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TEST REPORT No : 1772-1463 **DATE OF ISSUE : 9 July 2014**

BS EN ISO 354:2003
ACOUSTICS – MEASUREMENT OF SOUND ABSORPTION IN A REVERBERATION ROOM

CLIENT:	GIK Acoustics Europe Unit A Perseverance Mills Giles Street Wibsey BD6 3HS
JOB NUMBER:	ACOUS/01772
MANUFACTURER:	GIK Acoustics Europe
MODEL:	"Freestand 100 Corner Mount"
TYPE:	Non-standard, corner mounted panels
DATE RECEIVED:	6 May 2014
DATE OF TEST:	26 June 2014

Signed:.....
I G Rattigan
Laboratory Manager

Approved:.....
D J M^{c}Caul
Technical Manager

1 TEST SAMPLES

1.1 Description of Test Samples

Test Reference: **1772-1463**

Sample Reference: "Freestand 100 Corner Mount"

Sample Description: Corner mounted panels each with dimensions of 600 mm wide × 1800 mm long × 100 mm deep with a measured average weight of 8.9 kg. Each panel consisted of a timber frame containing a fibrous material panel. The faces and edges of the panel were covered by a cloth face. Eight panels were arranged at random by the client at the corners of the floor and walls of the reverberation room.

At the client's request, the additional frequencies 40 Hz, 50 Hz, 63 Hz, 80 Hz, 6.3 kHz, 8 kHz and 10 kHz were measured. Tabulated data for these additional frequencies can be found in Appendix A.

2 DESCRIPTION OF TEST PROCEDURE

2.1 Description of Test Facility

The tests were carried out in the large reverberation room at the University of Salford. The room has been designed with hard surfaces and non-parallel walls to give long empty room reverberation times with uniform decays. It has the shape of a truncated wedge. In addition 11 plywood panels, each panel 1.22m × 2.44m, were hung in the room to improve the diffusivity of the sound field. The test sample was placed in the centre of the floor. The excitation signal comprised wide band random noise played into the room via a loudspeaker system mounted in a cabinet facing a corner. The sound was monitored at each of 6 microphone positions. The room is 7.4m long × ~6.6m wide × 4.5m high with a volume of 220m^3 and a total surface area of 224m^2. The volume of the room permits a maximum sample size of 12.79m^2 to be tested, in accordance with Clause 6.2.1.1 in BS EN ISO 354: 2003, "Acoustics - Measurement of sound absorption in a reverberation room".

2.2 Test Procedure

The procedure followed that detailed in BS EN ISO 354. Measurements were made on the rate of decay of sound in the test chamber with and without the sample in place. The frequency range from 100Hz to 5000Hz[†] was covered in one-third octave bands. An average reverberation time was taken from five decays at each of six microphone positions for each of two loudspeaker positions (i.e. 60 decays per third octave band). The decays were produced by exciting the room with amplified wide band random noise and stopping the excitation once the chamber became saturated. The time taken for the sound to decay by 20dB is measured and tripled to give the reverberation time. In practice this was determined by sampling the decaying sound field on a one-third octave band frequency analyser and storing the spectrum in a computer every 32 milliseconds. The reverberation time was obtained from the arithmetically averaged decays at each frequency. The measurements with and without the sample in the room were carried out consecutively to avoid significant changes in relative humidity and temperature that influence air absorption at higher frequencies.

[†] At the client's request, the measured frequency response was 40 Hz – 10,000Hz

2.3 Calculation

At the request of the client, the equivalent sound absorption area, A_T of the test specimen were determined from the measured data by means of the equations below:

A_T is the equivalent sound absorption area of the test specimen (m^2)

$$A_T = A_2 - A_1 = 55.3V\left(\frac{1}{c_2 T_2} - \frac{1}{c_1 T_1}\right) - 4V(m_2 - m_1)$$

Where:

A_1 is the equivalent sound absorption area of the empty reverberation room (m^2).

A_2 is the equivalent sound absorption area of the room reverberation containing the test specimen (m^2).

V is the volume, in cubic metres, of the empty reverberation room:

c_1 is the propagation speed of sound at air temperature t_1;

c_2 is the propagation speed of sound at air temperature t_2;

T_1 is the mean reverberation times of the empty reverberation room in each frequency band (sec).

T_2 is the mean reverberation times of the reverberation room containing the test specimen in each frequency band (sec)

m_1 is the power attenuation, in reciprocal metres, using the climatic conditions that have been presented in the empty reverberation room.

m_2 is the power attenuation, in reciprocal metres, using the climatic conditions that have been presented in the reverberation room containing the test specimen.

(No correction is applied for the absorption of the surface covered by the test sample)

3 EQUIPMENT

	Departmental Record No
Norwegian Electronics 1/3 octave band real time analyser type 840 with in-built random noise generator	RTA2
Quad 510 power amplifier	PA7
2 of broadband loudspeakers (receiving room)	LS3-LS4
5 of Brüel &Kjær random incidence condenser microphone type 4166 in the receiving room	M7-M9 M18, M19
1 of G.R.A.S. random incidence condenser microphones type 40AP in the receiving room	M20
1 of Norsonic Multiplexers type 834A	MP2
HP Brio Pentium personal computer and related peripheral equipment (printer, plotter, monitor etc.)	COM6
Yamaha GQ1031BII graphic equalizer	GEQ1

4 RESULTS

The random incidence sound absorption coefficients are given in the table(s) overleaf.

Reverberation Room Volume:	220 m²
Number of Samples:	8
Panel Dimensions:	600 × 1800 × 100 mm
Temperature Sample Out:	22.7 °C
Relative Humidity Sample Out:	45.6 %
Temperature Sample In:	22.6 °C
Relative Humidity Sample In:	45.0 %

The results here presented relate only to the items tested and described in this report.

BS EN ISO 354:2003

Acoustics - Measurement of absorption in a reverberation room

Client: GIK Acoustics Europe
Unit A, Perseverance Mills
Giles Street, Wibsey
BD6 3HS

Object: "Freestand 100" Corner Panels

Please note that this test report is not UKAS accredited

Number of Samples: 8

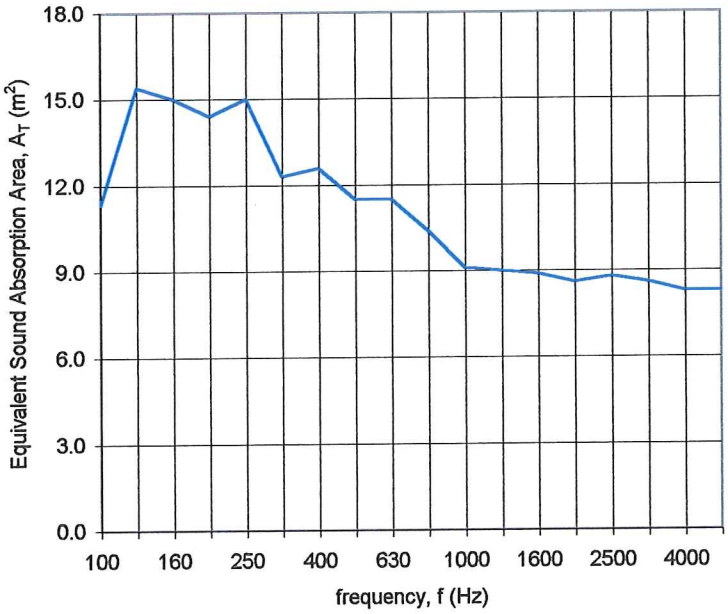
Receiving room:

Volume: 220 m^3
Condition: clean
Type: large reverberation room
Location: acoustic transmission suite

Sample out: Temperature [°C]: 22.7 Humidity [%]: 45.6
Sample in: Temperature [°C]: 22.6 Humidity [%]: 45.0

Equivalent Sound Absorption Area A_T

Frequency Hz	A_T m^2
100	11.3
125	15.4
160	15.0
200	14.4
250	15.0
315	12.3
400	12.6
500	11.5
630	11.5
800	10.4
1000	9.1
1250	9.0
1600	8.9
2000	8.6
2500	8.8
3150	8.6
4000	8.3
5000	8.3



Test reference number: 1772-1463 Date: 26/06/14

University of Salford, School of Computing, Science & Engineering *SSV1*

BS EN ISO 354:2003

Acoustics - Measurement of absorption in a reverberation room

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Unit A, Perseverance Mills
Giles Street, Wibsey
BD6 3HS

Object: "Freestand 100" Corner Panels

Please note that this test report is not UKAS accredited

Number of Samples: 8

Receiving room:

Volume: 220 m^3
Condition: clean
Type: large reverberation room
Location: acoustic transmission suite

Sample out: Temperature [°C]: 22.7 Humidity [%]: 45.6
Sample in: Temperature [°C]: 22.6 Humidity [%]: 45.0

Equivalent Sound Absorption Area A_T

Frequency Hz	A_T m^2	T1 s	T2 s				
100	11.3	4.22	1.80				
125	15.4	4.03	1.46				
160	15.0	3.91	1.47				
200	14.4	3.50	1.44				
250	15.0	3.77	1.45				
315	12.3	4.21	1.71				
400	12.6	4.37	1.71				
500	11.5	4.66	1.85				
630	11.5	4.69	1.86				
800	10.4	4.68	1.97				
1000	9.1	4.54	2.09				
1250	9.0	4.34	2.06				
1600	8.9	4.02	2.00				
2000	8.6	3.70	1.94				
2500	8.8	3.28	1.80				
3150	8.6	2.83	1.67				
4000	8.3	2.32	1.49				
5000	8.3	1.84	1.28				

Test reference number: 1772-1463 Date: 26/06/14

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APPENDIX A

At the client's request, the following additional frequencies were measured.

Frequency [Hz]	A_T	T_1 [s]	T_2 [s]
40	1.1	9.23	7.13
50	1.1	7.89	6.26
63	3.4	5.81	3.71
80	6.3	5.65	2.82
6,300	8.5	1.62	1.16
8,000	9.6	1.17	0.88
10,000	8.9	0.83	0.68