

**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 m<sup>2</sup>), Test configuration: Type E-200]

**Description:** • Bailey "Random" ceiling tiles, • direct-fix type,  
• with integral glass fibre batts (batts open to ceiling cavity at rear)

**Tile Details<sup>3</sup>**

- Perforated moulded plaster ceiling tiles, nominal size 600 x 600 mm (x 30 mm thick) designed to be nail/screw fixed to overhead ceiling battens.
- Manufactured with an integral glass fibre batt (Bradford Supertel, ≈42 kg/m<sup>3</sup>, 20 mm thick) behind the perforated face, constrained around the perimeter at the rear with plaster skim-coat covering the outer 60 mm of the batt (approx).
- Perforated with a random pattern with a mixture of 6.5 and 8.0 mm dia holes (approx 915 and 475 of each size respectively); the holes near the edges being closed at the rear, the remaining holes opening into the glass fibre batt behind.
- Open area percentage<sup>4</sup> (estimated): 12.0% (only holes open front and back); 15.1% (all holes).

**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/m<sup>2</sup>, 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 cl 6.2.1.2). Two modules (each 100 mm deep) were stacked to create the E-200 enclosure.
- A system of plastic support feet sitting on aluminium extrusions (upside-down Tees) was set up inside the enclosure to support the tiles with their exposed face 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.
- All relevant joints in the installation were taped to close off any gaps – ie the junctions of the enclosure modules to each other, to the floor, and to the tile array, and where adjacent tiles butted against each other in the installed array.
- Specimen installation was carried out by laboratory staff.



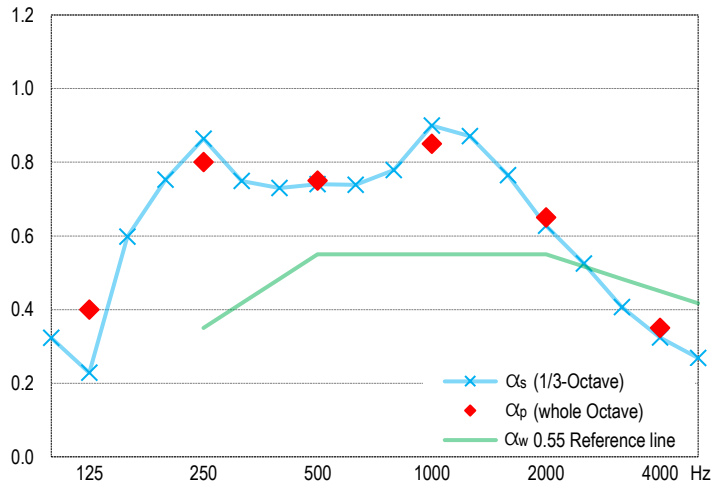
Test specimen installed for testing (image inverted to depict ceiling installation)



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

**Measurement Details & Results**

Freq Hz	Absorption coefficients			Reverberation times, T <sub>60</sub> (sec)	
	α <sub>s</sub>	α <sub>p</sub>	95% Conf (δ)	Empty room	with Specimen
100	0.32		0.06	5.02	3.27
125	0.23	0.40	0.06	5.81	4.04
160	0.60		0.08	6.30	2.81
200	0.75		0.10	5.79	2.38
250	0.86	0.80	0.11	4.84	2.03
315	0.75		0.05	5.94	2.41
400	0.73		0.05	5.79	2.42
500	0.74	0.75	0.05	5.55	2.36
630	0.74		0.04	5.27	2.31
800	0.78		0.04	5.09	2.20
1000	0.90	0.85	0.03	4.84	1.99
1250	0.87		0.04	4.36	1.94
1600	0.76		0.04	3.86	1.96
2000	0.63	0.65	0.05	3.48	2.02
2500	0.52		0.03	3.08	2.02
3150	0.41		0.03	2.68	1.98
4000	0.32	0.35	0.05	2.18	1.78
5000	0.27		0.03	1.72	1.51



**Performance Indices<sup>1,2</sup>**

α<sub>w</sub> = 0.55 (LM)  
SAA = 0.75  
NRC = 0.80

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:	1 Jun 2021	1 Jun 2021
Temperature & humidity:	17 °C, 48 % R.H.	17 °C, 49 % R.H.
Atmospheric pressure:	1009 mBar	1008 mBar

**Notes, Deviations etc**

1. Shape indicators (L, M, and H), if any, following the α<sub>w</sub> index, indicate α<sub>p</sub> 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:   
Date: 25 June 2021

**Instrumentation**

Real time analyser: • Brüel & Kjær PULSE LAN-XI type 3160-A-4/2  
Microphones/preamps: • 4 microphones (1 x B&K 4134, 1 x B&K 4166, and 2 x GRAS 40AR) on B&K and GRAS preamps, in fixed positions as per AS ISO 354  
Noise source: • Room populated with three Norsonic NOR276 dodecahedron loudspeakers, 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 m<sup>3</sup> total room volume • approx 215 m<sup>2</sup> surface area excluding diffusers  
Diffusers: • 20 stationary diffusers, approx 40 m<sup>2</sup> total surface area  
Absorption area: • in accordance with AS ISO 354, unless noted otherwise