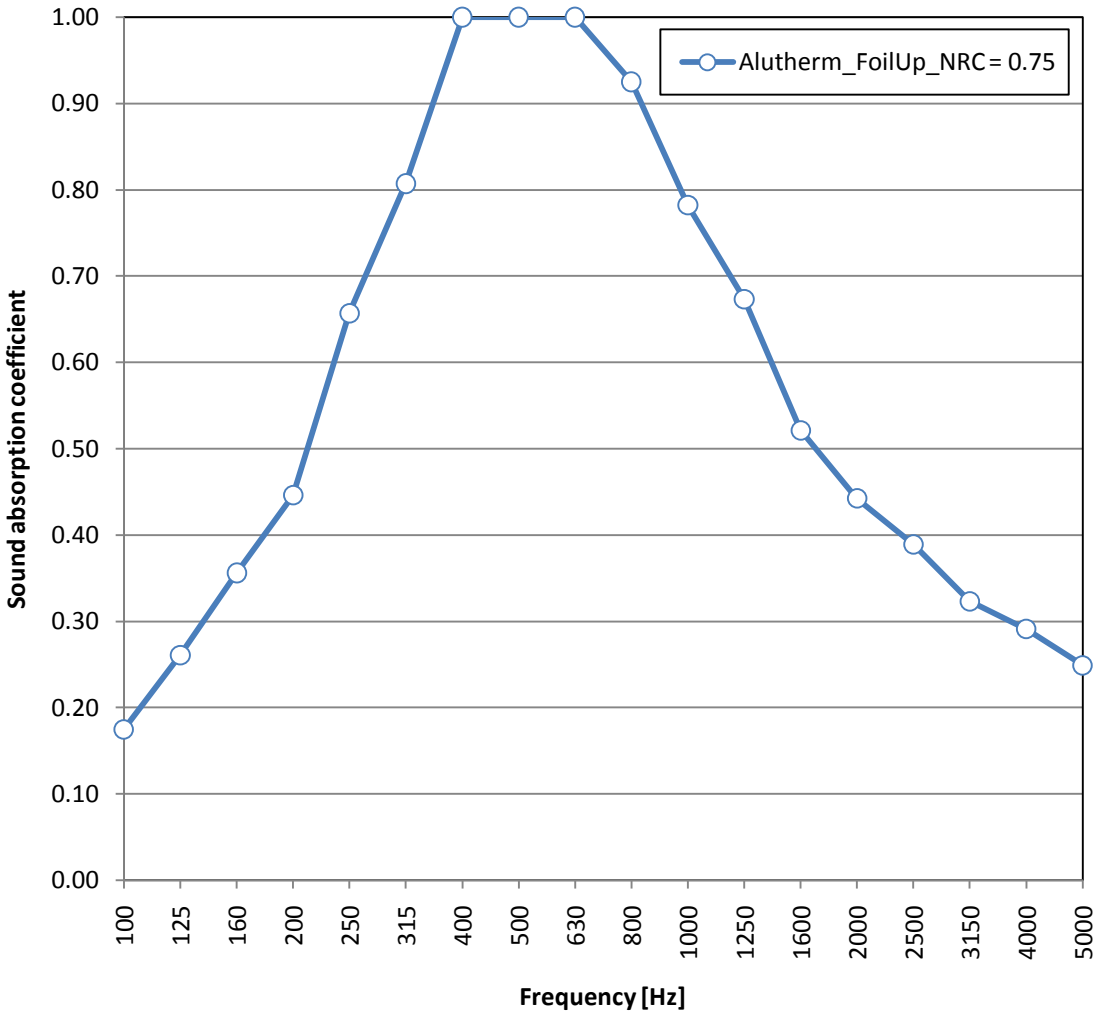
Acoustical Engineer

Random-incidence sound absorption coefficient α_r

Measured in a reverberation test chamber in accordance with ISO 354



Frequency [Hz]	α_r Sample 1
100	0.17
125	0.26
160	0.36
200	0.45
250	0.66
315	0.81
400	1.00
500	1.00
630	1.00
800	0.93
1000	0.78
1250	0.67
1600	0.52
2000	0.44
2500	0.39
3150	0.32
4000	0.29
5000	0.25
NRC	0.75

Figure 4.1

Test Sample: Alutherm

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		No adhesive	**Relative humidity**	:	32%
Tested by	:	B G van Zyl	**Atmospheric pressure**	:	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

	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

Career

CSIR
1971 – 1989

Join the Acoustics Division of the Council for Scientific and Industrial Research (CSIR) in 1971; Chief Specialist Research Engineer 1981 - 1989.

- Undertake basic and applied acoustic research & development projects;
- Pioneer technique and instrumentation for measurement of sound intensity vector, leading to sponsored research & consulting work in the Netherlands (TNO 1978) and Denmark (Brüel & Kjaer 1981).
- Acoustic consulting engineering services rendered in the fields of building acoustics, industrial noise control, acoustic materials development & environmental acoustics.

Advena
1989 – 1990

- SA Space Programme: Manager Systems Integration & Environmental Test Laboratories;
- Design and commissioning of ultra-high noise level simulation facilities for endurance testing of rocket launch vehicles, spacecraft, satellites, instrumentation and payload.

SABS
1991 – 1994

- Acoustic consulting engineering services rendered to industry
- Building acoustics, industrial noise control and environmental acoustics.

Private Practice
Since 1995

Private practice - Sole proprietor - Acoustic consulting engineering

- Noise studies; Environmental noise surveys; Blast noise measurement & assessment
- Design & problem solving: Building acoustics, Industrial & machinery noise reduction, Vehicle noise reduction (road, rail & air)
- Specialised services: Theoretical analysis & design of multi-layered acoustic panels.
- SABS Laboratory & field testing: Building systems and materials, Equipment & machinery noise

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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