

MEASUREMENT OF THE SOUND ABSORPTION IN A REVERBERATION CHAMBER

Cathedral Educational Pinboard

Report No. ALA 22-094-1

Tested to AS/ISO 354-2006

7 October 2022



For

Cathedral Office Products
21 Challenge Boulevard
WANGARA WA 6065

CONTENTS

Page

1.	TEST OBJECTIVE	3
2.	TEST SPECIMEN	
	2.1 Description of Test Specimen	3
	2.2 Installation of Specimen	3
3.	TEST FACILITIES	
	3.1 Reverberation Rooms	3
	3.2 Temperature / Humidity	3
4.	TEST PROCEDURE	
	4.1 Generation of Sound Field	4
	4.2 Measurement of Signal	4
	4.3 Test Equipment	4
5.	RESULTS	
	5.1 Results	4
6.	PHOTOS	6
7.	DATA SHEET	
	7.1 Sound Absorption Coefficients – Data Sheet	7

Rev No.	Rev Date	Revision Description	Prep by
Draft	7 October 2022	Issued for Client Review	N Gabriels
Initial	20 October 2022	Issued to client	N Gabriels

The report tester and author is a Fellow of the Australian Acoustical Society.

Disclaimer – The information contained within this report is solely for the use of the client identified on the cover page. The results reported above apply to the specific specimen as tested. No responsibility is assumed for performance of any other specimen.

The report is based on a specific Specimen as supplied, installed and described by the client and tested by Acoustic Laboratories Australia Pty Ltd. To the extent permitted by law, Acoustic Laboratories Australia Pty Ltd (including its directors and employees) excludes all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and any other compensation arising directly or indirectly from using any information or material contained in this document. Results relate only to the items tested. This report may only be distributed in its entirety

1. TEST OBJECTIVE

Cathedral Office Products commissioned Acoustic Laboratories Australia to measure the sound absorption performance of their Cathedral Educational Pinboard. Testing was carried out on 29th September 2022. The test was carried out at the Heafod Laboratory facility in Bayswater, Western Australia.

The sound absorption coefficients are determined from the surface area of the specimen and the reverberation times in the Reverberation Chamber with the room both empty and with specimen under test. The test was carried out in general accordance with Australian Standard AS / ISO 354-2006, *Acoustics – Measurement of Sound Absorption in a Reverberation Room*.

2. TEST SPECIMEN

2.1 Description of Test Specimen:

Details of the tested Cathedral Educational Pinboard as advised by client are:

- Vertiface fabric
- 12mm Softboard
- 3mm MDF Backing

2.2 Installation of the Specimen:

The specimen was installed on the concrete floor of the Reverberation Room floor– Type A Mounting in accordance with AS / ISO 354-2006 Annex B *Test Specimen Mountings for Sound Absorption*. The perimeter edge of the specimen was not covered as per normal installation practice in the field.

The specimen was arranged to be a minimum 1 metre from any boundary wall of the room, and not parallel to the walls of the room as required by the AS/ISO 354 Standard.

The specimen size was 3,600 mm x 3,000 mm. Total area 10.8m².

The empty room reverberation time was measured with the Specimen removed from the Reverberation Room.

3. TEST FACILITIES

3.1 Reverberation Room

3.1.1 *Volume and Shape:* The reverberation room is a parallelepiped room with a volume of 208m³. The shape of the room complies with the requirements of Clause 6 of AS/ISO 354. The room is constructed of reinforced concrete and is structurally isolated from adjoining areas.

3.1.2 *Acoustic Diffusion:* Sound diffusion is achieved by the location of large 19mm thick structural ply panels randomly oriented and freely suspended. A total of 6 panels of 1.44 m² each, and 5 panels of 2.88m² each are provided. Total area (two sided) of panels is 46 m². Acoustic diffusion meets the requirements of Annex A of AS/ISO 354. Total area of acoustic diffusers (both sides) is 22% of total surface area.

3.2 Temperature / Humidity

The temperature and relative humidity conditions during the test were:

Reverberation Chamber with Specimen		Reverberation Chamber Empty	
Temperature.	Rel. Humidity	Temperature.	Rel. Humidity
21.8°C	54 %	22.6°C	53 %

4. TEST PROCEDURE

4.1 Generation of the Sound Field

The test procedure involves generating a noise source fed to loudspeakers located in the trihedral corners of the Reverberation Chamber. The internal noise source of the Bruel and Kjaer 2270 Analyser is used as the noise source. The noise source is interrupted and the decay of sound measured in each of the one third octave bands. Four loudspeaker positions are used in the measurement procedure.

4.2 Measurement of Signal

Microphone Positions: A single microphone was used for the measurement. 5 microphone positions were used in conjunction with the 4 sound source positions. 6 sound decays are obtained at each microphone / source position; this represents 20 independent source / microphone positions, a total of 120 decays at each frequency. Microphone positions were selected to comply with requirements of AS/ISO 354.

Averaging: Results of the six sound decays at each of the 20 source / microphone positions were ensemble averaged. The results for the 20 source / microphone positions were then arithmetically averaged. The Reverberation Time was evaluated over a 20 dB range.

4.3 Test Equipment

- B&K Analyser Type 2270 Serial No 2644641 – (Cal: 22/03/22)
- B&K Microphone Type 4189 Serial No 3100167 - (Cal: 22/03/22)
- Norsonic Nor1256 Calibrator Serial No 125626205 - (Cal: 4/08/22)
- Yamaha Power Amp. P5000S Serial No.ACQX01003 390W - 8 Ω / channel
- Behringer Xenyx Q802 Serial No.S210300550575
- Norsonics Nor276 Dodehedron Speakers Serial No. 2766236 and 2766237
- Vaisla HM34C Humidity & Temperature Meter Serial No: V2910014

The acoustic measuring equipment has been calibrated by an independent NATA registered laboratory and is in current calibration.

5. RESULTS

5.1 Results

The results for the specimen tested are set out in the attached data sheet. The Reverberation Time at each frequency for the empty room, and the room with the specimen installed are provided. Also shown in Data Sheet is the sound absorption coefficient of the specimen with centre frequencies from 100 Hz to 5000 Hz.

5.1.1 *1/3 Octave Band Data:* The measured 1/3 octave band Sound Absorption Coefficients for the specimen as determined are set out below

Measured Sound Absorption Coefficients in 1/3 Octave Bands						
Frequency (Hz)	125	250	500	1k	2k	4k
Sound Absorption Coefficient (α)	0.04	0.12	0.25	0.49	0.51	0.65
	0.09	0.16	0.34	0.48	0.57	0.70
	0.11	0.20	0.43	0.47	0.59	0.69

5.1.2 *Octave Band Data:* The practical octave band Sound Absorption Coefficients for the specimen have been determined from the tested 1/3 octave band in accordance with AS ISO 11654-2002 *Acoustics – Rating of Sound Absorption – Materials and Systems*

Practical Sound Absorption Coefficients in Octave Bands						
Frequency (Hz)	125	250	500	1k	2k	4k
Sound Absorption Coefficient (α_w)	0.08	0.16	0.34	0.48	0.56	0.68

5.1.3 *Weighted Sound Absorption Coefficient (α_w):* The Weighted Sound Absorption Coefficient was determined in accordance with the procedure in the Standard AS/ISO11654 *Acoustics – Sound absorbers for use in buildings – Rating of sound absorption*. The Weighted Sound Absorption Coefficient is determined by fitting a weighted reference curve over the Practical sound absorption coefficients for the 250Hz to 4,000Hz octave bands. If the absorption coefficients in the Low, Middle, or High frequencies are significantly above the reference curve the Letters L, M or H are placed after the weighted sound absorption coefficient to indicate improved performance in this region of the frequency spectrum.

The AS/ ISO 11654 standard strongly recommends to use this single number rating in combination with the complete sound absorption curve.

Weighted Sound Absorption Coefficient (α_w): 0.40 H

5.1.4 *Sound Absorption Average (SAA):* The Sound Absorption Average was determined in accordance with ASTM C423-17: “Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method”. The Sound Absorption Average is the average of the 12 one-third octave bands from 200 to 2,500 Hz. Calculations are based on sound absorption coefficients measured to AS/ISO 354

Sound Absorption Average (SAA): 0.38

5.1.5 *Noise Reduction Coefficient (NRC):* The Noise Reduction Coefficient is superseded by SAA in the current standard. The current version of the Standard, ASTM C423-17 requires the NRC to be reported to provide comparison with values in the past.

The Noise Reduction Coefficient (NRC) was determined in accordance with ASTM C423-09a: "Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method". The NRC is determined by taking the arithmetic average of the absorption coefficients in the 250, 500, 1,000 and 2,000Hz bands.

Noise Reduction Coefficient (NRC): 0.40

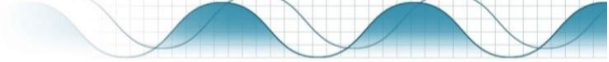
6. PHOTOS



Cathedral Educational Pinboard on floor of Reverberation Chamber - Type A Mounting

Test & Report by:

Norbert Gabriels B.Arch F.A.A.S.



SOUND ABSORPTION COEFFICIENT

Unit 3/2 Hardy Street
 South Perth 6151
 Tel: 9474 4477
 Fax: 9474 5977

ALA Test No.: ALA 22-091-1
Client: Cathedral Office Products
Specimen: Cathedral Educational Pinboard

Tested To: AS ISO 354
Meas. Date: 29-Sep-22

Description of Specimen:
 Cathedral Educational Pinboard
 Vertiface Fabric
 12mm softboard
 3mm MDF Backing

Specimen Installation
Specimen size: 10.8 m2
Test Specimen Mounting: Type: A
Air Gap behind Specimen: 0 mm
Location of Specimen: Floor central

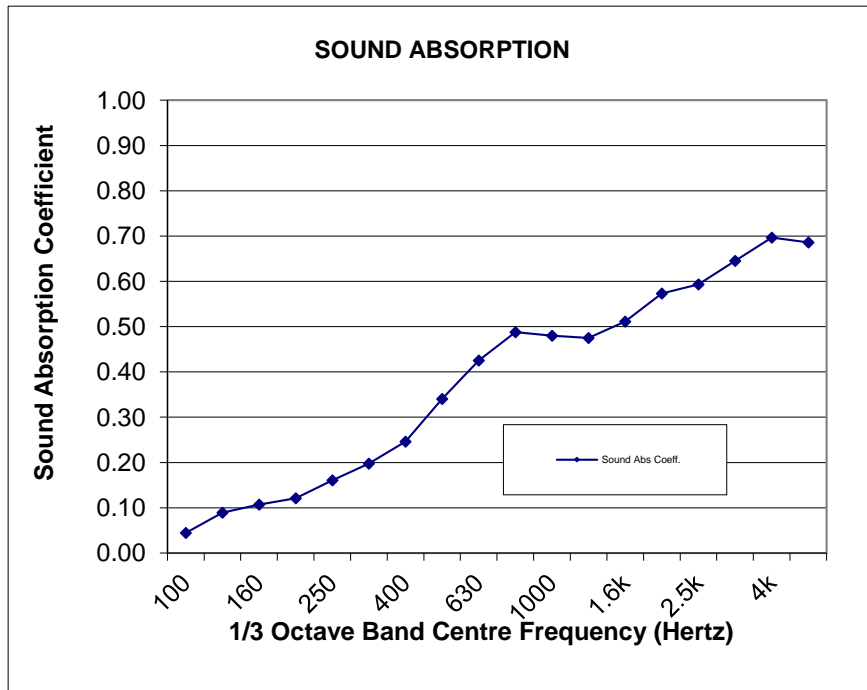
Test Facility
Shape of Reverb Chamber: 7m x 6m x 5m
Volume of Reverb Chamber: 208 m3
Area of Diffusers: 46.1 m2

	Specimen in Room	Empty Room	
Temp:	21.8	22.6	C
RH:	54.0	53.0	%

1/3 Octave Centre Frequency	RT for Empty Room	RT for room with Sample	Sound Absorption Coefficient
Hz	Sec.	Sec.	

Weighted Sound Absorption Coefficient: α_w **0.40** * * H
Sound Absorption Average: **SAA: 0.38**
Noise Reduction Coefficient: **NRC: 0.40**

100	6.55	5.99	0.04
125	7.94	6.46	0.09
160	8.05	6.29	0.11
200	7.84	6.00	0.12
250	7.88	5.59	0.16
315	8.79	5.62	0.20
400	8.93	5.21	0.25
500	8.60	4.41	0.34
630	7.24	3.62	0.43
800	5.98	3.07	0.49
1k	4.80	2.74	0.48
1.25k	4.11	2.52	0.47
1.6k	3.78	2.32	0.51
2k	3.56	2.14	0.57
2.5k	3.18	1.97	0.59
3.15k	2.77	1.75	0.65
4k	2.25	1.49	0.70
5k	1.86	1.31	0.69



This report must not be reproduced or reviewed, except in full