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Alutherm	Report No: G701-R1
Determination of random-incidence sound absorption coefficients	
For Khanyisa Africa Development Co	Issued: 12-May-2008

1 Objective

To determine random-incidence sound absorption coefficients of an Alutherm sample.

2 Description of test sample

The test sample submitted for testing was specified as follows:

Sample 1: 50 mm Alutherm

50 mm thick 10 kg/m^3 polyester fibre, sandwiched between 16 µm aluminium foil (top) and a low density bubble membrane (bottom)

In a typical field installation, the blanket is laid with the bubble side facing down and the aluminium foil side facing up, i.e. exposed to the sound source.

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	:	6-May-2008	**Source positions**	:	2
Test facility	:	SABS diffuse test chamber	**Microphone positions**	:	6
Room volume	:	217 m^3	**Sound source**	:	Loudspeaker
Sample size	:	10,2 m^2	**Excitation**	:	Pink noise
Mounting	:	Flat on floor; foil up;	**Temperature**	:	22 °C
		no air gap; edges covered	**Relative humidity**	:	43%
Tested by	:	B G van Zyl	**Atmospheric pressure**	:	866 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: De Beer Calibration Services Certificate No 2007-1165.

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 white 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 are 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.

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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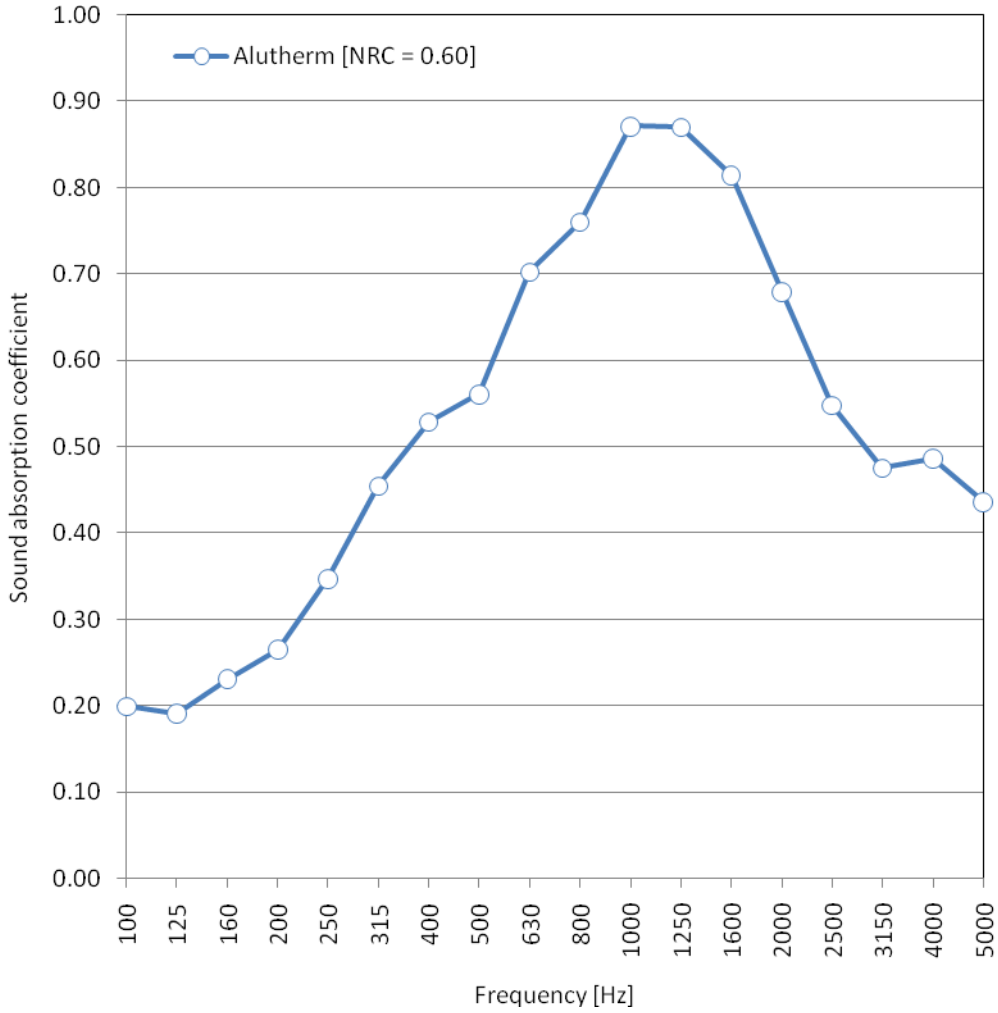
Acoustical Engineer

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	0.20
125	0.19
160	0.23
200	0.27
250	0.35
315	0.45
400	0.53
500	0.56
630	0.70
800	0.76
1000	0.87
1250	0.87
1600	0.81
2000	0.68
2500	0.55
3150	0.48
4000	0.49
5000	0.44
NRC	**0.60**

Figure 4.1

Sample 1: 50 mm Alutherm

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