

Client: Bailey Interiors Pty Ltd
83-85 Boundary Road, Mortdale, NSW 2223

Measurement Type: Sound Absorption

AS ISO 354-2006 [R2016]: *Acoustics-Measurement of sound absorption in a reverberation room*
AS ISO 11654-2002 [R2016] (ISO 11654:1997): *Acoustics-Rating of sound absorption-Materials and systems*

Test Specimen [Specimen area: 3.6 x 3.0 m (10.8 m²)]

Description: • Bailey "Moon" drop-in ceiling tiles, • in 600 mm grid, • with black tissue faced glass fibre batt fixed to rear of each tile, open to the cavity airspace (Type E-200)

Tile and Batt Details³

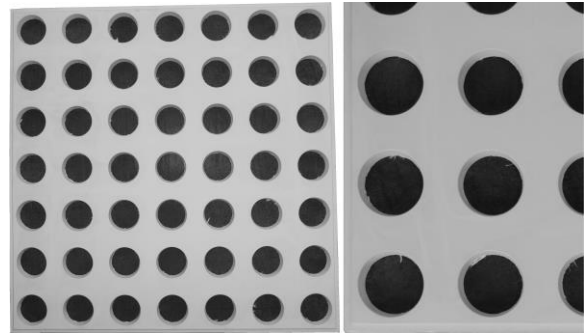
- Moulded plaster ceiling tiles designed to drop into a standard 600 mm suspended ceiling grid.
- Perforated with a regular pattern of 49 circular holes (7 x 7 array), opening into a black tissue-faced glass fibre batt behind (stapled to the rear of the tile). Hole size was approx 54 mm at the face, tapering to 50 mm at the rear, positioned at approx 84 mm centres.
- Open area percentage⁴ (estimated): 31.2 % (based on mouth area at face); 26.7 % (based on throat area at rear of tile).
- Each tile was fitted with a black tissue-faced semi rigid high-density CSR Bradford glass fibre batt, approx 590 x 590 x 20 mm (nom 32 kg/m³); factory-stapled to the rear of the tile.

Installation

- The test specimen was installed as an upside-down ceiling on the floor of the chamber.
- A 200 mm deep enclosure (32 mm MDF timber, approx 23 kg/m², built to surround an area of 3600 x 3000 mm) was placed on the floor of the chamber at an 11° angle to the chamber walls (not parallel, as per AS ISO 354 cl6.2.1.2). All enclosure edges and junctions were taped.
- A system of extruded aluminium profiles (all solid, not hollow) and plastic support pieces was set up inside the enclosure to support the tiles with their edges nominally flush with the enclosure. The cavity behind was a single undivided cavity without internal partitions.
- Tiles were arranged in a 6 x 5 array on the support system.
- Tee sections were placed on top to cover the gaps between adjacent tiles, equivalent to a normal ceiling installation. The perimeter of the installed test specimen was taped with masking tape to seal between the tiles and the enclosure at the perimeter.
- Specimen installation was carried out by laboratory staff.



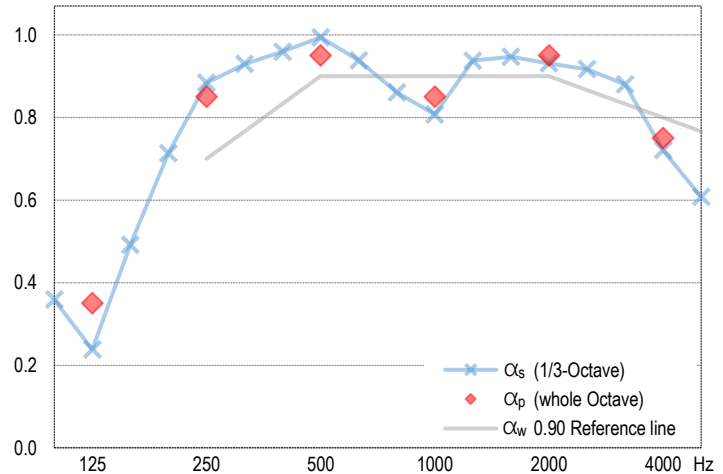
Test specimen installed for testing (image inverted to depict ceiling installation)



Tile details – Left: whole tile, Right: close-up view

Measurement Details & Results

Freq Hz	Absorption coefficients			Reverberation times, T ₆₀ (sec)	
	α _s	α _p	95% Conf (δ)	Empty room	with Specimen
100	0.36		0.07	5.13	3.19
125	0.24	0.35	0.04	6.60	4.35
160	0.49		0.06	6.48	3.16
200	0.71		0.08	5.80	2.45
250	0.88	0.85	0.05	5.20	2.07
315	0.93		0.09	6.22	2.14
400	0.96		0.05	6.19	2.10
500	0.99	0.95	0.07	5.74	1.99
630	0.94		0.05	5.75	2.07
800	0.86		0.05	5.42	2.14
1000	0.81	0.85	0.04	5.23	2.19
1250	0.94		0.05	4.65	1.91
1600	0.95		0.03	4.15	1.81
2000	0.93	0.95	0.05	3.69	1.73
2500	0.92		0.04	3.23	1.63
3150	0.88		0.03	2.83	1.55
4000	0.72	0.75	0.03	2.30	1.48
5000	0.61		0.05	1.85	1.34



Performance Indices^{1,2}

α_w = 0.90
SAA = 0.90
NRC = 0.90

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:	25 Aug 2020	25 Aug 2020
Temperature & humidity:	16 °C, 55 % R.H.	16 °C, 54 % R.H.
Atmospheric pressure:	1018 mBar	1017 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.
4. Open area estimates are based on 600 x 600 mm of ceiling area being 'treated' by each tile.

Issuing Authority

Signed:

David Truett

Date:

9 September 2020

Instrumentation

Real time analyser: • Brüel & Kjær PULSE LAN-XI type 3160-A-4/2
Microphones/preamps: • 2 x GRAS type 46AR mic/preamp sets, and 2 x B&K type 4134 mics on B&K 2669 preamps, in 4 fixed positions as per AS ISO 354
Noise source: • Room populated with three dodecahedron loudspeakers; (2 x 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 a plasterboard 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