CSIRO ACOUSTIC MEASUREMENT REPORT

Commonwealth Scientific and Industrial Research Organisation, Infrastructure Technologies
Acoustics Testing Laboratory, Gate 5, 2 Normanby Road, Clayton, Vic 3168 Australia

Report No:
AC208-01-1

Client: Woven Image Pty Ltd
37-39 Chard Road, Brookvale, NSW 2100

Measurement Type: Sound Absorption

AS ISO 354–2006 *"Acoustics–Measurement of sound absorption in a reverberation room"*
AS ISO 11654–2002 (ISO 11654:1997) *"Acoustics–Rating of sound absorption–Materials and systems"*

Test Specimen

[Specimen area: 3.624 x 2.802 m, = 10.2 m^2]

Name: Terrain Wall Panelling

Description:
- Semi-rigid felt sheets, 50% Flax, 50% Polypropylene
- Sheet size 2.802 x 1.208 m x 2.5 mm thick
- Mass per unit area 0.62 kg/m^2

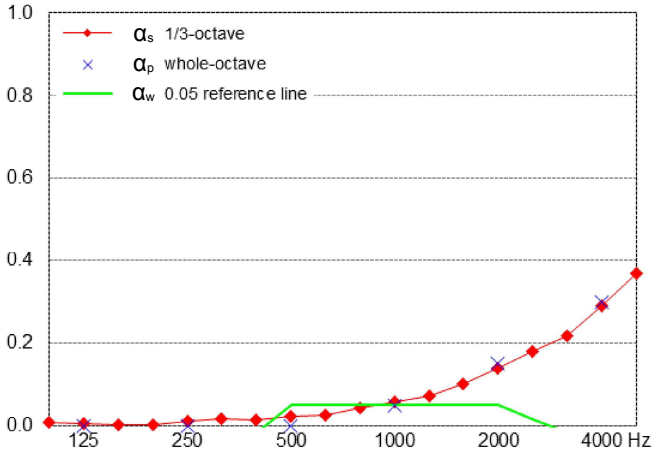
Installation:
- The floor of the laboratory was swept and vacuumed to remove dust.
- The test specimen, in the form of three identical sheets, having been left unrolled and lying flat for a week, was laid directly on the concrete floor of the reverberation chamber, sheets butted tightly against each other with no gaps between them.
- Upon inspection, it was apparent that a small air cavity existed between the concrete floor and the specimen in some areas; double sided adhesive film of minimal thickness was used to as required to stick the specimen down and eliminate such air cavities.
- The laboratory elected not to place any skirting material around the perimeter of the test specimen; the perimeter area being only 0.3 % of the exposed face area.
- Installation was carried out by the laboratory.
- Empty room measurement was carried out immediately after removing the test specimen.

Test specimen arranged for test

Close up view of specimen face and edge

Measurement Details & Results

Freq	Absorption coefficient		Reverberation times, T_{60} (sec)	
Hz	α_s	α_p	Empty room	with Specimen
100	0.01		5.84	5.76
125	0.01	0.00	7.05	6.94
160	0.00		6.73	6.67
200	0.00		6.81	6.76
250	0.01	0.00	6.52	6.35
315	0.02		6.56	6.34
400	0.01		6.22	6.05
500	0.02	0.00	5.86	5.64
630	0.03		5.90	5.63
800	0.04		5.52	5.13
1000	0.06	0.05	5.28	4.83
1250	0.07		4.80	4.33
1600	0.10		4.32	3.81
2000	0.14	0.15	3.93	3.36
2500	0.18		3.44	2.89
3150	0.22		3.12	2.58
4000	0.29	0.30	2.59	2.10
5000	0.37		2.11	1.70



Performance Indices[2,3]
α_w = 0.05 (H)
SAA = 0.06
NRC = 0.05

Measurement Conditions

	Empty room	with Test Specimen
Date of measurement:	17 Nov 2016	17 Nov 2016
Temperature & humidity:	18 °C, 64 % R.H.	18 °C, 64 % R.H.
Atmospheric pressure:	1005 mBar	1005 mBar

Notes, Deviations etc

1. The required 12 spatially independent decay curves came from ensemble averaging 10 successive decays with each of 3 different source loudspeaker positions, all sampled by 4 fixed microphones, using linear averaging.
2. Shape indicators (L, M, and H), if any, accompanying the α_w index, signify absorption coefficients (α_p) exceeding the α_w reference value by 0.25 or more in the Low, Medium or High frequency ranges respectively.
3. SAA and NRC are defined in ASTM C423; laboratory requirements for which differ from AS ISO 354.
4. Physical characteristics of materials may be as per client or supplier's advice; not necessarily verified by CSIRO.
5. The laboratory elected to install the test specimen parallel with the walls of the room.
6. The exposed perimeter area has been included in the area of the test specimen used in calculations.

Issuing Authority

Signed: .....
David Truett
Date: 20 January 2017

Instrumentation

Real time analyser: • Brüel & Kjær PULSE LAN-XI type 3160-A-4/2
Microphones/preamps: • 2 x GRAS 40AP & 2 x Brüel & Kjær 4134 microphones, all on Brüel & Kjær 2669 preamps, positioned in the room as per AS ISO 354
Noise source: • Rola 12UX on flat 1m^2 baffle (up to 1.8 KHz)
• Brüel & Kjær type HP 1000 dodecahedron (from 1.8 KHz)
Calibration: • Brüel & Kjær type 4228 Pistonphone: Feb 2016 (NATA cal)
• Analyser: Feb 2016 (NATA cal)

Laboratory Construction

Reverb room: • 300 mm thick concrete (closed off from the adjoining room by a wall with a medium density fibreboard face)
• parallelepiped with dimensional proportions 1:1.3:1.6 for distribution of room modes • approx 202 m^3 total room volume • approx 215 m^2 surface area excluding diffusers
Diffusers: • 20 stationary diffusers, approx. 40 m^2 total surface area
Absorption area: • in accordance with AS ISO 354 unless noted otherwise

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