

Client: Woven Image Pty. Ltd.
37-39 Chard Road, Brookvale, NSW 2766 Australia

Measurement Type: Sound Absorption

AS ISO 354 (2006, R2016) *Acoustics—Measurement of sound absorption in a reverberation room*
AS ISO 11654 (2002, R2016) *Acoustics—Rating of sound absorption—Materials and systems*

Test Specimen [Specimen area: 3.658 x 2.804 m (10.257 m²)]

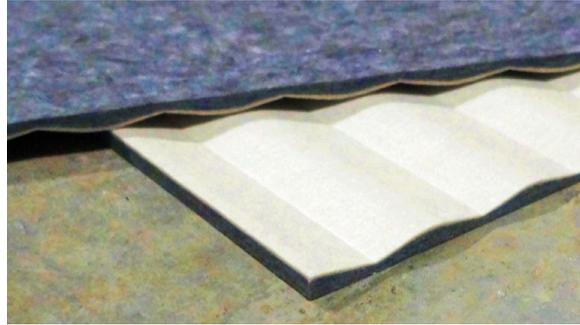
Description: Woven Image 'Zen Panel - 9 mm',
installed directly against the room surface.

Details³

- Product designation: Zen Panel - 9 mm
- Description: PET panel, embossed/thermoformed design single side
- Composition: 100% PET (60% recycled)
- Physical characteristics: panel size 2800 x 1130 mm, x 9 mm thick, area density 2475 gsm.
- Embossed/Thermoformed pattern: undulating, saw-tooth pattern with a 9 mm peak thickness and a 5 mm thickness at the troughs; 50 mm between peaks/troughs.

Installation

- The reverberation chamber was swept and vacuumed prior to testing.
- Three full panels and a 270 mm section (cut parallel to the 2800 mm dimension) were laid directly on the concrete floor of the chamber with the embossed/thermoformed face up, arranged in a rectangle 9° off parallel with the walls of the chamber.
- The panels were carefully aligned with each other and pushed tightly together. No curl was observed in the panels, allowing them to rest flat against the floor of the chamber.
- The perimeter edges of the test specimen were covered with a skirt of 1 mm thick folded steel angle, 10 mm high. Skirting members were pushed against the edges of the specimen panels; pushing the panels against each other and minimising gaps at the skirt.
- Specimen installation was carried out by laboratory staff.



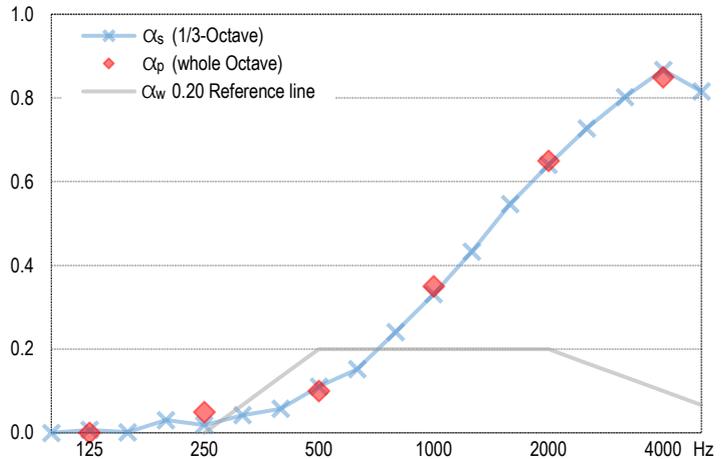
Close-up showing embossed face, backing and edge profile of panel



Test specimen installed for testing

Measurement Details & Results

Freq Hz	Absorption coefficients			Reverberation times, T ₆₀ (sec)	
	α _s	α _p	95% Conf (δ)	Empty room	with Specimen
100	0.00		0.05	6.08	6.22
125	0.01	0.00	0.04	6.68	6.59
160	0.00		0.02	6.81	6.79
200	0.03		0.03	6.46	6.09
250	0.02	0.05	0.04	5.75	5.57
315	0.04		0.02	6.71	6.17
400	0.06		0.02	6.61	5.91
500	0.11	0.10	0.02	6.31	5.18
630	0.15		0.03	5.84	4.57
800	0.24		0.03	5.50	3.90
1000	0.33	0.35	0.03	5.31	3.43
1250	0.43		0.03	4.64	2.85
1600	0.55		0.04	4.10	2.42
2000	0.64	0.65	0.03	3.61	2.10
2500	0.73		0.04	3.22	1.87
3150	0.80		0.03	2.80	1.65
4000	0.87	0.85	0.04	2.28	1.42
5000	0.82		0.05	1.80	1.24



Performance Indices^{1,2}

α_w = 0.20 (H)
SAA = 0.28
NRC = 0.30

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.

Measurement Conditions:

	Empty room	with Test Specimen
Date of measurement:	2 Dec 2019	2 Dec 2019
Temperature & humidity:	15 °C, 51 % R.H.	15 °C, 53 % R.H.
Atmospheric pressure:	990 mBar	990 mBar

Notes, Deviations etc

1. Shape indicators (L, M, and H), if any, following the α_w index, indicate α_p values above the reference contour by ≥ 0.25 in the Low, Medium or High frequency ranges respectively; it is strongly recommended to use this single number rating in combination with the complete sound absorption coefficient curve.
2. SAA and NRC are defined in ASTM C423; laboratory requirements for which differ from AS ISO 354.
3. Physical characteristics of materials may be as per client or supplier's advice; not necessarily verified by CSIRO.

Issuing Authority

Signed:
Date: 9 December 2019

Instrumentation

Real time analyser: • Brüel & Kjær PULSE LAN-XI type 3160-A-4/2
Microphones/preamps: • 2 x GRAS type 40AP and 2 x B&K type 4134 microphones, all on B&K type 2669 preamps, in 4 fixed positions as per AS ISO 354
Noise source: • Room populated with three decahedron loudspeakers; 2 Norsonic NOR276 & 1 x B&K 4296), driven in turn by a Norsonic NOR280 power amplifier.
Calibration: • Analyser: July 2018 (NATA cal)

Laboratory Construction

Reverb room: • 300 mm thick concrete (closed off from the adjoining room by an MDF Wall) • parallelepiped with dimensional proportions 1:1.3:1.6 for distribution of room modes • approx 202 m³ total room volume • approx 215 m² surface area excluding diffusers
Diffusers: • 20 stationary diffusers, approx 40 m² total surface area
Absorption area: • in accordance with AS ISO 354, unless noted otherwise