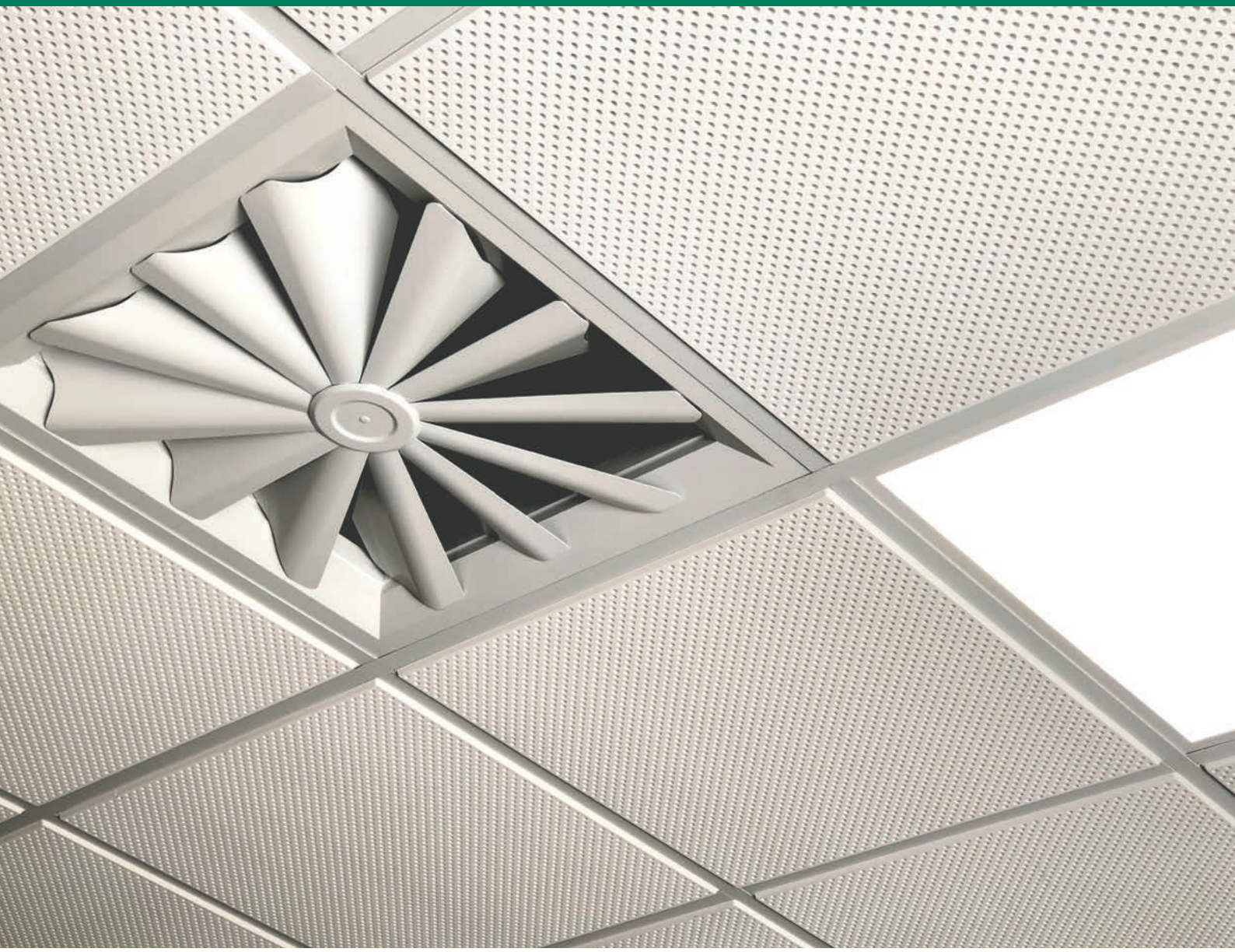
Australian Plaster Acoustics

Quiet Sound – Ultimate Plaster Acoustic Ceiling Tiles

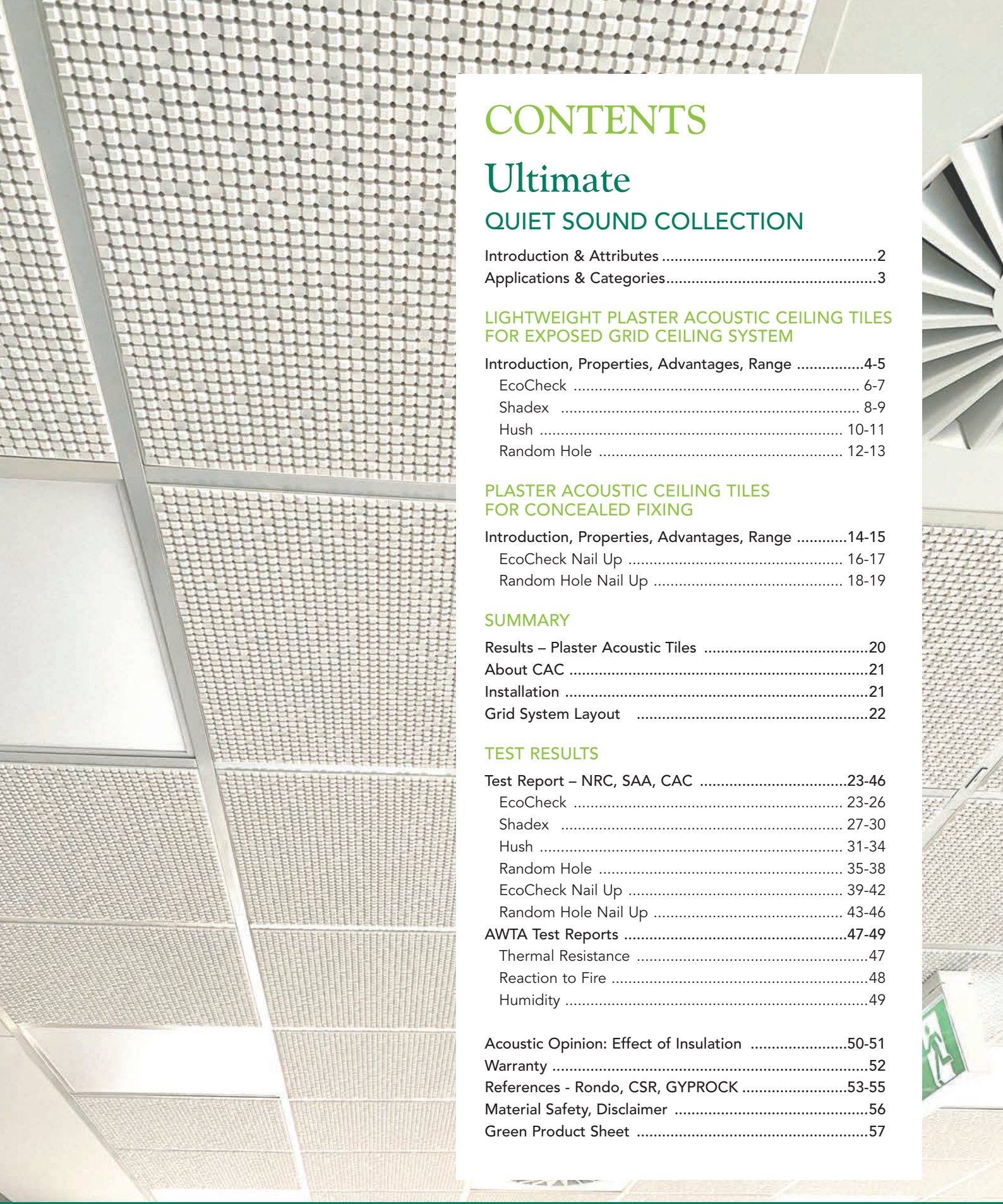


AUSTRALIAN
PLASTER ACOUSTICS
Innovative Sound Solutions

COVER AND THIS PAGE ECOCHECK INSTALLATION

HUMPTY DOO SENIOR SCHOOL

DARWIN NT AUSTRALIA



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Ultimate

QUIET SOUND COLLECTION

SHADEX INSTALLATION

ZUCCOLI PRIMARY SCHOOL
DARWIN NT AUSTRALIA

Quiet Sound ULTIMATE COLLECTION

The **Quiet Sound** Ultimate collection was developed from our *Standard Range of Plaster Acoustic Ceiling Tiles*. It involved major research and development that highlighted the substantial relationship between acoustic performance and the weight of the tiles. As a consequence of research and development, the **Quiet Sound** collection provides:

- New innovative modern designs only achievable from cast plaster
- Exceptionally sharp tile profiles possible only with the use of silicone rubber moulds
- Higher acoustic & sound transmission properties
- Lightweight properties which allow lighter structural ceiling grid
- Easier installation
- Easier packaging & transportation

The **Quiet Sound** consists of perforated ceiling tiles and panels, perfect for acoustic engineers architects and interior designers who are looking for aesthetic designs coupled with high acoustic properties. **Quiet Sound** provides subtle innovative solutions for creating a unique, decorative finish giving many benefits.

KEY SELECTION ATTRIBUTES

- Cost effective ceiling and wall solution
- High-quality product
- Decorative or non-decorative
- High humidity performance. Our acoustic tiles and panel do not sag in humid conditions. They are able to withstand high humidity and temperature from 0° to 80°C
- Dimensional stabilty up to 95% humidity
- Anti-mould paint applied at the time of manufacture which stops growth of mould (Tiles are prepainted white)
- Simple installation Plaster Acoustic Tiles.
- Plaster glass panels screw fix to steel or timber battens
- Flush jointing
- High acoustic performance – all products having NRC ranges between 0.70 up to 0.90 NRC
- CAC between 32 to 45 dB for acoustic ceiling tiles
- Reduces noise reverberation
- Prevents dust entering into room space
- Reduces echo
- Able to distinguish between music and speech
- Fire rated to group 1 certification
- High light reflective
- Good R values in plaster acoustic tiles 0.80 thermal resistance
- All products 100% Australian made

All acoustic tests for NRC carried out by RMIT University of Melbourne and CSIRO Melbourne in accordance with ASTM-C423-90A NRC (Noise Reduction Coefficient)

Acoustic tests for CAC (Ceiling Attenuation Class) carried out by Acoustic Laboratories Australia
Pty Ltd in accordance with
ASTM E1414/E1414 M 11A for CAC

All dimensions are in mm and are approximate

APPLICATIONS

- Commercial office buildings
- Show rooms
- Schools and universities
- Restaurants, cafes, food halls
- Retail complexes
- Shopping centres
- Auditoriums and concert halls
- Libraries and galleries
- Cinemas
- Home theatres
- Foyers for public buildings
- Music rooms
- Public Domains
- Health Care Areas

THE ULTIMATE COLLECTION CONSISTS OF

1. Lightweight plaster acoustic ceiling tiles for exposed grid ceiling system

Four modern designs that have excellent NRC and CAC properties, made to suit 600 x 600mm steel or aluminium grid systems.

2. Plaster acoustic ceiling tiles for concealed direct fixing

Two striking designs for V-edged finish, giving exceptional NRC and CAC properties. These are made to be directly fixed to furring channels.

ECOCHECK INSTALLATION

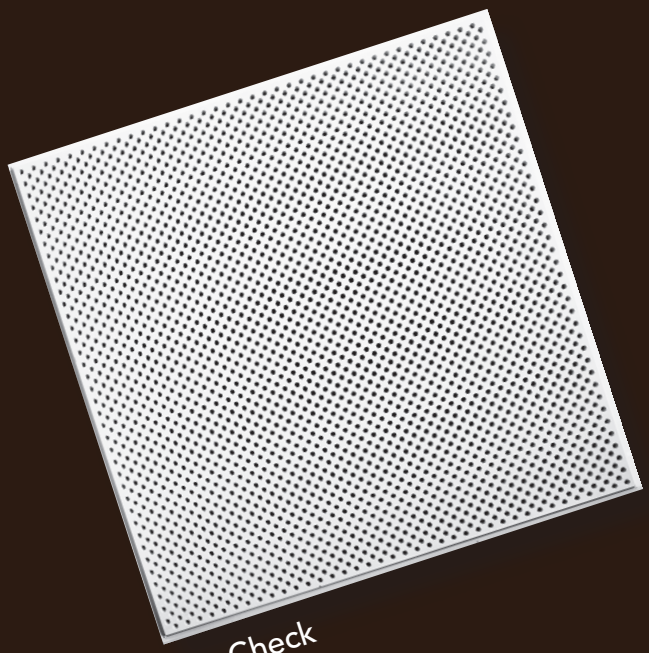
ARB 4X4 ACCESSORIES SHOWROOM

DARWIN NT AUSTRALIA

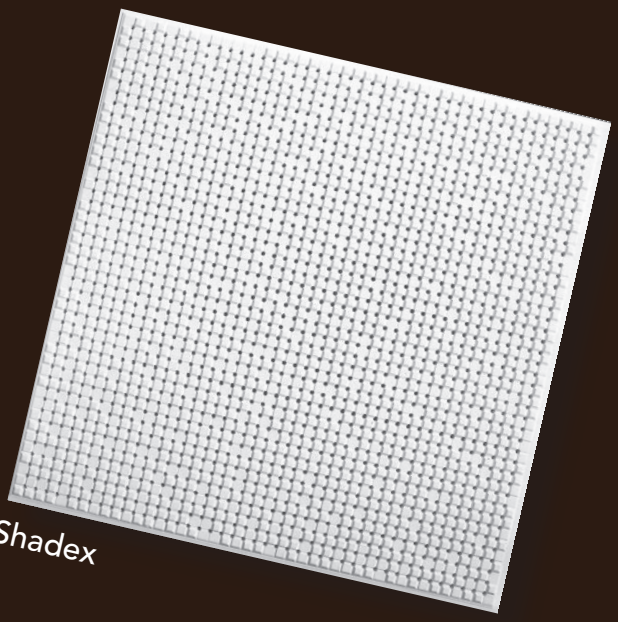
All dimensions are in mm and are approximate

LIGHT WEIGHT PLASTER ACOUSTIC CEILING TILES

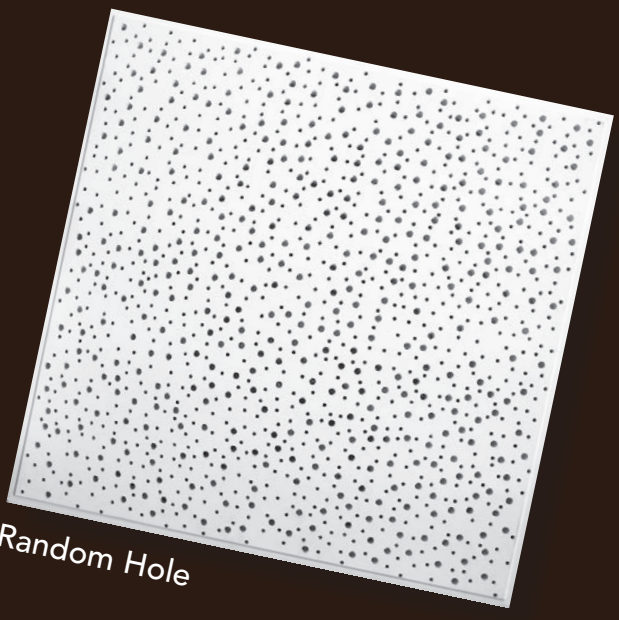
- made from silicon rubber moulds giving a sharp and distinctive attribute



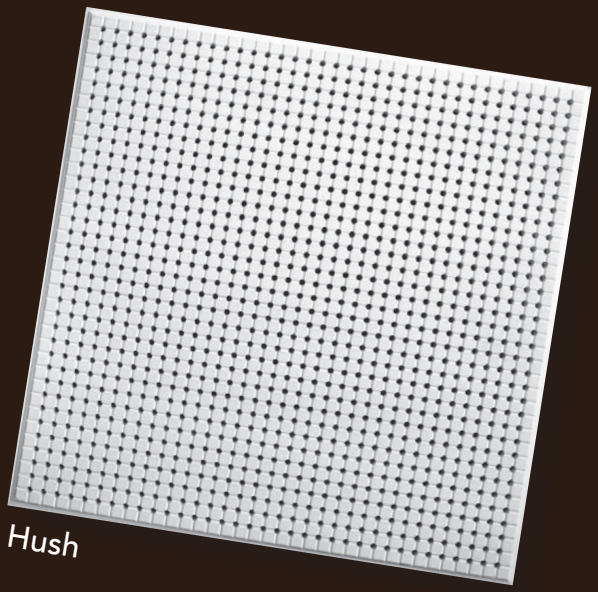
EcoCheck



Shadex



Random Hole



Hush

All dimensions are in mm and are approximate

LIGHT WEIGHT PLASTER ACOUSTIC CEILING TILES

■ for exposed grid ceiling systems.

Plaster acoustic ceiling tiles are manufactured from reinforced casting plaster and offer excellent sound absorption, controlled sound transmission and decorative finishes.

The tiles are supplied with an integrated sound absorbent batt inserted during casting and are produced in a range of varying designs. These tiles are pre–painted white.

ACOUSTIC PROPERTIES

These tiles measure 30mm thick, 600 x 600mm with a 20mm thick sound absorbent batt giving a high NRC and CAC value.

ADVANTAGES

1. Dimensionally stable will not warp or buckle
2. Not affected by humidity
3. Fire resistant
4. Acoustic properties
5. Redecoration does not affect the properties
6. Easy removal and replacement
7. Mass 12.2-12.4 kg/m^2

PLASTER ACOUSTIC TILE RANGE :

ECOCHECK

a diamond pattern tile

SHADEX

a multi-level faced tile

HUSH

a uniform chocolate block pattern tile

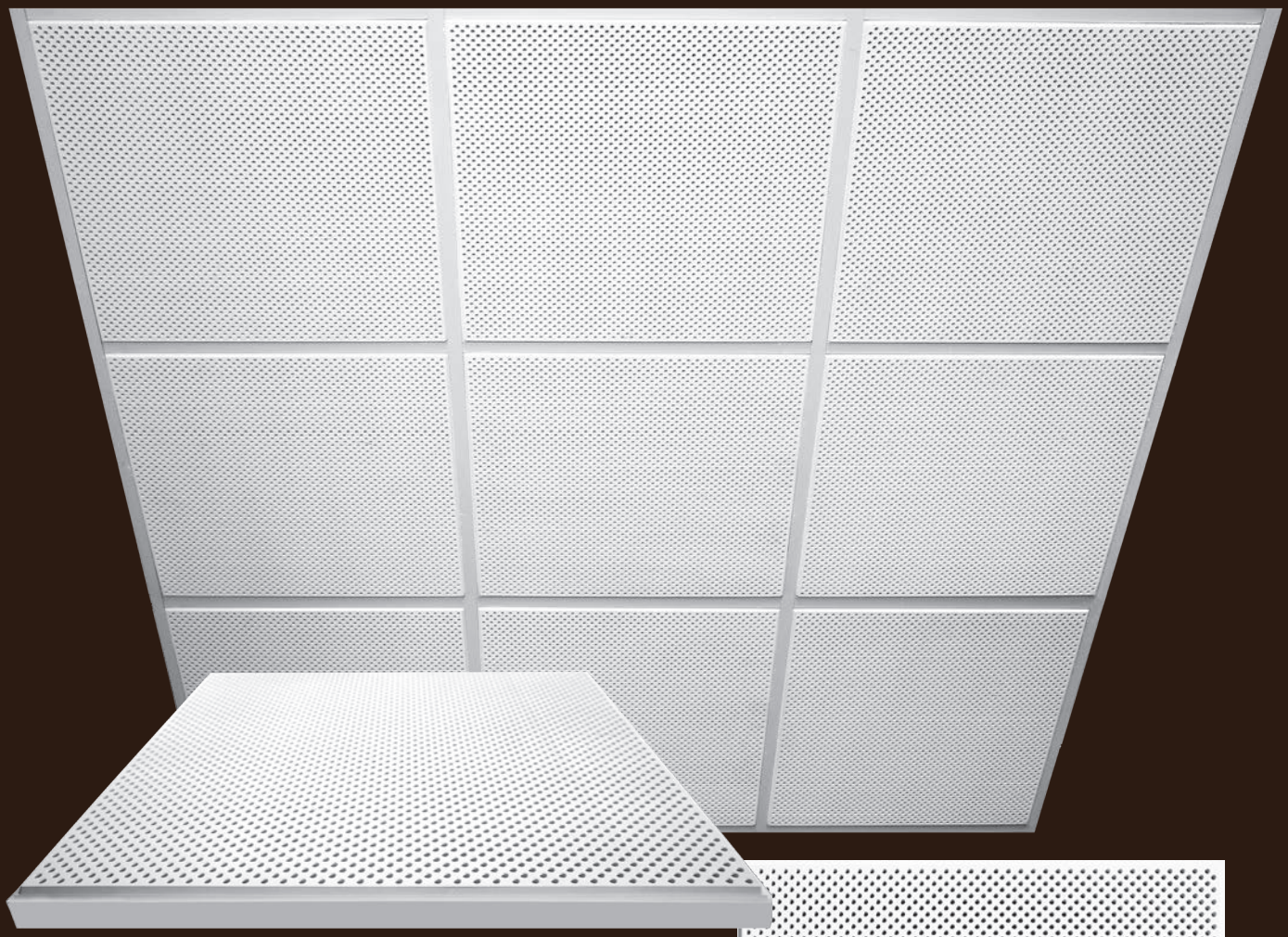
RANDOM HOLE

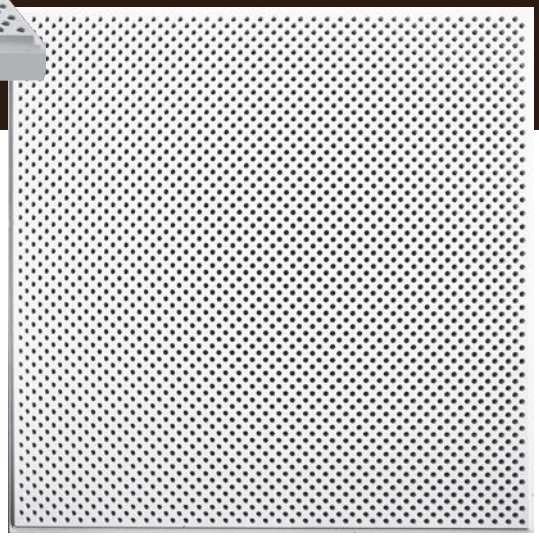
a plain faced tile with Random Hole circular perforations over the entire face

ECOCHECK INSTALLATION

HUMPTY DOO SENIOR SCHOOL
DARWIN NT AUSTRALIA

EcoCheck





PROPERTIES

- Bevelled edge.
- Insulation is integrated. Fiberglass insulation batt inserted into tile during manufacture. 32Kg/m^3, 20mm thick Glasswool
- To be used in conjuction with ceiling grid exposed 24mm T Bar steel or aluminum 600 x 600 system.

EcoCheck ACOUSTIC PERFORMANCE AND SPECIFICATION

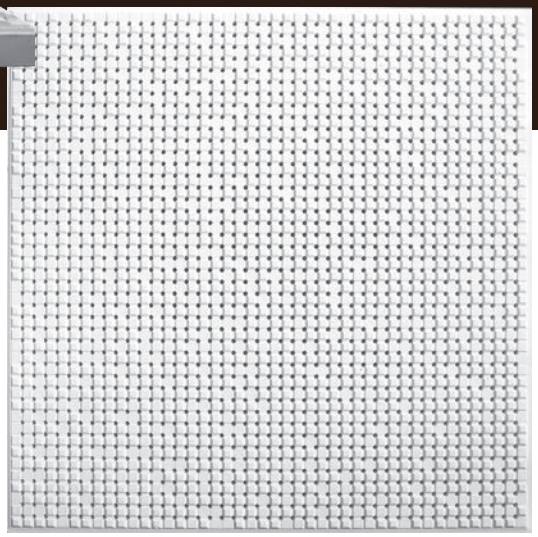
Open Area	Thickness mm	Size mm	CAC	R Value	NRC	% Light Reflective	Mass Kg/m^2	Weight per Tile Kg
22.7%	20	600 x 600	35	0.80	0.80	0.80	12.20	4.45

All dimensions are in mm and are approximate

SHADEX INSTALLATION

ZUCCOLI PRIMARY SCHOOL
DARWIN NT AUSTRALIA

Shadex



PROPERTIES

- Bevelled edge.
- Insulation is integrated. Fiberglass insulation batt inserted into tile during manufacture. 32Kg/m^3, 20mm thick Glasswool
- To be used in conjuction with ceiling grid exposed 24mm T Bar steel or aluminum 600 x 600 system.

Shadex ACOUSTIC PERFORMANCE AND SPECIFICATION

Open Area	Thickness mm	Size mm	CAC	R Value	NRC	% Light Reflective	Mass Kg/m^2	Weight per Tile Kg
15.3%	30	600 x 600	32	0.80	0.70	0.80	12.20	4.5

All dimensions are in mm and are approximate

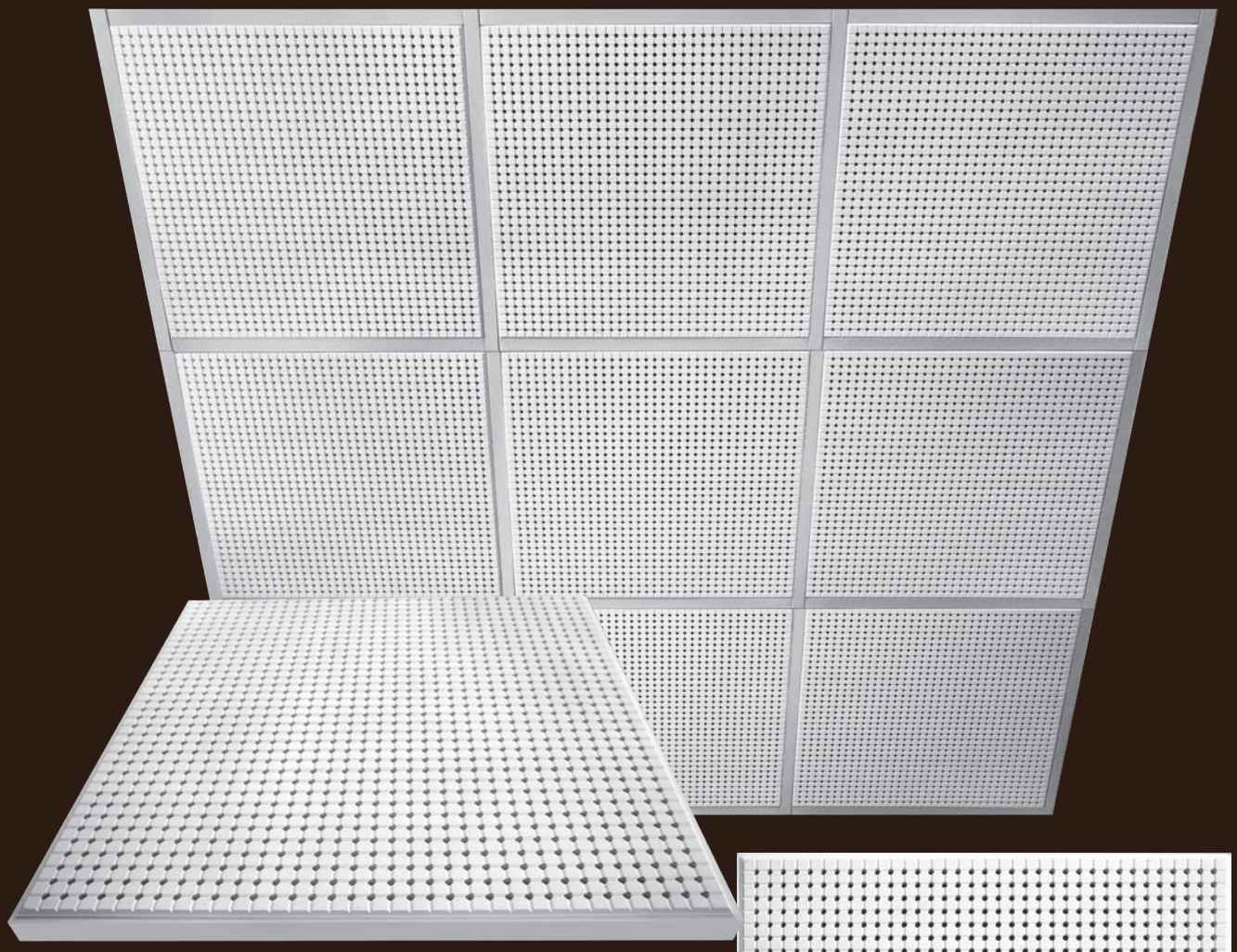
HUSH INSTALLATION

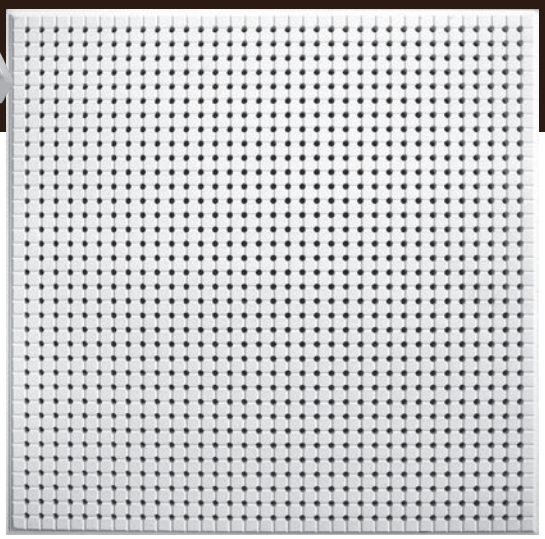
MINING COMPANY HEAD OFFICE

FANNIE BAY NT AUSTRALIA

All dimensions are in mm and are approximate

Hush





PROPERTIES

- Bevelled edge.
- Insulation is integrated. Fiberglass insulation batt inserted into tile during manufacture. 32Kg/m^3, 20mm thick Glasswool
- To be used in conjuction with ceiling grid exposed 24mm T Bar steel or aluminum 600 x 600 system.

Hush ACOUSTIC PERFORMANCE AND SPECIFICATION

Open Area	Thickness mm	Size mm	CAC	R Value	NRC	% Light Reflective	Mass Kg/m^2	Weight per Tile Kg
21.4%	30	600 x 600	34	0.80	0.70	0.78	12.20	4.5

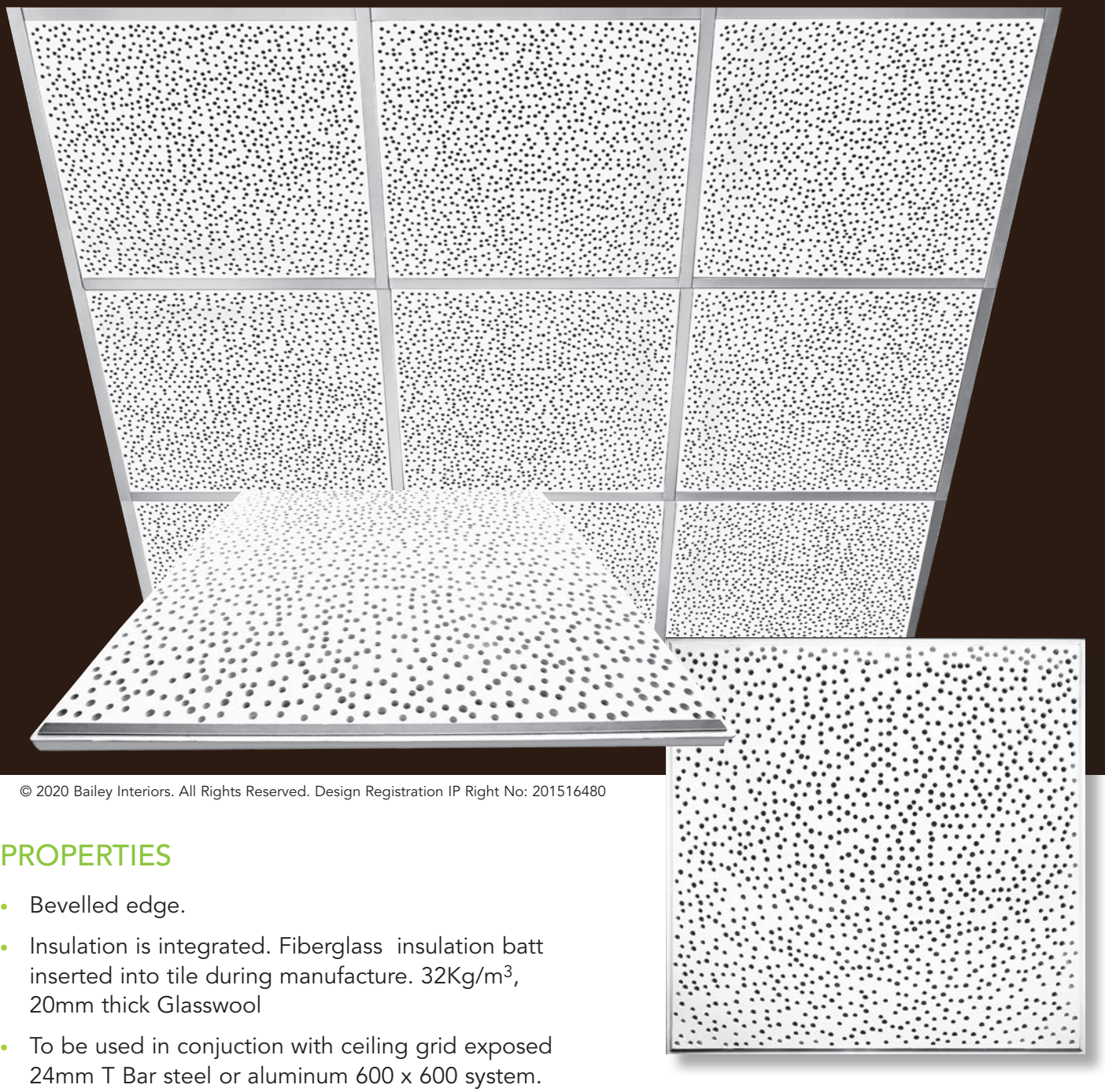
All dimensions are in mm and are approximate

RANDOM HOLE INSTALLATION

KINGSGROVE RSL SYDNEY NSW AUSTRALIA

All dimensions are in mm and are approximate

Random Hole



PROPERTIES

- Bevelled edge.
- Insulation is integrated. Fiberglass insulation batt inserted into tile during manufacture. 32Kg/m^3, 20mm thick Glasswool
- To be used in conjuction with ceiling grid exposed 24mm T Bar steel or aluminum 600 x 600 system.

Random Hole ACOUSTIC PERFORMANCE AND SPECIFICATION

Open Area	Thickness mm	Size mm	CAC	R Value	NRC	% Light Reflective	Mass Kg/m^2	Weight per Tile Kg
16.6%	30	600 x 600	34	0.80	0.70	0.80	12.20	4.5

All dimensions are in mm and are approximate

PLASTER ACOUSTIC CEILING TILES

■ for concealed direct fixing

These tiles are designed specially for a concealed grid system. Installation is by direct fixing to furring channels.

The tiles are supplied with an integrated sound absorbent batt inserted during casting and are produced in two different patterns.

ACOUSTIC PROPERTIES

These tiles measure 30mm thick, 600 x 600mm with a 20mm thick sound absorbent batt giving outstanding NRC and CAC results.

ADVANTAGES

1. Dimensionally stable will not warp or buckle
2. Not affected by humidity, no variance up to 95 % humidity
3. Fire resistant Group 1 Rating
4. Acoustic properties excellent NRC and CAC Rating
5. Mass 12.0-12.5 kg/m2

THE RANGE CONSISTS OF:

ECOCHECK NAIL UP CEILING TILE

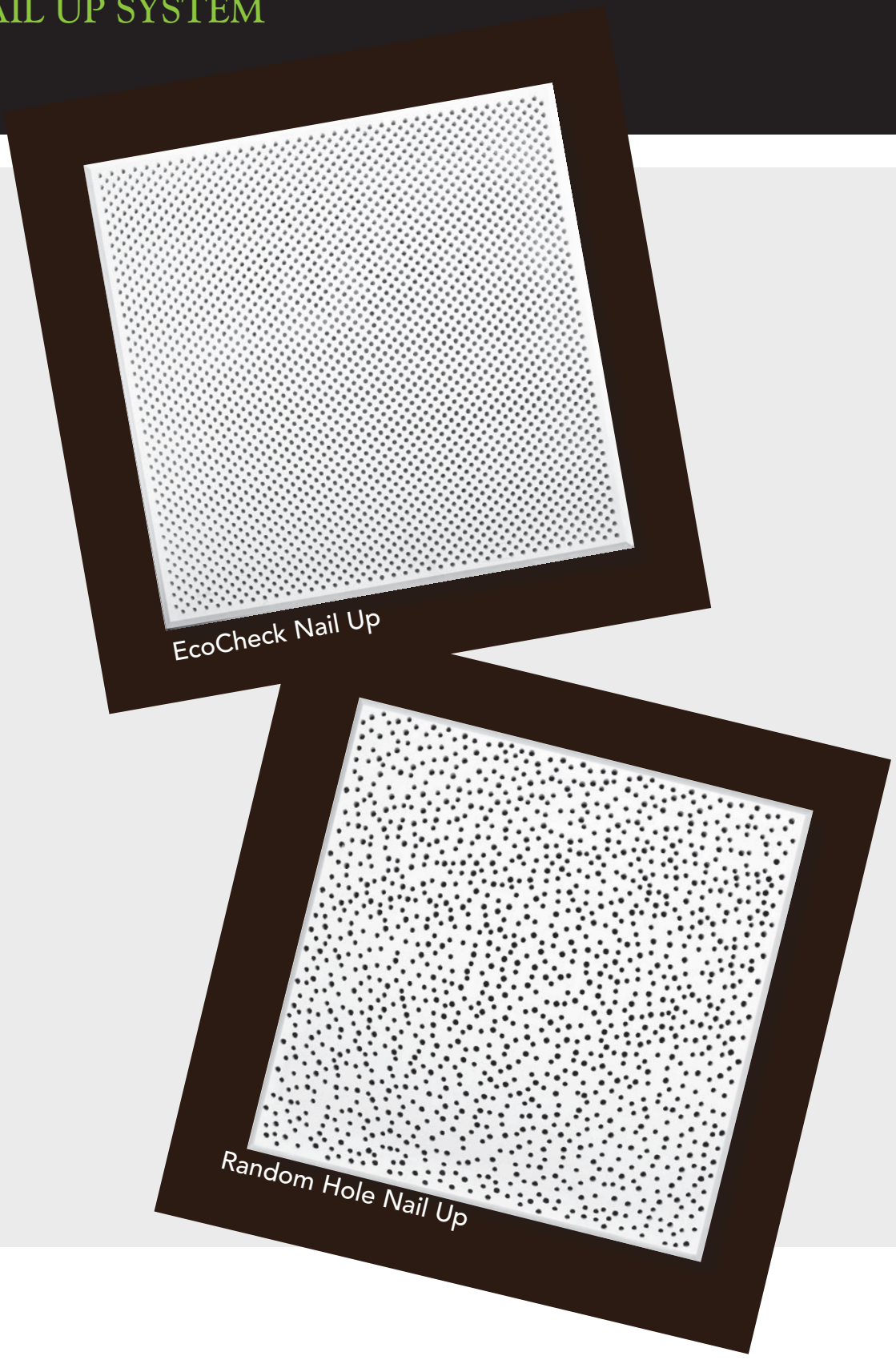
A diamond pattern tile

RANDOM HOLE NAIL UP CEILING TILE

A plain faced tile with Random Hole circular perforations over the entire tile

All dimensions are in mm and are approximate

PLASTER ACOUSTIC CEILING TILES ON NAIL UP SYSTEM

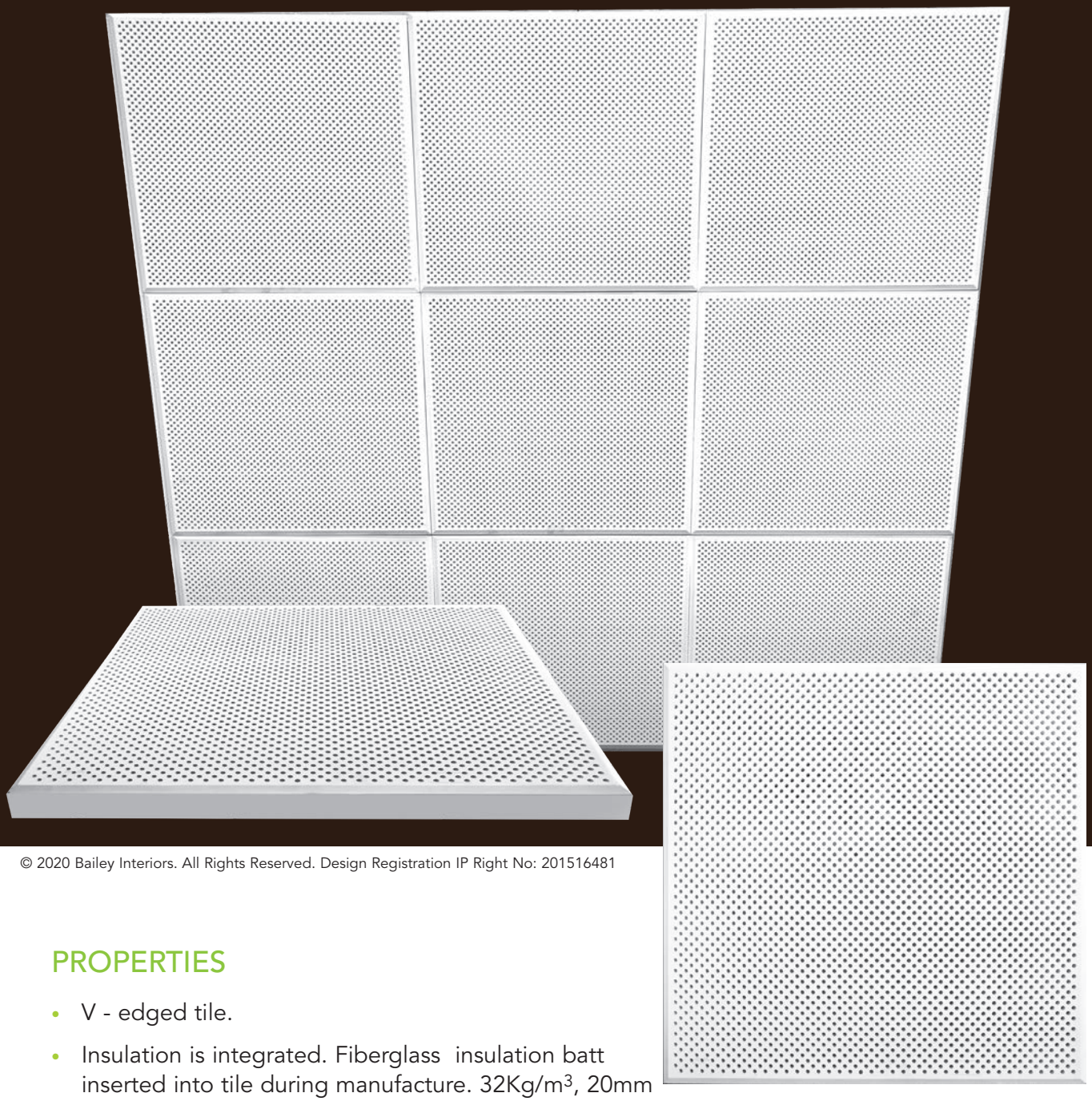


ECOCHECK NAIL UP INSTALLATION

CADENCE OFFICE
GLADESVILLE NSW AUSTRALIA

All dimensions are in mm and are approximate

EcoCheck Nail Up



PROPERTIES

- V - edged tile.
- Insulation is integrated. Fiberglass insulation batt inserted into tile during manufacture. 32Kg/m^3, 20mm thick Glasswool
- To be used in conjuction with concealed Rondo Furring Channel No 155 system.

EcoCheck NU ACOUSTIC PERFORMANCE AND SPECIFICATION

Open Area	Thickness mm	Size mm	CAC	R Value	NRC	SAA	% Light Reflective	Mass Kg/m^2	Weight per Tile - Kg
22.7%	30	600 x 600	42	0.80	0.7	0.68	0.80	12.5	4.5

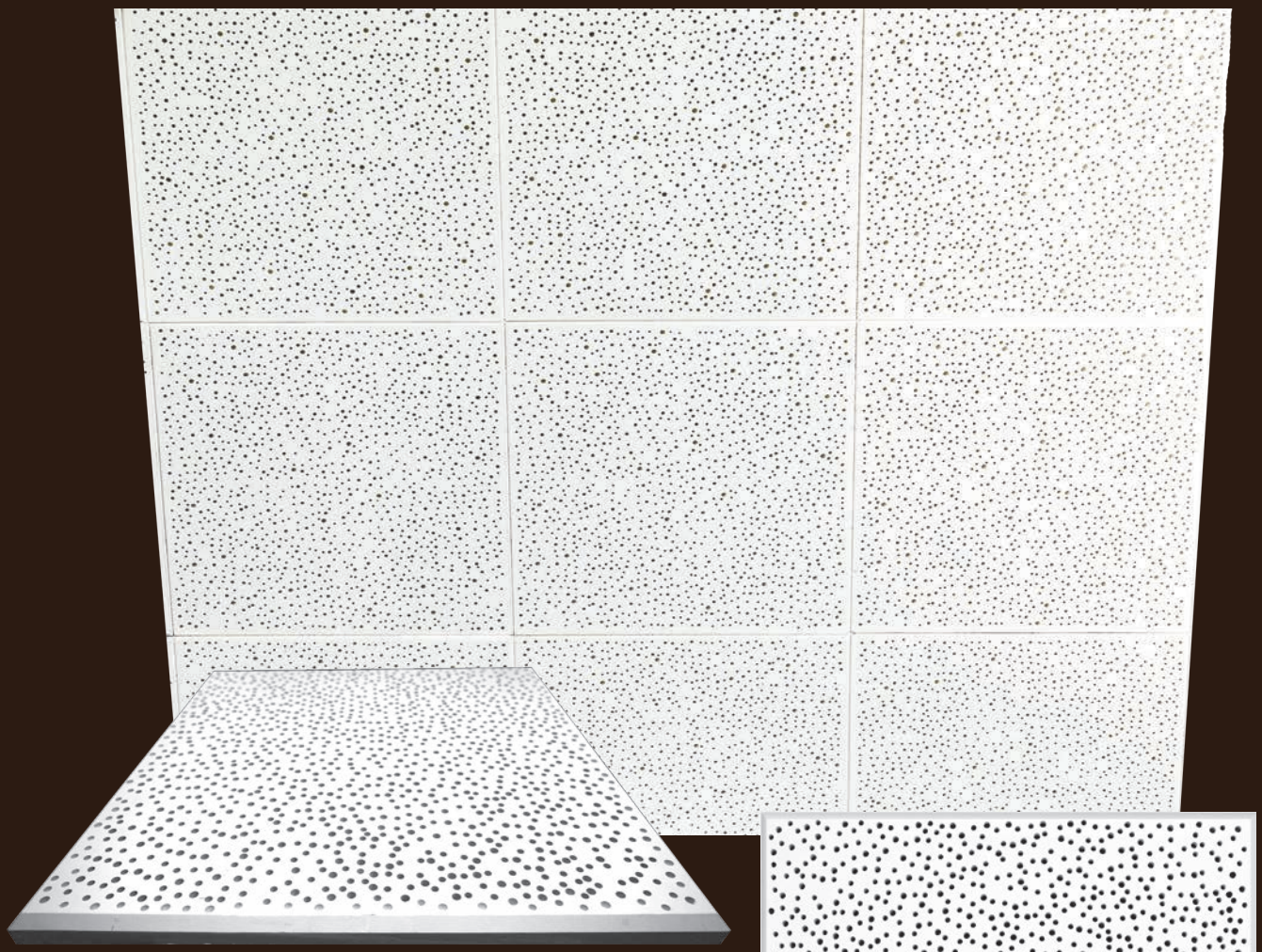
All dimensions are in mm and are approximate

RANDOM HOLE NAIL UP INSTALLATION

LDS CHURCH
LAMI FIJI

All dimensions are in mm and are approximate

Random Hole Nail Up



PROPERTIES

- V - edged tile.
- Insulation is integrated. Fiberglass insulation batt inserted into tile during manufacture. 32Kg/m^3, 20mm thick Glasswool
- To be used in conjuction with concealed Rondo Furring Channel system.

Random Hole NU ACOUSTIC PERFORMANCE AND SPECIFICATION

Open Area	Thickness mm	Size mm	CAC	R Value	NRC	SAA	% Light Reflective	Mass Kg/m^2	Weight per Tile - Kg
16.6%	30	600 x 600	38	0.80	0.75	0.72	0.80	12.5	4.5

All dimensions are in mm and are approximate

SUMMARY

LIGHTWEIGHT PLASTER ACOUSTIC TILES – EXPOSED GRID CEILING SYSTEM

Tile Dimensions: 600mm x 600mm x 30mm Thick, Mass 12.20 Kg/m^2

	Open Area	Glasswool				R Value	% Light Reflective	Suspension
		NRC	CAC dB[1]	CAC dB[2]	SAA			
EcoCheck	22.7%	0.80	35	38	0.78	0.80	0.80	Duo1/Duo x1200 Duo2/600
Shadex	15.3%	0.70	32	35	0.69	0.80	0.80	
Hush	21.4%	0.70	34	37	0.69	0.80	0.78	
Random Hole	16.6%	0.70	34	37	0.70	0.80	0.76	

PLASTER ACOUSTIC TILES – CONCEALED DIRECT FIXING

Tile Dimensions: 600mm x 600mm x 30mm Thick, Mass 12.50 Kg/m^2

	Open Area	Glasswool				R Value	% Light Reflective	Suspension
		NRC	CAC dB[1]	CAC dB[2]	SAA			
EcoCheck NU	22.7%	0.80	42	45	0.79	0.80	0.80	Furring Rondo 155
Random Hole NU	16.6%	0.75	38	41	0.72	0.80	0.80	

1 – CAC Tile only

2 – CAC R3.5 insulation batts,1800 each side of partition

SUMMARY - PHYSICAL PROPERTIES

- **Material:** Glass reinforced plaster
- **Surface finish:** Factory applied white Anti Mould paint (Plaster acoustic tiles only)
- **Flame spread/ fire resistance:** Conforms to BCA Spec CI 10 tested to AS/NZS 3837 - 1998 Group 1
- **Thermal resistance (R Value):** 0.80 m^2k/w
- **Insulation:** FBS-1 Glasswool Insulation, 32Kg/m^3, compressed to 20mm thick, with lightweight black acoustic fabric backing
- This product has a "non-dangerous goods" classification
- Dimensional stabilty up to 95% humidity
-

All dimensions are in mm and are approximate

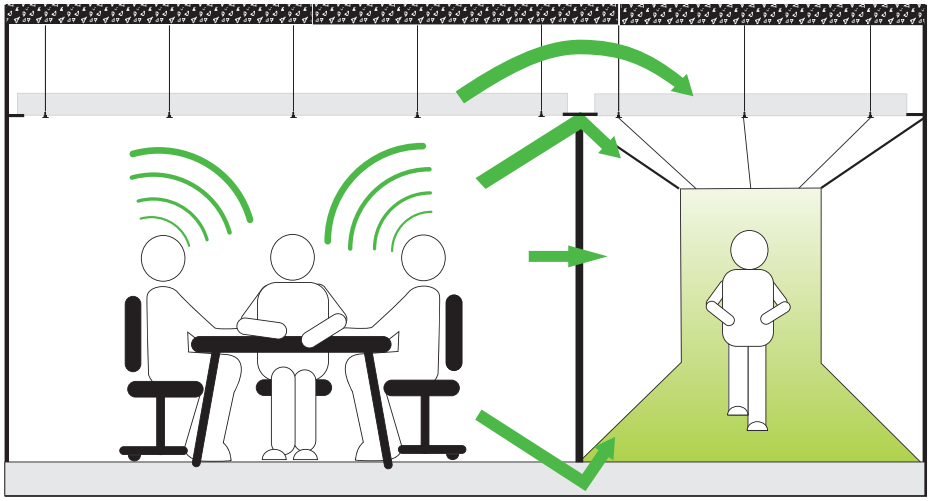
CAC - Ceiling Attenuation Class

ABOUT CAC - Ceiling Attenuation Class

CAC is an important meaure of sound transfer between adjacent rooms and or a corridor.

Ceiling Attenuation Class indicates the ceilings ability to prevent airborne sound from travelling between adjacent rooms when the dividing wall does not connect with the structural ceiling.

Higher Values are better. A CAC value of 35 dB or above is considered to be very good.



INSTALLATION

LIGHT WEIGHT PLASTER ACOUSTIC CEILING TILES, 600 X 600 MM RANGE

1. Plan ceiling layout to provide even margins at the perimeter.
2. Centre the ceiling both ways ensuring centre lines are at right angles.
3. Fix wall angle trim to perimeter walls at the correct height set by a level line. Mitre the wall angle trim around piers and columns.
4. Fix ceiling grid in accordance to Rondo grid layout using Duo system.
5. Cutting tiles can generally be avoided by designing the ceiling so that whole tiles or panels extend as close as practicable to the room area perimeters and then filling to the wall with a plaster board margin.
6. If cutting cannot be avoided the following typical methods are recommended.
   - When ordering plaster acoustic ceiling tiles make sure to order solid tiles with the same pattern but without the acoustic insulation, these separate tiles will make cutting of the tiles much easier to perform.
   - Use a router bit to cut panels and tiles to the required size. The router bit rebates the tile to enable installation into the ceiling grid.
   - Panels and tiles can also be cut to size with a panel saw.
   - Cable penetrations and sprinkler head holes should be cut into solid tiles or panels using a drill with an appropriate hole saw attachment.
   - Down light & pipe penetrations should also be cut into solid tiles or panels using a key hole saw or a drill with an appropriate hole saw attachment.

GRID SYSTEM LAYOUT

PLASTER ACOUSTIC CEILING TILE 600 X 600 MM RANGE

(1) The Duo 1 main tee shall be hung on soft galvanize rod or 2.5mm wire, accurately levelled.

Suspension clips shall be spaced at 1200mm centres along the Duo 1 main tee.

(5) Duo 1 main tees to be spaced at 1200mm centres.

Duo X 1200 cross tees shall intersect main tees at 600mm centres and be positively locked together.

(3) Duo 2 x 600 cross tees are to be spaced at 600mm and shall intersect Duo 1200 cross tees at 600mm centres and be positively locked together.

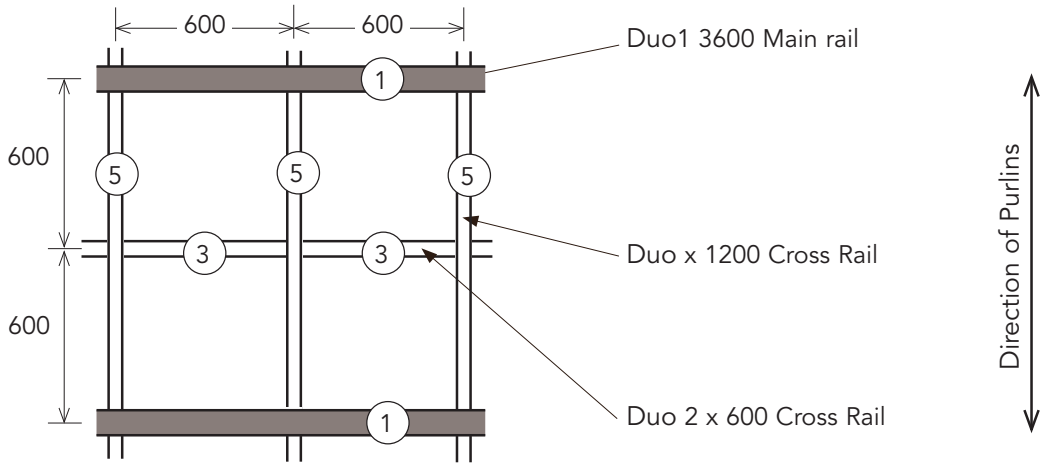
Wall angle shall be securely fixed to the wall at 600mm centres providing a true level edge.

The suspension hangers, main tees and cross tees shall be spaced as not to exceed the design ceiling load, or as required to prevent deflection, in excess of 1/360 of the span of cross tee or main tee.

Extra hangers are to be provided for light fittings and conditioning units etc.

All light fittings are to be supported on the main tee.

ACOUSTIC TILE RANGE 600 X 600 - GRID DESIGN LAYOUT



TESTING

Plaster Acoustic Products have been tested for **NRC** in accordance with ASTM-C423-90A at CSIRO Melbourne, Australia with NATA accreditation.

Plaster Products tested for **Room to Room CAC** have been tested in accordance with ASTM E1414 / E 1414M - 11A at Acoustic Laboratories Australia Pty Ltd, Perth, Western Australia.

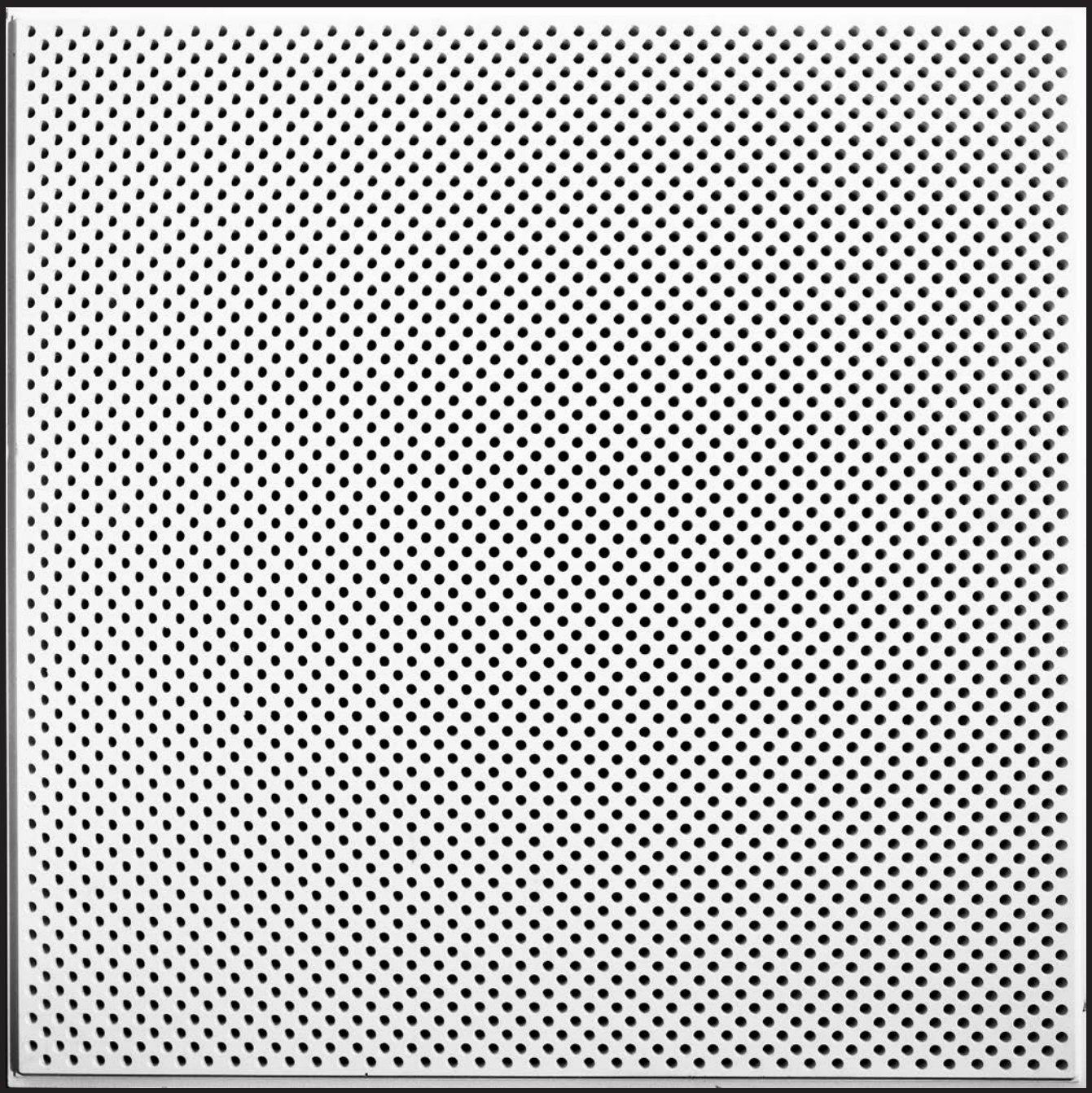
Plaster Products tested for **Steady - State Thermal Transmission** properties by means of the Heat Flow Apparatus have been product tested in Melbourne, Australia at AWTA Product Testing. (ASTM-C518) 2010

Plaster Products tested for **Heat + Smoke** release have been tested in accordance with AS/NZS 3837 - 1998 and ISO 5660.1- 2002 (Cone Colorimeter Method) at AWTA Product Testing Melbourne, Australia.

All dimensions are in mm and are approximate

TEST RESULTS

EcoCheck



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: **AC270-05-1**

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

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: 3.6 x 3.0 m (10.8 m^2), Test configuration: Type E-400]

Description: • Bailey "EcoCheck" drop-in acoustic ceiling tiles
• with integral glass fibre batt behind, non-encapsulated

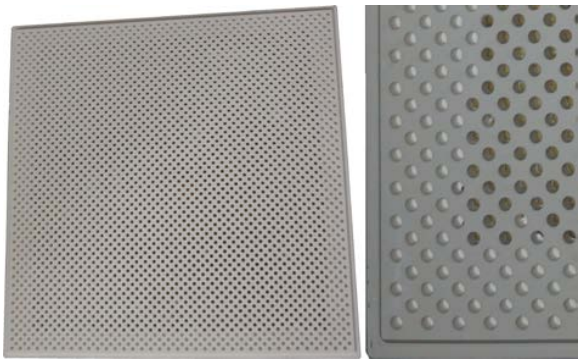
Tile Details[3]

- Perforated moulded plaster ceiling tiles, approx 588 x 588 mm (x 30 mm thick) designed to drop into a standard 600 mm suspended ceiling grid.
- Manufactured with an integral glass fibre batt (Bradford Supertel, 32 kg/m^3, 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 in a regular pattern of 6.5 mm dia holes (2888 count); the perforations in the vicinity of the perimeter being open only at the face (closed at the rear), with the perforations away from the perimeter being open front and back (exposing the glass fibre batt behind).
- Open area percentage[4] (estimated): 21.3% (only holes open front and back); 26.6% (all holes).

Installation

- The test specimen was installed as an upside down ceiling on the floor of the chamber.
- A 400 mm deep enclosure (32 mm MDF timber, approx 23 kg/m^2, built to surround an area of 3600 x 3000 mm) was placed on the floor of the chamber, 11° off parallel with the walls. The enclosure was taped at all joints to prevent air leakage between the enclosed space and the outside.
- A system of steel wall studs/track was set up inside the enclosure to support the specimen tiles. The cavity behind the panels was a single undivided cavity without internal partitions.
- Specimen 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 and acoustically mimic a normal ceiling installation. The perimeter of the installed test specimen was taped with masking tape to seal gaps between the tiles and the enclosure.
- Specimen installation was carried out by laboratory staff.

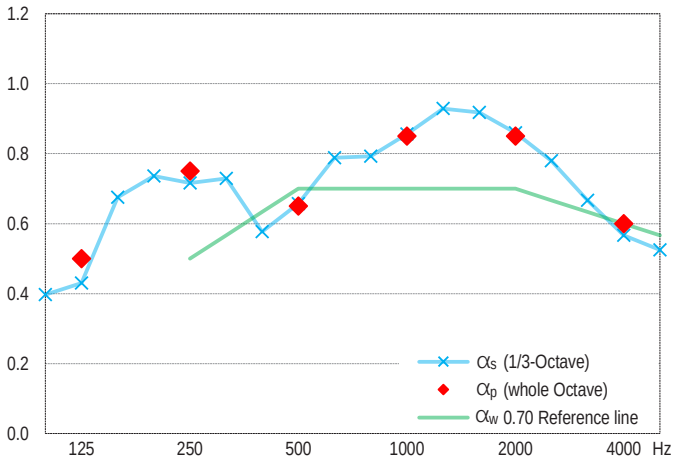
Test specimen installed for testing (image inverted to depict ceiling installation)



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

Measurement Details & Results

Freq	Absorption coefficients			Reverberation times, T_{60} (sec)	
Hz	α_s	α_p	95% Conf (δ)	Empty room	with Specimen
100	0.40		0.07	5.82	3.27
125	0.43	0.50	0.08	6.86	3.43
160	0.68		0.08	6.59	2.63
200	0.74		0.06	6.43	2.47
250	0.72	0.75	0.06	5.40	2.33
315	0.73		0.05	6.57	2.50
400	0.58		0.05	6.31	2.82
500	0.66	0.65	0.05	5.91	2.55
630	0.79		0.05	5.47	2.23
800	0.79		0.03	5.00	2.14
1000	0.86	0.85	0.04	4.84	2.02
1250	0.93		0.04	4.30	1.84
1600	0.92		0.06	3.93	1.77
2000	0.86	0.85	0.04	3.53	1.74
2500	0.78		0.03	3.22	1.73
3150	0.67		0.03	2.96	1.74
4000	0.57	0.60	0.03	2.58	1.66
5000	0.52		0.05	2.21	1.49



Performance Indices[1,2]
α_w = 0.70 (L)
SAA = 0.78
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:	15 Jan 2020	15 Jan 2020
Temperature & humidity:	27 °C, 58 % R.H.	29 °C, 41 % R.H.
Atmospheric pressure:	996 mBar	992 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: 24 January 2020

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 a plasterboard wall) • 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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REPORT ON THE DETERMINATION OF SOUND ABSORPTION COEFFICIENTS OF BAILEY INTERIORS ECOCHECK 600MM X 600MM PERFORATED PLASTER CEILING TILES WITH ATTACHED GLASSWOOL SUBSTRATE WITH A 400MM AIR GAP IN A REVERBERATION ROOM.

Testing Procedure:	AS ISO 354 - 2006
Testing Laboratory:	Applied Acoustics Laboratory School of Electrical and Computer Engineering RMIT University Melbourne, Victoria 3000, Australia NATA Accreditation Number: 1421
Client:	Bailey Interiors Pty. Ltd. 83-85 Boundary Road Mortdale, New South Wales 2223 Australia
Date of Test:	20th of June 2013
Date of Report:	28th June 2013
Report Number:	13-062/JW
Testing Officer:	John Watson

John Watson
Approved NATA Signatory

Accredited for compliance with ISO/IEC 17025

3. SAMPLE FOR TESTING

As provided by Client:

Bailey Interiors EcoCheck 600mm x 600mm Perforated Plaster Ceiling Tiles with attached Glasswool Substrate tested with a 400mm air-gap:

Manufacturer:	Bailey Interiors Pty. Ltd.
Product Designation:	Bailey Interiors EcoCheck
Colour:	White
Material:	Perforated Plaster with a Glasswool substrate
Glasswool Details:	Thickness 20mm, Density: 32kg/m^3,
Glasswool Manufacturer:	C.S.R.
Substrate Fixing:	Masking tape across nominal middle of major tile
dimensions	
Tape:	Sequence Masking Tape – 48mm width
Nominal Open Area of Tile:	22.7%
Nominal Tile Surface Density:	12 kg/m^2
Nominal Tile Density:	340 kg/m^3
Nominal Individual Tile Size:	600 mm x 600 mm x 30mm
Test Air gap:	400mm
Dimensions of Sample:	2.80m x 3.60m
Area of Sample:	10.08m^2

The panels were tested by mounting the panels on a 420mm in height, 20mm thick MDF frame with dimensions 2840mm wide by 3640mm long. The Ceiling Tiles were suspended in the frame by a standard ceiling tile grid to achieve a 400mm void on the underside of the ceiling tile under test. Standard Ceiling tile grid was also installed between the joins between adjacent ceiling tiles on the sound-incident side of the tiles under test.

The sound-incident side of the ceiling tile featured a perforated and textured face and is pictured below in detail in Figure 1. On the left in Figure 2 is the entire sound-incident textured face of a single specimen of the ceiling tile under test. On the right in Figure 2 is the underside of the tile featuring the masking tape used to fix the glasswool substrate to the underside of the perforated plaster tile face. The sample mounted for testing is pictured in Figure 3 below.

The area of the sample under test was totalled 10.08m^2.

The sample was tested on June 20th 2013.

5. RESULTS

The mean reverberation times at each frequency for the empty room, $T60_e$, the room with the sample installed, $T60_{e+s}$, the sound absorption coefficient and the 95% confidence interval are provided in Table 1. The results are rounded to 0.01. The 95% confidence interval for each frequency is determined from the standard deviation of the reverberation times of the empty room and the room with the sample. The k factor used to determine the 95% Confidence interval is 2.201.

The results for the sample are detailed in Table 1, Table 2 and Graph 1 of this report.

Test conditions:

Room Empty:	Air temperature	20.9°C,
	Relative Humidity	35%
	Barometric Pressure	0.7705 metre of mercury.
Room with Sample:	Air temperature	20.9°C,
	Relative Humidity	41%
	Barometric Pressure	0.7674 metre of mercury.

Table 1: Reverberation times and Sound Absorption Coefficients of Bailey Interiors EcoCheck 600mm x 600mm Perforated Plaster with 20mm thick 30kg/m^3 Glasswool Substrate Ceiling Tiles tested with a 400mm air gap.

Octave Centre Frequency Bands, Hz	Average RT's for Empty Room $T60_e$	Average RT's for Room with Sample $T60_{e+s}$	Sound Absorption Coefficient α_s	95% Confidence Interval for α_s
100	8.717	3.547	0.53	0.11
125	7.760	3.823	0.42	0.09
160	9.450	3.364	0.61	0.10
200	9.616	3.094	0.70	0.06
250	8.449	2.756	0.78	0.06
315	8.148	2.728	0.78	0.04
400	8.293	2.840	0.74	0.04
500	7.422	2.774	0.72	0.04
630	7.120	2.410	0.87	0.04
800	6.683	2.391	0.86	0.06
1000	5.909	2.181	0.92	0.04
1250	5.179	2.070	0.93	0.03
1600	4.538	1.974	0.93	0.03
2000	3.956	1.968	0.84	0.03
2500	3.243	1.912	0.72	0.03
3150	2.532	1.743	0.63	0.03
4000	1.966	1.512	0.59	0.03
5000	1.619	1.374	0.51	0.03

The weighted sound absorption coefficient α_w of the sample determined in accordance with AS ISO 11654-1997 "Acoustics: Sound Absorbers for Use in Buildings - Rating of sound absorption" is:

$$\alpha_w = 0.80$$

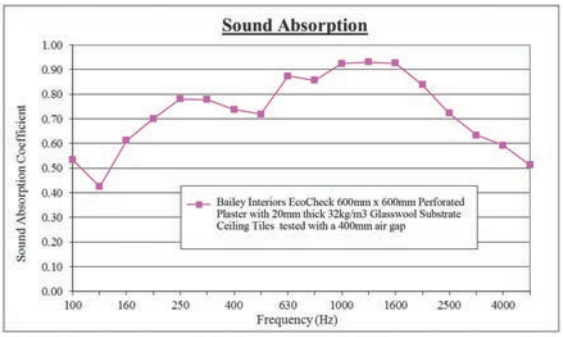
The Practical Sound Absorption Coefficients are detailed below in Table 2. These values have been determined in accordance with AS ISO 11654-1997 "Acoustics: Sound Absorbers for Use in Buildings - Rating of sound absorption".

Table 2: Practical Sound Absorption Coefficients for the Sample

Frequency (Hz)	125	250	500	1000	2000	4000
Practical Sound Absorption Coefficient, α_p	0.50	0.75	0.80	0.90	0.85	0.60

N.R.C. of the sample calculated in accordance with ASTM C423-90A is: 0.80.

Graph 1: Sound Absorption Coefficients of Bailey Interiors EcoCheck 600mm x 600mm Perforated Plaster with 20mm thick 32kg/m^3 Glasswool Substrate Ceiling Tiles tested with a 400mm air gap.



ACOUSTIC LABORATORIES AUSTRALIA PTY LTD

AIRBORNE SOUND ATTENUATION BETWEEN ROOMS SHARING COMMON CEILING PLENUM

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

ALA Test No.: **16-095-4**
Client: **Australian Plaster Acoustics**
Specimen: Ecocheck tegular edge
Detail: 600 x 600 Plaster Acoustic Tile

Description of Specimen:

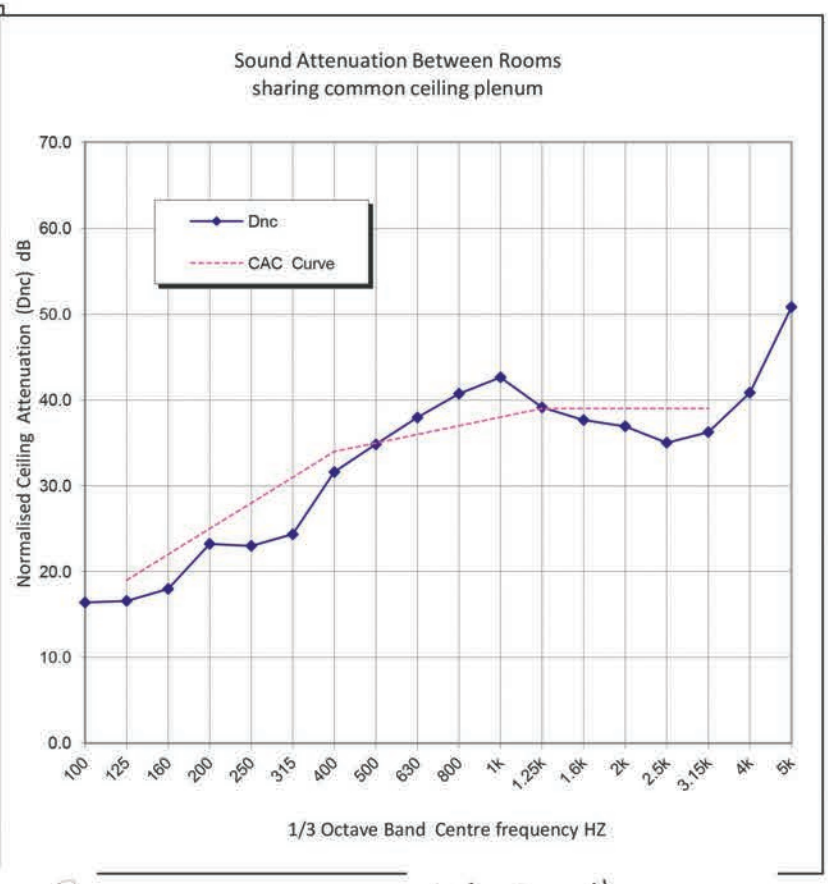
Ecocheck Tile, Tegular Edge 600 x 600 X 28mm Plaster Acoustic Tile
Nominal open area 22.7%
25mm glasswool insulation @ 32 kg/m3; compressed to 20mm
Thin 2mm plaster skim coat over insulation to seal tile
Nominal weight per tile 4.35 kg
Lay in Tee Bar grid, Rondo Duo 1 & 2

Meas. Date: 10-Aug-16

Tested in accordance with
ASTM E1414 / E1414M - 11a

CEILING ATTENUATION CLASS **CAC** **35**

Centre Frequency	Dnc	CAC Curve	Deficiencies
Hz	dB	dB	dB
100	**16.4**		
125	**16.6**	19	2.4
160	**18.0**	22	4.0
200	**23.2**	25	1.8
250	**23.0**	28	5.0
315	**24.3**	31	6.7
400	**31.6**	34	2.4
500	**34.8**	35	0.2
630	**38.0**	36	
800	**40.7**	37	
1k	**42.7**	38	
1.25k	**39.1**	39	
1.6k	**37.7**	39	1.3
2k	**36.9**	39	2.1
2.5k	**35.0**	39	4.0
3.15k	**36.3**	39	2.7
4k	**40.9**	39	
5k	**50.8**		
			Total
CAC	**35**		32.5



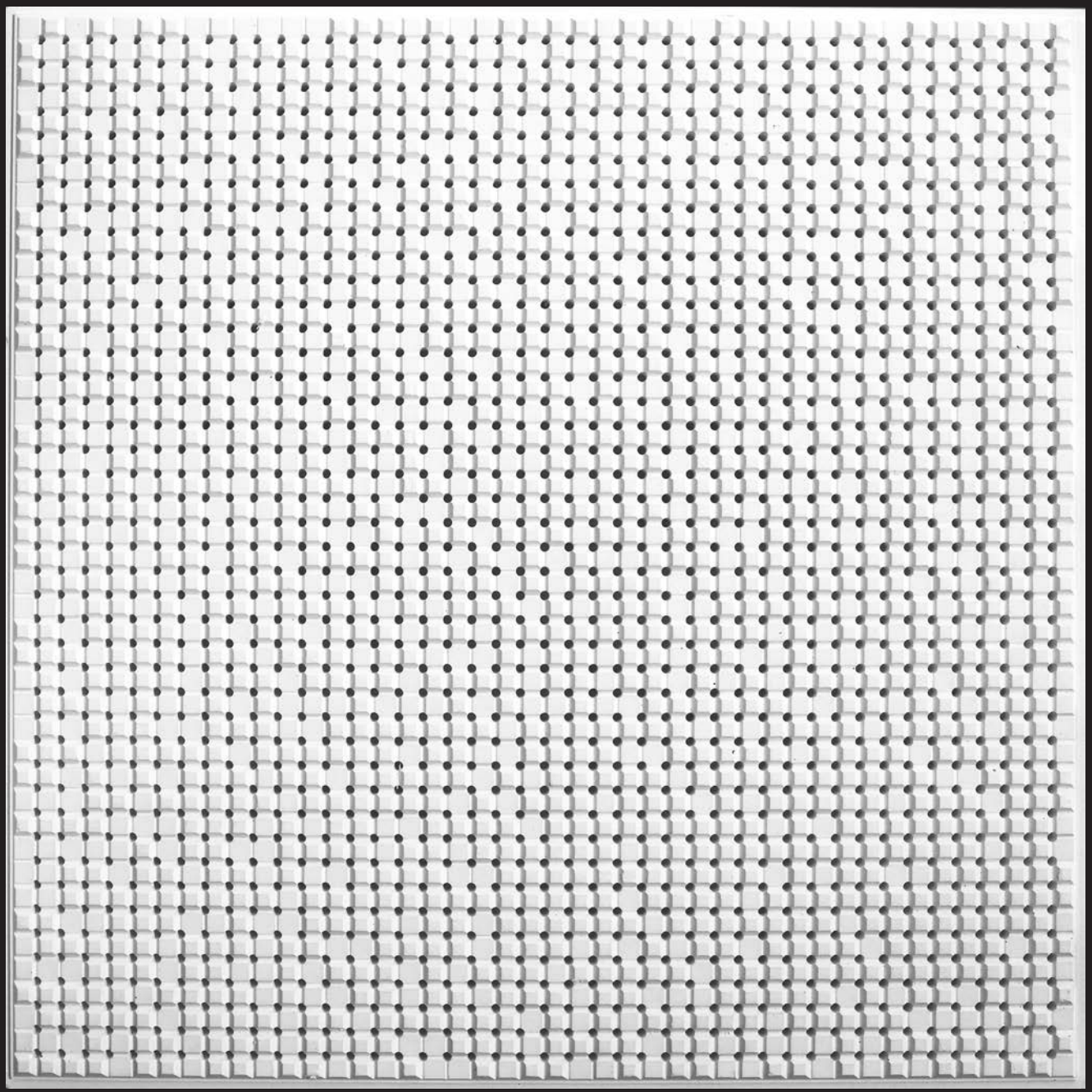
Signatory:
Tester: N Gabriels B.Arch, FAAS

Date: 12-Aug-16

Kingsley Hearne.
Checked: K Hearne B.Arch, MAAS

TEST RESULTS

SHADEX



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: **AC270-02-1**

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

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: 3.6 x 3.0 m (10.8 m^2), Test configuration: Type E-400]

Description: • Bailey "Shadex" drop-in acoustic ceiling tiles
• with integral glass fibre batt behind, non-encapsulated

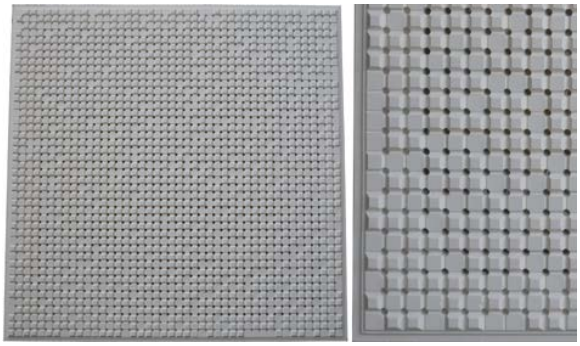
Tile Details[3]

- Perforated moulded plaster ceiling tiles, approx 588 x 588 mm (x 30 mm thick) designed to drop into a standard 600 mm suspended ceiling grid.
- Manufactured with an integral glass fibre batt (Bradford Supertel, 32 kg/m^3, 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 in a regular pattern of 5.0 mm dia holes (1849 count); the perforations in the vicinity of the perimeter being open only at the face (closed at the rear), with the perforations away from the perimeter being open front and back (exposing the glass fibre batt behind).
- Open area percentage[4] (estimated): 8.3% (only holes open front and back); 10.1% (all holes).
- Decorative effect of perforations supplemented by additional moulding details (grooves and varying facets between the perforations).

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

Installation

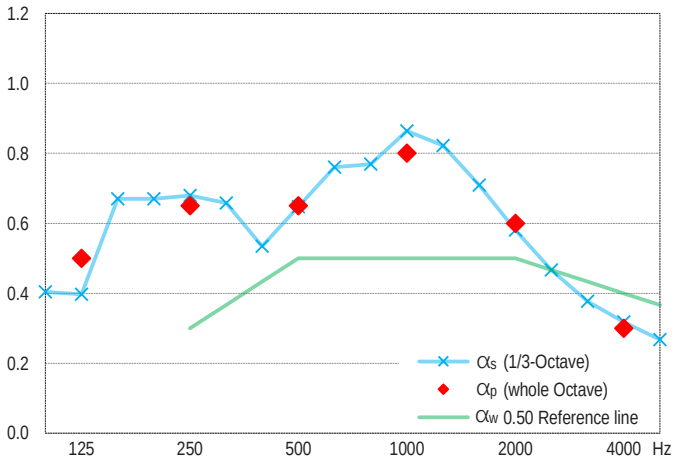
- The test specimen was installed as an upside down ceiling on the floor of the chamber.
- A 400 mm deep enclosure (32 mm MDF timber, approx 23 kg/m^2, built to surround an area of 3600 x 3000 mm) was placed on the floor of the chamber, 11° off parallel with the walls. The enclosure was taped at all joints to prevent air leakage between the enclosed space and the outside.
- A system of steel wall studs/track was set up inside the enclosure to support the specimen tiles. The cavity behind the panels was a single undivided cavity without internal partitions.
- Specimen 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 and acoustically mimic a normal ceiling installation. The perimeter of the installed test specimen was taped with masking tape to seal gaps between the tiles and the enclosure.
- Specimen installation was carried out by laboratory staff.



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

Measurement Details & Results

Freq	Absorption coefficients			Reverberation times, T_{60} (sec)	
Hz	α_s	α_p	95% Conf (δ)	Empty room	with Specimen
100	0.40		0.07	5.82	3.25
125	0.40	0.50	0.09	6.86	3.57
160	0.67		0.05	6.59	2.64
200	0.67		0.09	6.43	2.62
250	0.68	0.65	0.06	5.40	2.41
315	0.66		0.05	6.57	2.66
400	0.53		0.03	6.31	2.94
500	0.65	0.65	0.04	5.91	2.58
630	0.76		0.04	5.47	2.28
800	0.77		0.04	5.00	2.19
1000	0.86	0.80	0.04	4.84	2.02
1250	0.82		0.04	4.30	1.97
1600	0.71		0.04	3.93	2.04
2000	0.58	0.60	0.03	3.53	2.09
2500	0.47		0.02	3.22	2.12
3150	0.38		0.02	2.96	2.10
4000	0.32	0.30	0.03	2.58	1.92
5000	0.27		0.03	2.21	1.70



Performance Indices[1,2]
α_w = 0.50 (LM)
SAA = 0.68
NRC = 0.70

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:	15 Jan 2020	15 Jan 2020
Temperature & humidity:	27 °C, 58 % R.H.	28 °C, 41 % R.H.
Atmospheric pressure:	996 mBar	996 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: 24 January 2020

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 a plasterboard wall) • 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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REPORT ON THE DETERMINATION OF SOUND ABSORPTION COEFFICIENTS OF BAILEY INTERIORS SHADEX 600MM x 600MM PERFORATED PLASTER CEILING TILES WITH A 25MM @ 32KG/M^3 GLASSWOOL BACKING COMPRESSED TO 20MM AND SEALED WITH A PLASTER SKIM COAT TESTED WITH A 400MM AIR GAP IN A REVERBERATION ROOM.

Testing Procedure:	AS ISO 354 - 2006
Testing Laboratory:	Applied Acoustics Laboratory School of Electrical and Computer Engineering RMIT University Melbourne, Victoria 3000, Australia NATA Accreditation Number: 1421
Client:	Bailey Interiors Pty. Ltd. 83-85 Boundary Road Mortdale, New South Wales 2223 Australia
Date of Test:	29th of May 2014
Date of Report:	16th of April 2015
Report Number:	14-047/PD
Testing Officer:	Peter Dale

Peter Dale
Testing Officer

Accredited for compliance with ISO/IEC 17025

The mean reverberation times at each frequency for the empty room, $T60_e$, the room with the sample installed, $T60_{e+s}$, the sound absorption coefficient and the 95% confidence interval are provided in Table 1. The results are rounded to 0.01. The 95% confidence interval for each frequency is determined from the standard deviation of the reverberation times of the empty room and the room with the sample. The k factor used to determine the 95% Confidence interval is 2.201.

The results for the sample are detailed in Table 1, Table 2 and Graph 1 of this report.

Test conditions:

Room Empty:	Air temperature	22.1ºC,
	Relative Humidity	53%
	Barometric Pressure	0.7540 metre of mercury.
Room with Sample:	Air temperature	22.2ºC,
	Relative Humidity	45%
	Barometric Pressure	0.7698 metre of mercury.

Table 1: Reverberation times and Sound Absorption Coefficients of Bailey Interiors Shadex 600mm x 600mm Perforated Plaster Ceiling Tiles with 25mm thick @ 32kg/m^3 Glasswool backing compressed to 20mm and sealed with a plaster skim coat tested with a 400mm air gap.

Octave Centre Frequency Bands, Hz	Average RT's for Empty Room $T60_e$	Average RT's for Room with Sample $T60_{e+s}$	Sound Absorption Coefficient α_s	95% Confidence Interval for α_s
100	8.555	3.657	0.47	0.05
125	8.711	3.483	0.52	0.05
160	10.108	4.546	0.36	0.06
200	9.213	3.936	0.43	0.06
250	8.494	3.320	0.55	0.06
315	8.167	3.475	0.49	0.04
400	8.236	3.238	0.56	0.04
500	7.142	2.433	0.81	0.05
630	6.676	2.025	1.03	0.04
800	6.144	1.972	1.03	0.03
1000	5.883	2.105	0.92	0.04
1250	5.221	2.305	0.73	0.02
1600	4.641	2.429	0.58	0.02
2000	4.176	2.503	0.47	0.02
2500	3.551	2.354	0.41	0.02
3150	2.982	2.096	0.39	0.02
4000	2.408	1.794	0.36	0.04
5000	2.012	1.542	0.35	0.05

N.R.C. of the sample calculated in accordance with ASTM C423-90A is: 0.70

sound decays in accordance with the standard. The measuring equipment has been calibrated by an external laboratory, and is in current calibration.

3. SAMPLE FOR TESTING

As provided by Client:

Bailey Interiors Shadex 600mm x 600mm Shadex Perforated Plaster Ceiling Tiles with 25mm thick @ 32kg/m^3 Glasswool backing compressed to 20mm and sealed with a plaster skim coat

Manufacturer:	Bailey Interiors Pty. Ltd.
Product Designation:	Shadex
Construction:	Perforated Plaster with 25mm thick glasswool as backing compressed to 20mm sealed with a plaster skim coat
Colour:	White
Nominal Open Area of Panel:	15.3%
Hole Pattern:	Circular holes with raised sections between holes.
Nominal Hole Diameter:	7.5mm
Number of Holes Per Tile:	36 x 36 array: 1296
Nominal Individual Panel Size:	600mm x 600mm x 30mm
RMIT Measured Individual Panel Size:	600mm x 600mm x 30mm
Single Tile Weight	4.5kg
Nominal Test Air gap:	400mm
Dimensions of Sample:	3.00m x 3.57m
Area of Sample:	10.71m^2

The sample was tested on the 29th of May 2014.

The tiles were tested by mounting the tiles on a 420mm in height, 25mm thick MDF Frame with dimensions 3050mm wide by 3650mm long that was installed on the floor of the Reverberation Chamber giving sample dimensions of 3000mm wide and 3570mm in length and a total sample surface area of 10.71m^2. Due to the 586mm dimension of the plaster tiles under test, nominally 30mm of 3mm thick steel was run along on the 3000mm dimension to fill the 30mm gap between the tiles under test and the perimeter of the test frame.

The sample under test was supported in the MDF Test Frame by a steel suspension frame to achieve a 400mm void between the underside of the sample under test and the floor of the Reverberation Chamber. The tiles were installed with the glasswool insulation to the underside of the tile with the perforated plaster face incident to the sound field. Standard ceiling tile suspension grid was also installed in the joins between adjacent ceiling tiles on the sound-incident side of the tiles under test to replicate a standard field installation.

The sound-incident side of the ceiling panel featured circular holes in a grid pattern and is pictured below in detail in Figure 1. Figure 2 shows the rear face of the panel with the glasswool installed. Figure 3 depicts the sample installed in the Reverberation Chamber for testing.

The weighted sound absorption coefficient α_w of the sample determined in accordance with AS ISO 11654-1997 "Acoustics: Sound Absorbers for Use in Buildings - Rating of sound absorption" is:

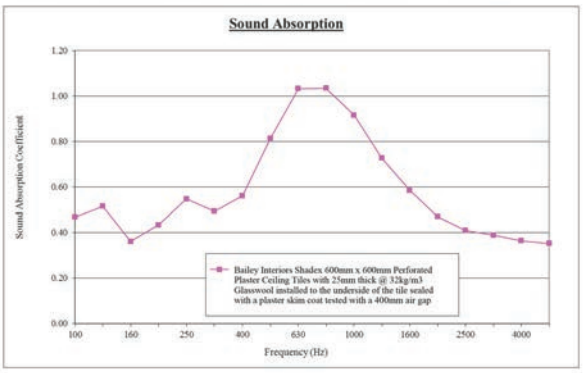
$$\alpha_w = 0.50(M)$$

The Practical Sound Absorption Coefficients are detailed below in Table 2. These values have been determined in accordance with AS ISO 11654-1997 "Acoustics: Sound Absorbers for Use in Buildings - Rating of sound absorption".

Table 2: Practical Sound Absorption Coefficients for the Sample

Frequency (Hz)	125	250	500	1000	2000	4000
Practical Sound Absorption Coefficient, α_p	0.45	0.50	0.80	0.90	0.50	0.35

Graph 1: Sound Absorption Coefficients of Bailey Interiors Shadex 600mm x 600mm Perforated Plaster Ceiling Tiles with 25mm thick @ 32kg/m^3 Glasswool backing compressed to 20mm and sealed with a plaster skim coat tested with a 400mm air gap.



ACOUSTIC LABORATORIES AUSTRALIA PTY LTD

AIRBORNE SOUND ATTENUATION BETWEEN ROOMS SHARING COMMON CEILING PLENUM

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

ALA Test No.: **16-091-2**
Client: **Australian Plaster Acoustics**
Specimen: Shadex tegular edge
Detail: 600 x 600 Plaster Acoustic Tile

Description of Specimen:

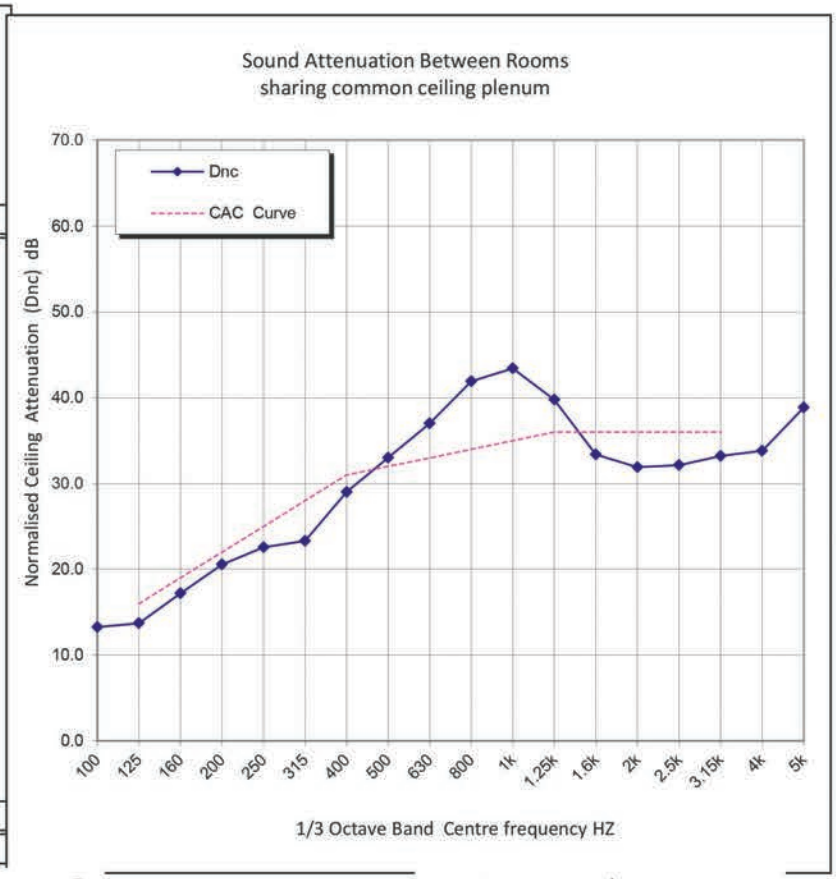
Shadex Tile, Tegular Edge 600 x 600 28mm thick Plaster Acoustic Tile
Nominal open area 15%
25mm glasswool insulation @ 32 kg/m3; compressed to 20mm
Thin 2mm plaster skim coat over insulation to seal tile
Weight per tile4.5 Kg
Lay in Tee Bar grid

Meas. Date: 13-Apr-16

Tested in accordance with
ASTM E1414 / E1414M - 11a

CEILING ATTENUATION CLASS **CAC** **32**

Centre Frequency	Dnc	CAC Curve	Deficiencies
Hz	dB	dB	dB
100	**13.2**		
125	**13.7**	16	2.3
160	**17.2**	19	1.8
200	**20.6**	22	1.4
250	**22.6**	25	2.4
315	**23.3**	28	4.7
400	**29.0**	31	2.0
500	**33.0**	32	
630	**37.0**	33	
800	**41.9**	34	
1k	**43.4**	35	
1.25k	**39.8**	36	
1.6k	**33.4**	36	2.6
2k	**31.9**	36	4.1
2.5k	**32.1**	36	3.9
3.15k	**33.2**	36	2.8
4k	**33.8**	36	2.2
5k	**38.9**		
			Total
CAC	**32**		30.2



Signatory:
Tester: N Gabriels B.Arch, FAAS

Date: 15-Apr-16

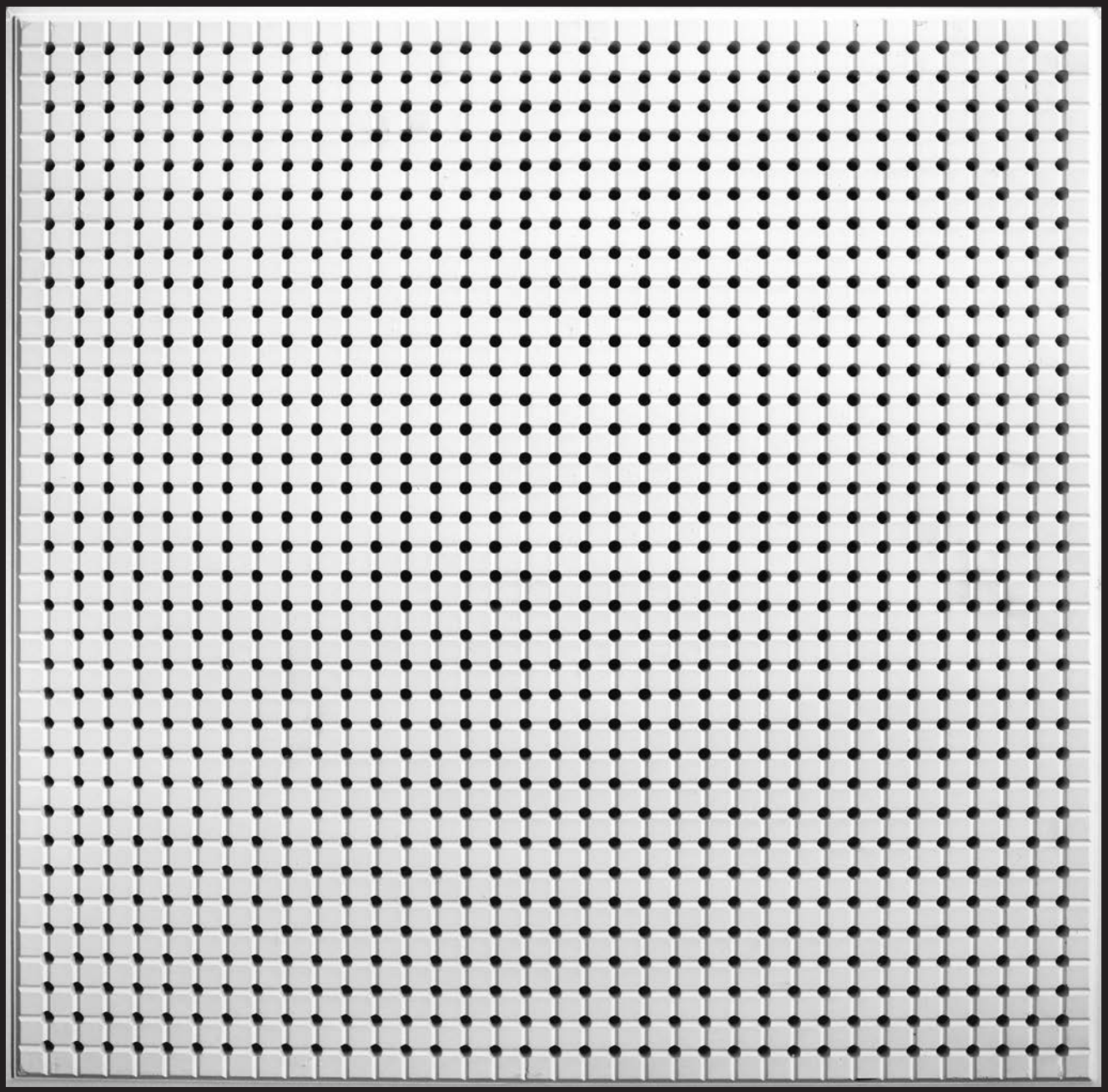
Checked: K Hearne B.Arch, MAAS

16-091-2 Shadex.xlsx

Page 7 of 7

TEST RESULTS

Hush



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: **AC270-04-1**

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

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: 3.6 x 3.0 m (10.8 m^2), Test configuration: Type E-400]

Description: • Bailey "Hush" drop-in acoustic ceiling tiles
• with integral glass fibre batt behind, non-encapsulated

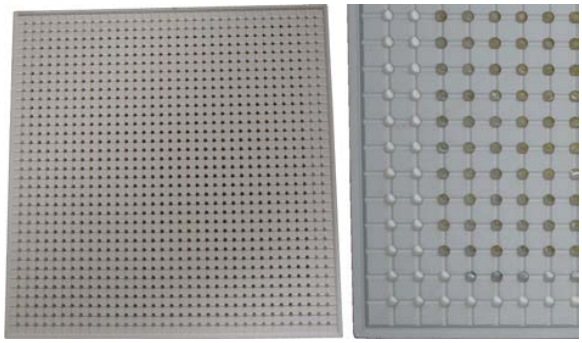
Tile Details[3]

- Perforated moulded plaster ceiling tiles, approx 588 x 588 mm (x 30 mm thick) designed to drop into a standard 600 mm suspended ceiling grid.
- Manufactured with an integral glass fibre batt (Bradford Supertel, 32 kg/m^3, 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 in a regular pattern of 7.0 mm dia holes (1225 count); the perforations in the vicinity of the perimeter being open only at the face (closed at the rear), with the perforations away from the perimeter being open front and back (exposing the glass fibre batt behind).
- Open area percentage[4] (estimated): 10.5% (only holes open front and back); 13.1% (all holes).
- Decorative effect of perforations supplemented by additional moulding details (grooves between the perforations).

Installation

- The test specimen was installed as an upside down ceiling on the floor of the chamber.
- A 400 mm deep enclosure (32 mm MDF timber, approx 23 kg/m^2, built to surround an area of 3600 x 3000 mm) was placed on the floor of the chamber, 11° off parallel with the walls. The enclosure was taped at all joints to prevent air leakage between the enclosed space and the outside.
- A system of steel wall studs/track was set up inside the enclosure to support the specimen tiles. The cavity behind the panels was a single undivided cavity without internal partitions.
- Specimen 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 and acoustically mimic a normal ceiling installation. The perimeter of the installed test specimen was taped with masking tape to seal gaps between the tiles and the enclosure.
- Specimen installation was carried out by laboratory staff.

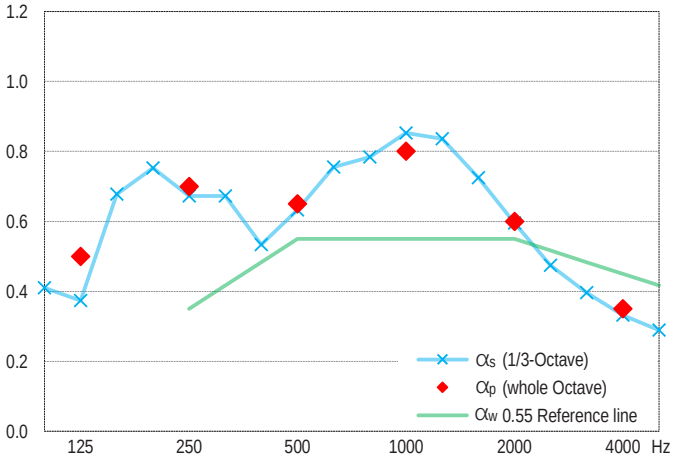
Test specimen installed for testing (image inverted to depict ceiling installation)



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

Measurement Details & Results

Freq	Absorption coefficients			Reverberation times, T_{60} (sec)	
Hz	α_s	α_p	95% Conf (δ)	Empty room	with Specimen
100	0.41		0.06	5.82	3.23
125	0.37	0.50	0.09	6.86	3.68
160	0.68		0.07	6.59	2.63
200	0.75		0.10	6.43	2.44
250	0.67	0.70	0.06	5.40	2.42
315	0.67		0.05	6.57	2.63
400	0.53		0.04	6.31	2.95
500	0.63	0.65	0.04	5.91	2.61
630	0.75		0.04	5.47	2.29
800	0.78		0.04	5.00	2.16
1000	0.85	0.80	0.04	4.84	2.03
1250	0.84		0.04	4.30	1.96
1600	0.73		0.04	3.93	2.01
2000	0.60	0.60	0.03	3.53	2.07
2500	0.47		0.03	3.22	2.11
3150	0.40		0.03	2.96	2.08
4000	0.33	0.35	0.03	2.58	1.93
5000	0.29		0.03	2.21	1.70



Performance Indices[1,2]
α_w = 0.55 (LM)
SAA = 0.69
NRC = 0.70

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:	15 Jan 2020	15 Jan 2020
Temperature & humidity:	27 °C, 58 % R.H.	28 °C, 43 % R.H.
Atmospheric pressure:	996 mBar	994 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: 24 January 2020

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 a plasterboard wall) • 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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REPORT ON THE DETERMINATION OF SOUND ABSORPTION COEFFICIENTS OF BAILEY INTERIORS HUSH PERFORATED PLASTER CEILING TILES (600MM x 600MM) WITH A 25MM @ 32KG/M^3 GLASSWOOL BACKING COMPRESSED TO 20MM AND SEALED WITH A PLASTER SKIM COAT TESTED WITH A 400MM AIR GAP IN A REVERBERATION ROOM.

Testing Procedure:	AS ISO 354 - 2006
Testing Laboratory:	Applied Acoustics Laboratory School of Electrical and Computer Engineering RMIT University Melbourne, Victoria 3000, Australia NATA Accreditation Number: 1421
Client:	Bailey Interiors Pty. Ltd. 83-85 Boundary Road Mortdale, New South Wales 2223 Australia
Date of Test:	28th of May 2014
Date of Report:	15th of April 2015
Report Number:	14-045/JW
Report drafted by:	Peter Dale
Testing Officer:	John Watson

John Watson
Testing Officer

Accredited for compliance with ISO/IEC 17025

The mean reverberation times at each frequency for the empty room, $T60_e$, the room with the sample installed, $T60_{e+s}$, the sound absorption coefficient and the 95% confidence interval are provided in Table 1. The results are rounded to 0.01. The 95% confidence interval for each frequency is determined from the standard deviation of the reverberation times of the empty room and the room with the sample. The k factor used to determine the 95% Confidence interval is 2.201.

The results for the sample are detailed in Table 1, Table 2 and Graph 1 of this report.

Test conditions:

Room Empty:	Air temperature	22.1°C,
	Relative Humidity	53%
	Barometric Pressure	0.7540 metre of mercury.
Room with Sample:	Air temperature	22.1°C,
	Relative Humidity	47%
	Barometric Pressure	0.7600 metre of mercury.

Table 1: Reverberation times and Sound Absorption Coefficients of Bailey Interiors Hush 600mm x 600mm Perforated Plaster Ceiling Tiles with 25mm thick @ 32kg/m^3 Glasswool backing compressed to 20mm and sealed with a plaster skim coat tested with a 400mm air gap.

Octave Centre Frequency Bands, Hz	Average RT's for Empty Room $T60_e$	Average RT's for Room with Sample $T60_{e+s}$	Sound Absorption Coefficient α_s	95% Confidence Interval for α_s
100	8.555	3.722	0.45	0.10
125	8.711	3.497	0.51	0.05
160	10.108	4.508	0.36	0.05
200	9.213	4.039	0.41	0.06
250	8.494	3.535	0.49	0.05
315	8.167	3.460	0.49	0.05
400	8.236	3.291	0.54	0.02
500	7.142	2.532	0.76	0.06
630	6.676	2.021	1.03	0.05
800	6.144	1.927	1.06	0.05
1000	5.883	1.992	0.99	0.04
1250	5.221	2.221	0.77	0.03
1600	4.641	2.269	0.67	0.02
2000	4.176	2.336	0.55	0.02
2500	3.551	2.257	0.47	0.02
3150	2.982	2.071	0.41	0.02
4000	2.408	1.750	0.42	0.04
5000	2.012	1.472	0.47	0.05

N.R.C. of the sample calculated in accordance with ASTM C423-90A is: 0.70

sound decays in accordance with the standard. The measuring equipment has been calibrated by an external laboratory, and is in current calibration.

3. SAMPLE FOR TESTING

As provided by Client:

Manufacturer:	Bailey Interiors Pty. Ltd.
Product Designation:	Hush
Construction:	Perforated Plaster with 25mm thick glasswool as backing compressed to 20mm sealed with a plaster skim coat
Colour:	White
Nominal Open Area of Panel:	21.4%
Hole Pattern:	Circular holes in a 35 x 35 grid
Nominal Hole Size:	7.0mm
Number Of Holes Per tile:	1225
Nominal Individual Panel Size:	600mm x 600mm x 30mm
RMIT Measured Individual Panel Size:	600mm x 600mm x 30mm
Single Tile Weight (including backing):	4.50kg
Nominal Test Air gap:	400mm
Dimensions of Sample:	3.00m x 3.60m
Area of Sample:	10.80m^2

The sample was tested on the 28th of May 2014.

The tiles were tested by mounting the tiles on a 420mm in height, 25mm thick MDF Frame with dimensions 3050mm wide by 3650mm long that was installed on the floor of the Reverberation Chamber giving a total sample surface area of 10.80m^2.

The sample under test was supported in the MDF Test Frame by a steel suspension frame to achieve a 400mm void between the underside of the sample under test and the floor of the Reverberation Chamber. The tiles were installed with the glasswool insulation to the underside of the tile with the perforated plaster face incident to the sound field. Standard ceiling tile suspension grid was also installed in the joins between adjacent ceiling tiles on the sound-incident side of the tiles under test to replicate a standard field installation.

The sound-incident side of the ceiling panel featured circular holes with a 7mm diameter holes and is pictured below in detail in Figure 1. Figure 2 shows the rear face of the panel with the glasswool installed. Figure 3 depicts the sample installed in the Reverberation Chamber for testing.

The weighted sound absorption coefficient α_w of the sample determined in accordance with AS ISO 11654-1997 "Acoustics: Sound Absorbers for Use in Buildings - Rating of sound absorption" is:

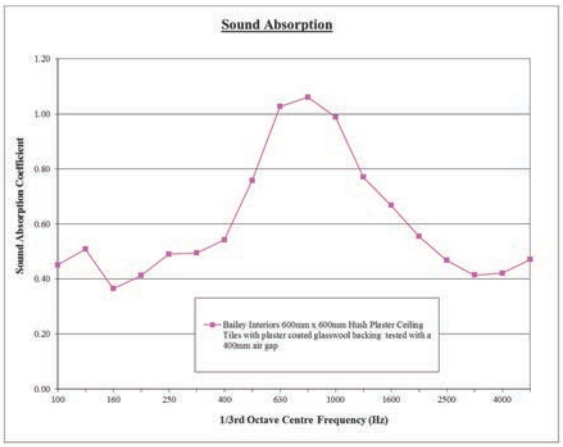
$$\alpha_w = 0.60(M)$$

The Practical Sound Absorption Coefficients are detailed below in Table 2. These values have been determined in accordance with AS ISO 11654-1997 "Acoustics: Sound Absorbers for Use in Buildings - Rating of sound absorption".

Table 2: Practical Sound Absorption Coefficients for the Sample

Frequency (Hz)	125	250	500	1000	2000	4000
Practical Sound Absorption Coefficient, α_p	0.45	0.45	0.80	0.95	0.55	0.45

Graph 1: Sound Absorption Coefficients of Bailey Interiors Hush 600mm x 600mm Perforated Plaster Ceiling Tiles with 25mm thick @ 32kg/m^3 Glasswool backing compressed to 20mm and sealed with a plaster skim coat tested with a 400mm air gap.



ACOUSTIC LABORATORIES AUSTRALIA PTY LTD

AIRBORNE SOUND ATTENUATION BETWEEN ROOMS SHARING COMMON CEILING PLENUM

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

ALA Test No.: **16-091-5**
Client: **Australian Plaster Acoustics**
Specimen: Hush Tile- Tegular Edge
Detail: 600 x 600 Plaster Acoustic Tile

Description of Specimen:

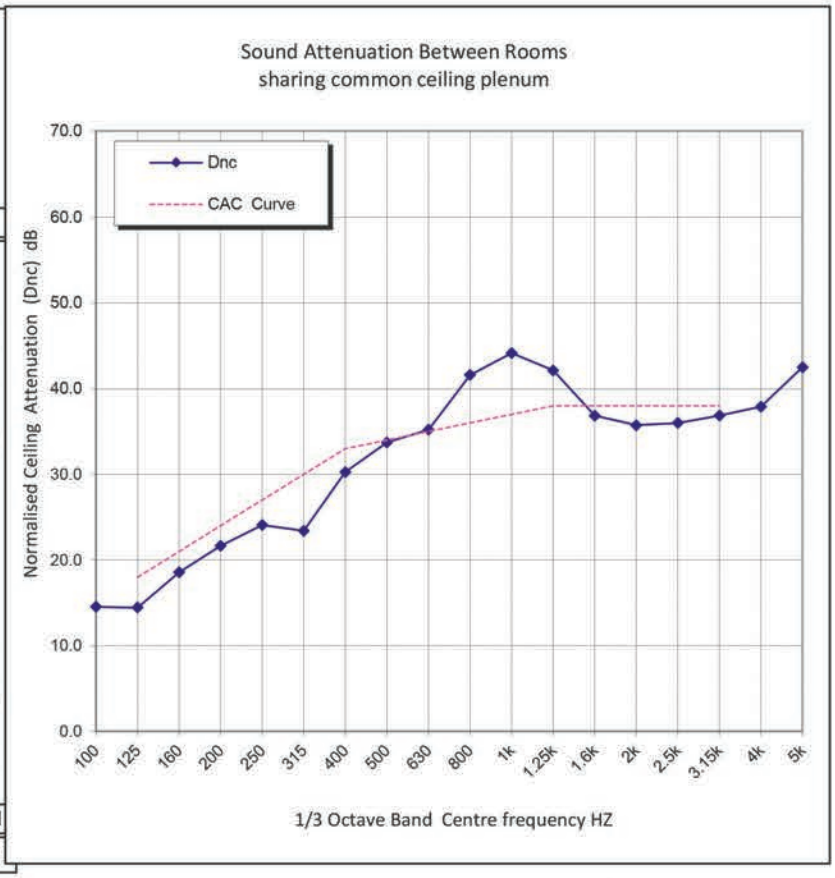
Hush Tile, Tegular Edge 600 x 600 X 28mm Plaster Acoustic Tile
6mm perforated plaster face. Nominal open area 21.4%
25mm glasswool insulation @ 32 kg/m3; compressed to 20mm
Thin 2mm plaster skim coat over insulation to seal tile
Nominal weight per tile 4.5 kg
Lay in Tee Bar grid - Rondo Duo 1 and 2

Meas. Date: 14-Apr-16

Tested in accordance with
ASTM E1414 / E1414M - 11a

CEILING ATTENUATION CLASS **CAC 34**

Centre Frequency	Dnc	CAC Curve	Deficiencies
Hz	dB	dB	dB
100	**14.5**		
125	**14.4**	18	3.6
160	**18.6**	21	2.4
200	**21.7**	24	2.3
250	**24.1**	27	2.9
315	**23.4**	30	6.6
400	**30.3**	33	2.7
500	**33.7**	34	0.3
630	**35.2**	35	
800	**41.6**	36	
1k	**44.2**	37	
1.25k	**42.1**	38	
1.6k	**36.8**	38	1.2
2k	**35.7**	38	2.3
2.5k	**36.0**	38	2.0
3.15k	**36.9**	38	1.1
4k	**37.9**	38	0.1
5k	**42.5**		
			Total
CAC	**34**		27.5



Signatory:
Tester: N Gabriels B.Arch, FAAS

Date: 16-Apr-16

Checked: K Hearne B.Arch, MAAS

16-091-5 Hush.xlsx

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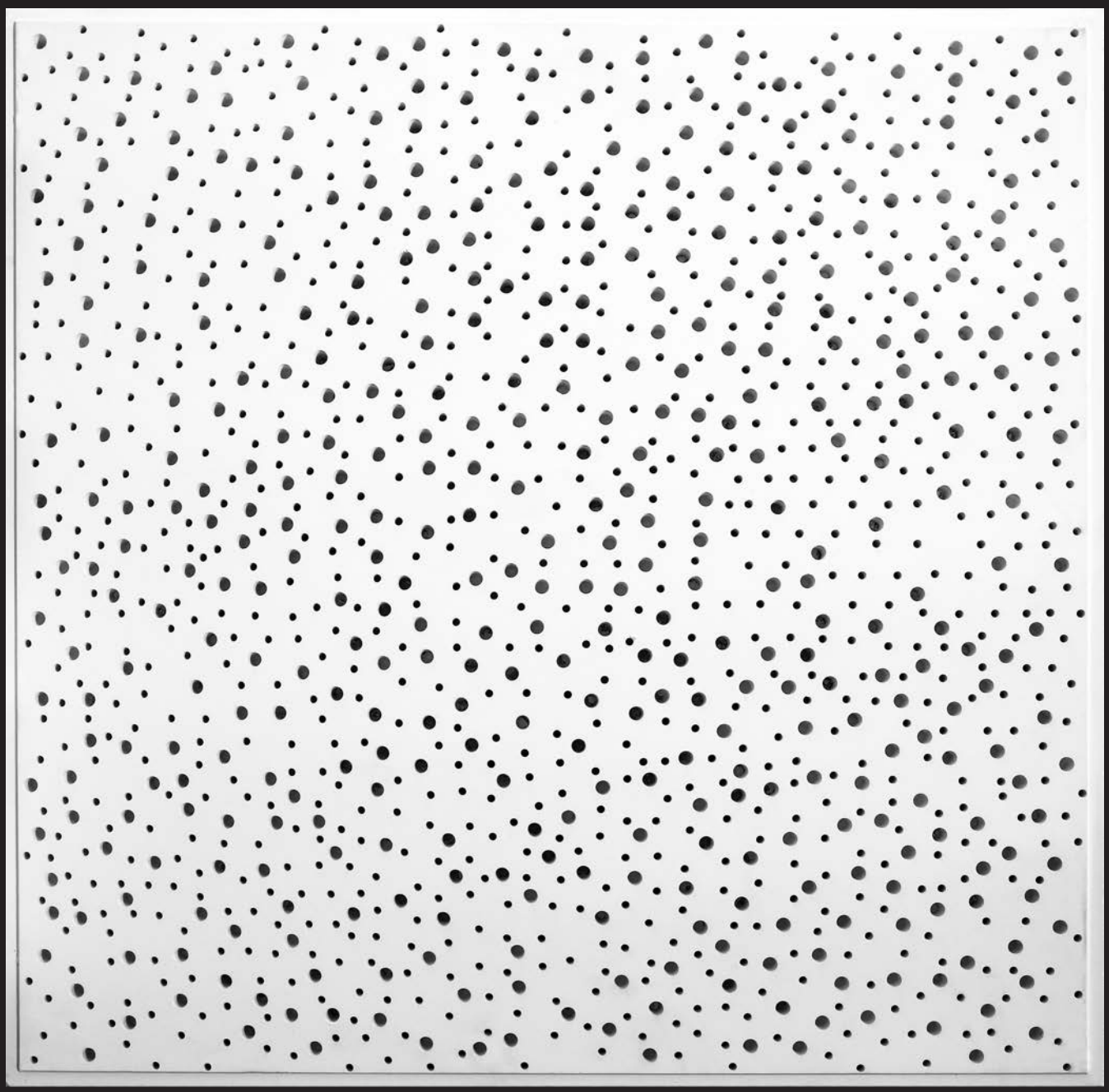
TEST RESULTS

Random



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: **AC270-01-1**

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

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: 3.6 x 3.0 m (10.8 m²), Test configuration: Type E-400]

Description: • Bailey "Random" drop-in acoustic ceiling tiles
• with integral glass fibre batt behind, non-encapsulated

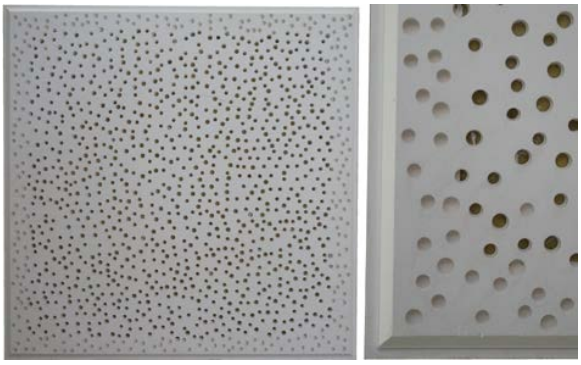
Tile Details[3]

- Perforated moulded plaster ceiling tiles, approx 588 x 588 mm (x 30 mm thick) designed to drop into a standard 600 mm suspended ceiling grid.
- Manufactured with an integral glass fibre batt (Bradford Supertel, 32 kg/m³, 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 in a random pattern with a mixture of 6.5 and 8.0 mm dia holes (approx 880 and 440 of each size respectively); the perforations in the vicinity of the perimeter being open only at the face (closed at the rear), with the perforations away from the perimeter being open front and back (exposing the glass fibre batt behind).
- Open area percentage[4] (estimated): 11.5% (only holes open front and back); 14.3% (all holes).

Installation

- The test specimen was installed as an upside down ceiling on the floor of the chamber.
- A 400 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, 11° off parallel with the walls. The enclosure was taped at all joints to prevent air leakage between the enclosed space and the outside.
- A system of steel wall studs/track was set up inside the enclosure to support the specimen tiles. The cavity behind the panels was a single undivided cavity without internal partitions.
- Specimen 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 and acoustically mimic a normal ceiling installation. The perimeter of the installed test specimen was taped with masking tape to seal gaps between the tiles and the enclosure.
- Specimen installation was carried out by laboratory staff.

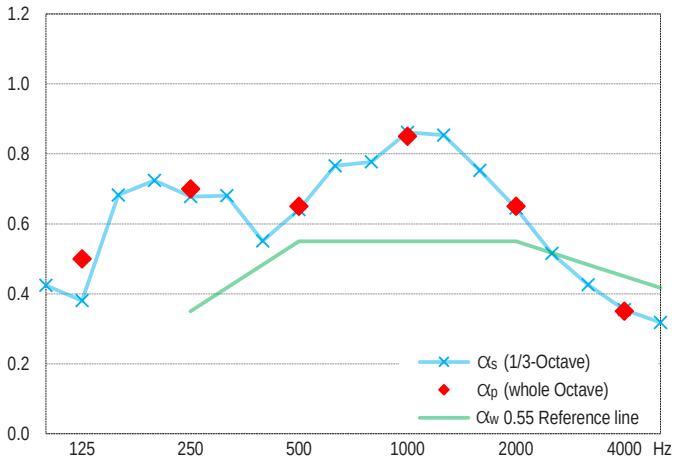
Test specimen installed for testing (image inverted to depict ceiling installation)



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

Measurement Details & Results

Freq	Absorption coefficients			Reverberation times, T_{60} (sec)	
Hz	α_s	α_p	95% Conf (δ)	Empty room	with Specimen
100	0.42		0.07	5.82	3.18
125	0.38	0.50	0.08	6.86	3.66
160	0.68		0.08	6.59	2.62
200	0.72		0.12	6.43	2.51
250	0.68	0.70	0.06	5.40	2.42
315	0.68		0.05	6.57	2.62
400	0.55		0.04	6.31	2.91
500	0.64	0.65	0.04	5.91	2.61
630	0.77		0.05	5.47	2.28
800	0.78		0.04	5.00	2.19
1000	0.86	0.85	0.04	4.84	2.04
1250	0.85		0.03	4.30	1.95
1600	0.75		0.03	3.93	1.99
2000	0.64	0.65	0.03	3.53	2.01
2500	0.52		0.03	3.22	2.06
3150	0.43		0.03	2.96	2.03
4000	0.35	0.35	0.03	2.58	1.88
5000	0.32		0.03	2.21	1.65



Performance Indices[1,2]
α_w = 0.55 (LM)
SAA = 0.70
NRC = 0.70

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:	15 Jan 2020	15 Jan 2020
Temperature & humidity:	27 °C, 58 % R.H.	26 °C, 43 % R.H.
Atmospheric pressure:	996 mBar	996 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: 24 January 2020

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 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

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: **AC194-06-1**

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

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: 3.6 x 3.0 m = 10.8 m²]

Description: Plaster Acoustic Ceiling Tiles designated "Random", with perforated face and glass wool sound absorbing batt insert, in 600 x 600 ceiling grid. Test configuration: type E-400.

Materials:

a] Bailey Interiors "Random" plaster acoustic ceiling tiles. Tiles having a plaster face moulded with an irregular array of 6 & 8 mm diameter perforations (approx 16.6 % open area), backed by a 20 mm thick batt of glass wool material, the batt being fully encapsulated with plaster except for the perforated front face. Tile mass approx 5.0 kg, with edges profiled to rest in a standard 600 x 600 ceiling grid, item b].

b] Rondo DUO ceiling grid (3600 mm main tees and 600 mm cross tees, trimmed by hand to enable upside down installation with the ceiling tiles supported from beneath).

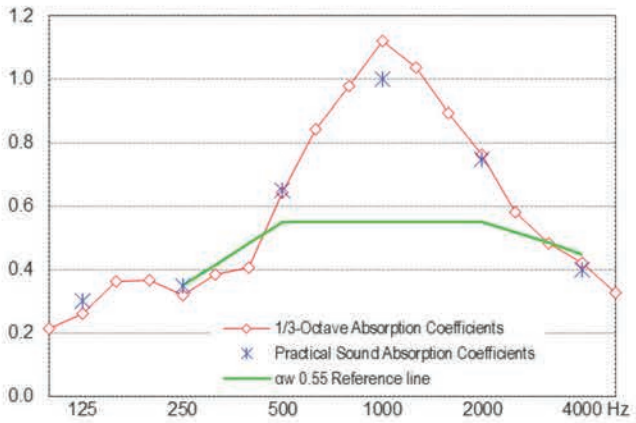
Installation:

- The test specimen was installed as an inverted ceiling on the floor of the laboratory.
- A 400 mm high perimeter enclosure of 32 mm thick MDF board (approx. 23 kg/m²) was constructed and placed on the concrete floor of the chamber, not parallel to the walls.
- A grid of timber pieces and sheet metal sections (furring channels and wall studs) was set up inside the enclosure to support the specimen tiles, which were arranged with the exposed face 400 mm from the surface of the concrete behind. The cavity behind the tiles was a single contiguous cavity with no internal partitions.
- After placement of the test specimen tiles, the ceiling grid was placed on top, and steel angles were placed around the perimeter to complete the inverted ceiling. Gaps remaining due to irregularities in the specimen components and/or arrangement were closed up by placing weights on top and/or by taping-over such gaps.
- Specimen installation was carried out jointly by the client and laboratory staff.

Test specimen arranged for test

Measurement Details & Results

Freq	Absorption coefficient		Reverberation times, T_{60} (sec)	
Hz	α_s	α_p	Empty room	with Specimen
100	0.21		5.76	4.12
125	0.26	0.30	5.72	3.86
160	0.36		6.43	3.66
200	0.37		6.58	3.69
250	0.32	0.35	6.36	3.83
315	0.38		6.62	3.63
400	0.41		6.40	3.47
500	0.64	0.65	6.30	2.72
630	0.85		6.56	2.34
800	0.98		6.09	2.08
1000	1.12	1.00	5.98	1.88
1250	1.04		5.30	1.90
1600	0.89		4.81	2.01
2000	0.77	0.75	4.32	2.08
2500	0.58		3.80	2.22
3150	0.48		3.33	2.19
4000	0.42	0.40	2.65	1.95
5000	0.33		2.11	1.73



Performance Indices[2,3]
α_w = 0.55 (M)
SAA = 0.70
NRC = 0.70 (rounded from 0.71)

Measurement Conditions

	Empty room	with Test Specimen
Date of measurement:	1 Jul 2016	1 Jul 2016
Temperature & humidity:	11 °C, 78 % R.H.	10 °C, 90 % R.H.
Atmospheric pressure:	1010 mBar	1008 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. Temperature in the chamber, being below 15 °C during testing, is a deviation from AS ISO 354 requirements.

Issuing Authority

Signed: .....
David Truett
Date: 30 August 2016

Instrumentation

Real time analyser: • Brüel & Kjær PULSE LAN-XI type 3160-A-4/2
Microphones/preamps: • Brüel & Kjær, 2 x 4166 & 2 x 4134 microphones on 2669 preamps, positioned in the room as per AS ISO 354
Noise source: • Rola 12UX on flat 1m² 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 plasterboard faced wall) • parallelepiped with dimensional proportions 1:1.3:1.6 for distribution of room modes • approx 207 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

ACOUSTIC LABORATORIES AUSTRALIA PTY LTD

AIRBORNE SOUND ATTENUATION BETWEEN ROOMS SHARING COMMON CEILING PLENUM

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

ALA Test No.: **16-091-1**
Client: **Australian Plaster Acoustics**
Specimen: Random Tile
Detail: 600 x 600 Plaster Acoustic Tile

Description of Specimen:

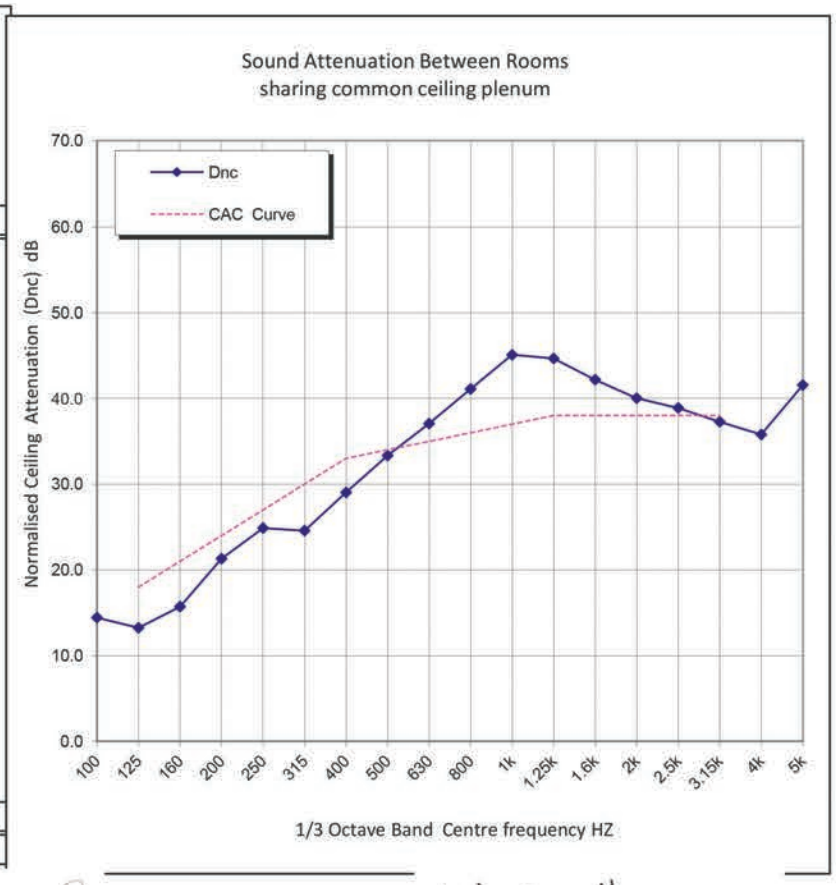
Random Tile, Tegular Edge 600 x 600 X 28mm thick Plaster Acoustic Tile
Nominal open area 10.5%
25mm glasswool insulation @ 32 kg/m3; compressed to 20mm
Thin 2mm plaster skim coat over insulation to seal tile
Nominal weight per tile 4.5 kg
Lay in Tee Bar grid

Meas. Date: 12-Apr-16

Tested in accordance with
ASTM E1414 / E1414M - 11a

CEILING ATTENUATION CLASS **CAC** **34**

Centre Frequency	Dnc	CAC Curve	Deficiencies
Hz	dB	dB	dB
100	**14.4**		
125	**13.2**	18	4.8
160	**15.7**	21	5.3
200	**21.3**	24	2.7
250	**24.9**	27	2.1
315	**24.6**	30	5.4
400	**29.0**	33	4.0
500	**33.3**	34	0.7
630	**37.1**	35	
800	**41.1**	36	
1k	**45.1**	37	
1.25k	**44.7**	38	
1.6k	**42.2**	38	
2k	**40.0**	38	
2.5k	**38.9**	38	
3.15k	**37.3**	38	0.7
4k	**35.8**	38	2.2
5k	**41.6**		
			Total
CAC	**34**		27.8



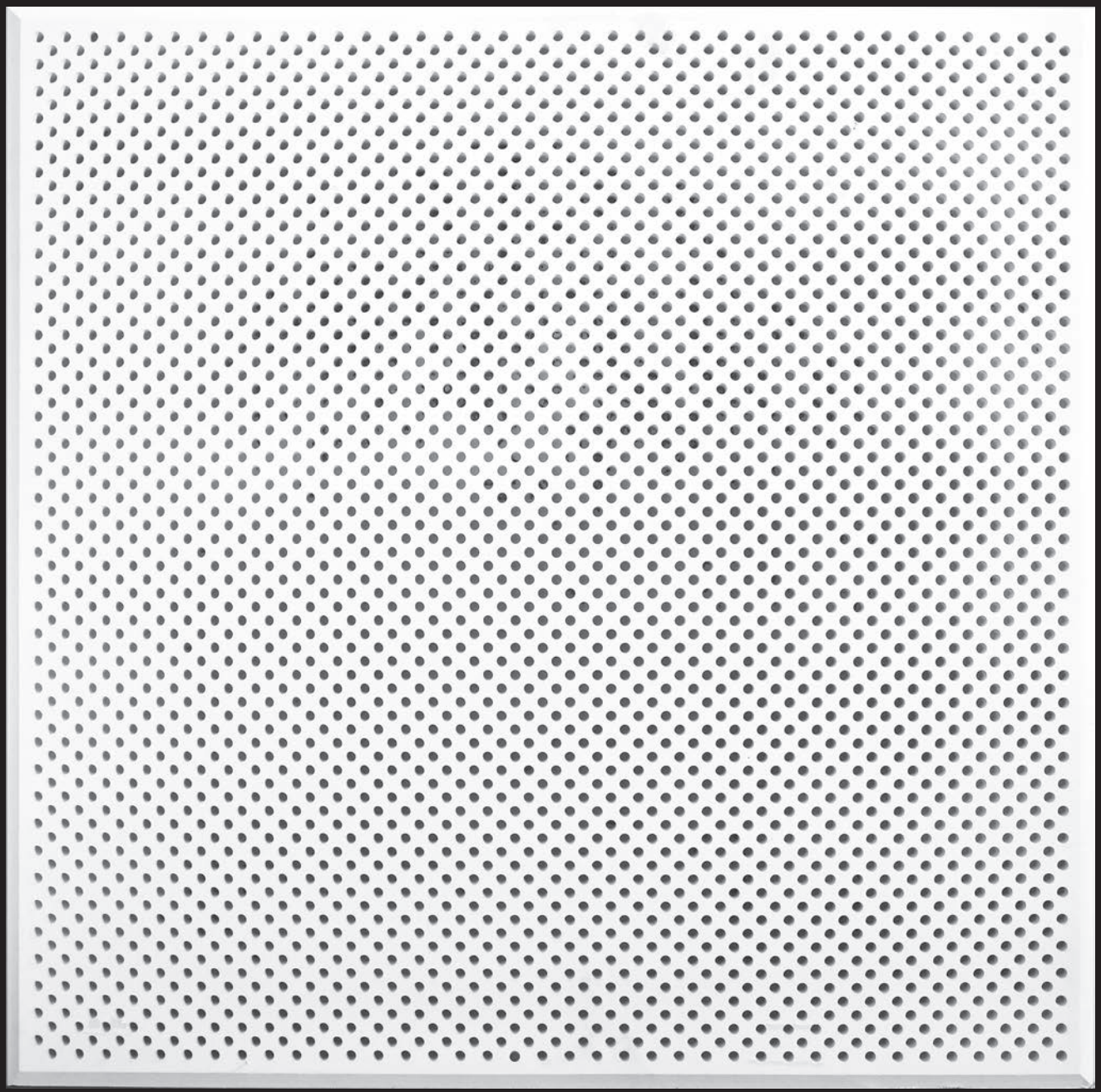
Signatory:
Tester: N Gabriels B.Arch, FAAS

Date: 14-Apr-16

Checked: K Hearne B.Arch, MAAS

TEST RESULTS

EcoCheck nail Up



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: **AC270-07-1**

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

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: 3.6 x 3.0 m (10.8 m^2), Test configuration: Type E-400]

Description: • Bailey "EcoCheck" nail-up acoustic ceiling tiles
• with integral glass fibre batt behind, non-encapsulated

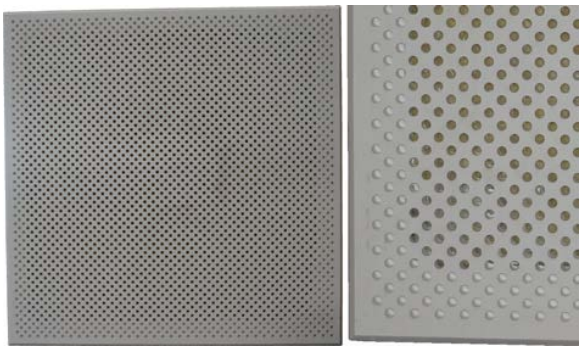
Tile Details[3]

- 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, 32 kg/m^3, 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 in a regular pattern of 6.5 mm dia holes (2888 count); the perforations in the vicinity of the perimeter being open only at the face (closed at the rear), with the perforations away from the perimeter being open front and back (exposing the glass fibre batt behind).
- Open area percentage[4] (estimated): 21.3% (only holes open front and back); 26.6% (all holes).

Installation

- The test specimen was installed as an upside down ceiling on the floor of the chamber.
- A 400 mm deep enclosure (32 mm MDF timber, approx 23 kg/m^2, built to surround an area of 3600 x 3000 mm) was placed on the floor of the chamber, 11° off parallel with the walls. The enclosure was taped at all joints to prevent air leakage between the enclosed space and the outside.
- A system of steel wall studs/track was set up inside the enclosure to support the specimen tiles. The cavity behind the panels was a single undivided cavity without internal partitions.
- Specimen tiles were arranged in a 6 x 5 array on the support system; tiles installed along two of the edges of the enclosure were rasped as required to fit into the 3.6 x 3.0 m enclosure.
- All edges where adjacent tiles met each other and at the perimeter junction with the enclosure, were sealed with PVC electrical tape or paper masking tape.
- Specimen installation was carried out by laboratory staff.

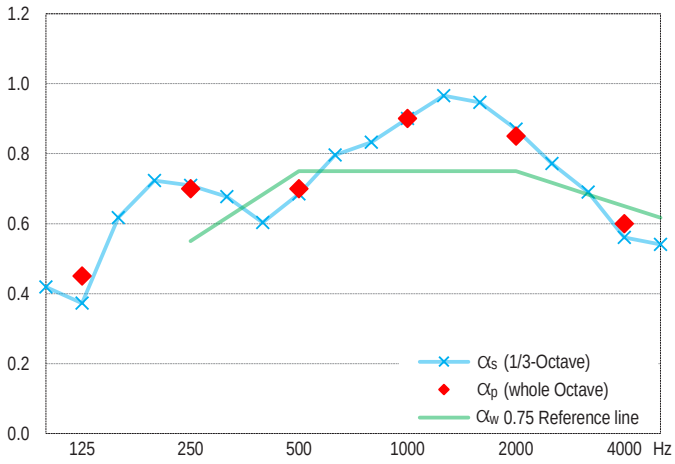
Test specimen installed for testing (image inverted to depict ceiling installation)



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

Measurement Details & Results

Freq	Absorption coefficients			Reverberation times, T_{60} (sec)	
Hz	α_s	α_p	95% Conf (δ)	Empty room	with Specimen
100	0.42		0.06	5.79	3.20
125	0.37	0.45	0.09	6.74	3.67
160	0.62		0.07	6.43	2.77
200	0.72		0.07	6.44	2.52
250	0.71	0.70	0.06	5.49	2.39
315	0.68		0.04	6.62	2.65
400	0.60		0.05	6.48	2.81
500	0.68	0.70	0.05	6.08	2.54
630	0.80		0.06	5.65	2.26
800	0.83		0.05	5.34	2.15
1000	0.90	0.90	0.03	5.12	2.02
1250	0.97		0.06	4.62	1.86
1600	0.95		0.05	4.08	1.78
2000	0.87	0.85	0.04	3.62	1.76
2500	0.77		0.04	3.22	1.76
3150	0.69		0.04	2.83	1.71
4000	0.56	0.60	0.03	2.36	1.62
5000	0.54		0.04	1.93	1.42



Performance Indices[1,2]
α_w = 0.75
SAA = 0.79
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:	16 Jan 2020	16 Jan 2020
Temperature & humidity:	22 °C, 46 % R.H.	23 °C, 44 % R.H.
Atmospheric pressure:	1001 mBar	1001 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: 24 January 2020

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 a plasterboard wall) • 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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REPORT ON THE DETERMINATION OF SOUND ABSORPTION COEFFICIENTS OF BAILEY INTERIORS ECOCHECK 600MM X 600MM PERFORATED PLASTER CEILING TILES WITH 25MM THICK @ 32KG/M^3 GLASSWOOL INSTALLED TO THE UNDERSIDE OF THE TILE AND SEALED WITH A PLASTER SKIM COAT TESTED WITH A 400MM AIR GAP IN A REVERBERATION ROOM.

Testing Procedure:	AS ISO 354 - 2006
Testing Laboratory:	Applied Acoustics Laboratory School of Electrical and Computer Engineering RMIT University Melbourne, Victoria 3000, Australia NATA Accreditation Number: 1421
Client:	Bailey Interiors Pty. Ltd. 83-85 Boundary Road Mortdale, New South Wales 2223 Australia
Date of Test:	11th of March 2015
Date of Report:	30th of March 2015
Report Number:	15-043/PD
Testing Officer:	Peter Dale

Peter Dale
Testing Officer

Accredited for compliance with ISO/IEC 17025

5. RESULTS

The mean reverberation times at each frequency for the empty room, $T60_e$, the room with the sample installed, $T60_{e+s}$, the sound absorption coefficient and the 95% confidence interval are provided in Table 1. The results are rounded to 0.01. The 95% confidence interval for each frequency is determined from the standard deviation of the reverberation times of the empty room and the room with the sample. The k factor used to determine the 95% Confidence interval is 2.201.

The results for the sample are detailed in Table 1, Table 2 and Graph 1 of this report.

Test conditions:

Room Empty:	Air temperature	23.0°C
	Relative Humidity	44%
	Barometric Pressure	0.7630 metre of mercury.
Room with Sample:	Air temperature	23.0°C
	Relative Humidity	50%
	Barometric Pressure	0.7660 metre of mercury.

Table 1: Reverberation times and Sound Absorption Coefficients of Bailey Interiors EcoCheck 600mm x 600mm Perforated Plaster Ceiling Tiles with 25mm thick @ 32kg/m^3 Glasswool installed to the underside of the tile sealed with a plaster skim coat tested with a 400mm air gap.

1/3rd Octave Centre Frequency Bands (Hz)	Average RT's for Empty Room $T60_e$ (s)	Average RT's for Room with Sample $T60_{e+s}$ (s)	Sound Absorption Coefficient α_s	95% Confidence Interval for α_s
100	8.669	5.075	0.24	0.06
125	10.009	4.002	0.45	0.05
160	10.303	5.282	0.27	0.04
200	9.530	4.778	0.31	0.03
250	8.674	4.230	0.36	0.03
315	8.202	4.041	0.37	0.03
400	7.989	3.996	0.37	0.02
500	7.332	3.016	0.58	0.04
630	6.896	2.524	0.74	0.04
800	6.309	2.128	0.92	0.03
1000	5.683	1.867	1.07	0.04
1250	5.128	1.805	1.06	0.03
1600	4.544	1.833	0.97	0.04
2000	4.075	1.942	0.81	0.02
2500	3.439	2.004	0.63	0.02
3150	2.881	1.911	0.55	0.02
4000	2.247	1.659	0.52	0.02
5000	1.900	1.499	0.50	0.04

N.R.C. of the sample calculated in accordance with ASTM C423-90A is: 0.70

sound decays in accordance with the standard. The measuring equipment has been calibrated by an external laboratory, and is in current calibration.

3. SAMPLE FOR TESTING

As provided by Client:

Bailey Interiors EcoCheck 600mm x 600mm Perforated Plaster Ceiling Tiles with 25mm thick @ 32kg/m^3 Glasswool installed to the underside of the tile sealed with a plaster skim coat tested with a 400mm air gap:

Manufacturer:	Bailey Interiors Pty. Ltd.
Product Designation:	EcoCheck Concealed
Construction:	Perforated Plaster with 25mm thick glasswool backing compressed to 20mm with a plaster skim coat sealing the rear face of the glasswool
Colour:	White
Nominal Open Area of Panel:	22.7%
Hole Type :	Round pattern
Hole Diameter:	6mm
Number of holes per tile:	2850 (75 @ 45 degrees on longest diagonal)
Nominal Individual Panel Size:	600mm x 600mm x 30 mm
Single Tile Weight :	4.5kg
Nominal Test Air gap:	400mm
Dimensions of Sample:	3.00m x 3.60m
Area of Sample:	10.80m^2
Insulation:	Glass-wool insulation, 32kg/m^3 and 25mm thick Compressed to 20mm and fixed to the rear face of the tiles.

The sample was tested on the 11th of March 2015.

The tiles were tested by mounting the tiles on a 420mm in height, 25mm thick MDF Frame with dimensions 3050mm wide by 3650mm long that was installed on the floor of the Reverberation Chamber giving a total sample surface area of 10.80m^2.

The sample under test was supported in the MDF Test Frame by a steel suspension frame to achieve a 400mm void between the underside of the sample under test and the floor of the Reverberation Chamber. The tiles were installed with the glasswool insulation to the underside of the tile with the perforated plaster face incident to the sound field. Standard ceiling tile suspension grid was also installed in the joins between adjacent ceiling tiles on the sound-incident side of the tiles under test to replicate a standard field installation.

The sound-incident side of the ceiling panel featured a perforated face with 6mm diameter holes and is pictured below in detail in Figure 1. Figure 2 shows the rear face of the panel with the glasswool installed and sealed with the plaster skim coat. Figure 3 depicts the sample installed in the Reverberation Chamber for testing.

The Weighted Sound Absorption Coefficient α_w of the sample determined in accordance with AS ISO 11654-1997 "Acoustics: Sound Absorbers for Use in Buildings - Rating of sound absorption" is:

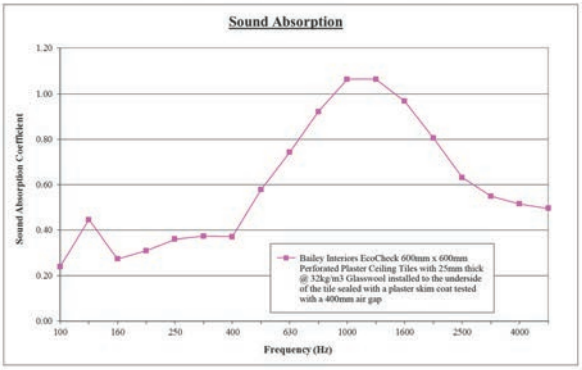
$$\alpha_w = 0.60(M)$$

The Practical Sound Absorption Coefficients are detailed below in Table 2. These values have been determined in accordance with AS ISO 11654-1997 "Acoustics: Sound Absorbers for Use in Buildings - Rating of sound absorption".

Table 2: Practical Sound Absorption Coefficients for the Sample

Frequency (Hz)	125	250	500	1000	2000	4000
Practical Sound Absorption Coefficient, α_p	0.30	0.35	0.55	1.00	0.80	0.50

Graph 1: Sound Absorption Coefficients of Bailey Interiors EcoCheck 600mm x 600mm Perforated Plaster Ceiling Tiles with 25mm thick @ 32kg/m^3 Glasswool installed to the underside of the tile sealed with a plaster skim coat tested with a 400mm air gap.



ACOUSTIC LABORATORIES AUSTRALIA PTY LTD

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

Airborne Sound Attenuation between Rooms Sharing Common Ceiling Plenum

ALA Test No.: 15-086-2
Project: Bailey Interiors
Specimen: Echo-Check Nail Up.
Detail: CAC Measurement

Description of Specimen:

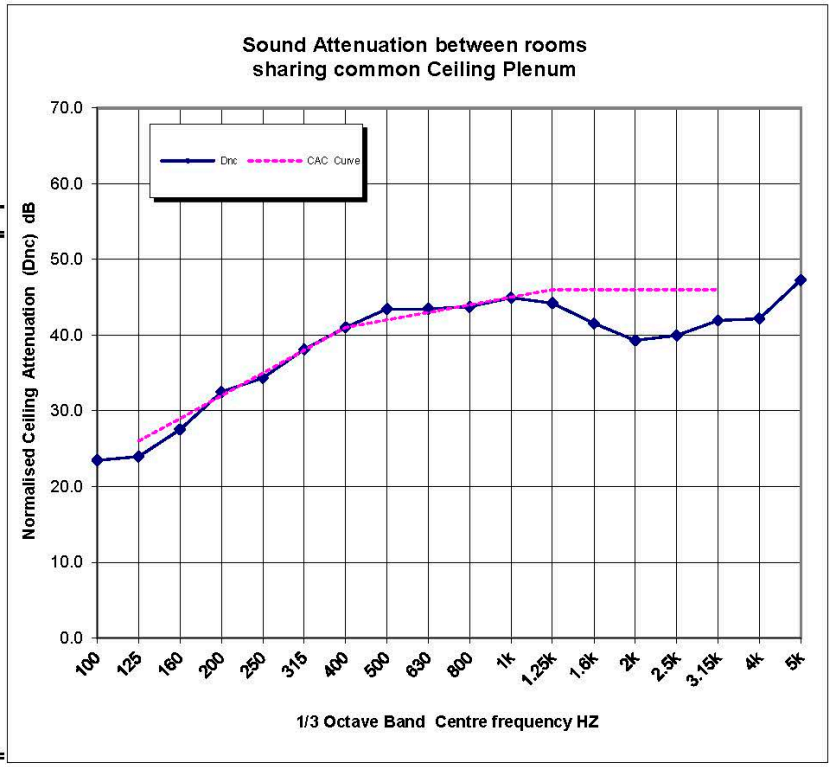
Echo-Check 600 x 600 X 28mm thick Plaster Acoustic Tile
25mm glasswool insulation @ 32 kg/m3; compressed to 20mm
Thin plaster skim coat over insulation to seal tile
Sides of tile, screw fixed to furring chennels
Opposite enbds of tile are lapped to control acoustic Leakage
6mm round holes with nominal open area 8.7%
Nominal surface density 14.4 kg/m2

Meas. Date: 02-Apr-15

Tested in accordance with
ASTM E1414 / E1414M - 11a

CEILING ATTENUATION CLASS **CAC** **42**

Centre Frequency	Dnc	CAC Curve	Deficiencies
Hz	dB	dB	dB
100	**23.5**		
125	**24.0**	26	2.0
160	**27.6**	29	1.4
200	**32.5**	32	
250	**34.3**	35	0.7
315	**38.1**	38	
400	**41.0**	41	
500	**43.4**	42	
630	**43.5**	43	
800	**43.7**	44	0.3
1k	**44.9**	45	0.1
1.25k	**44.2**	46	1.8
1.6k	**41.5**	46	4.5
2k	**39.3**	46	6.7
2.5k	**40.0**	46	6.0
3.15k	**41.9**	46	4.1
4k	**42.2**	46	3.8
5k	**47.3**		
			Total
CAC	**42**		31.3



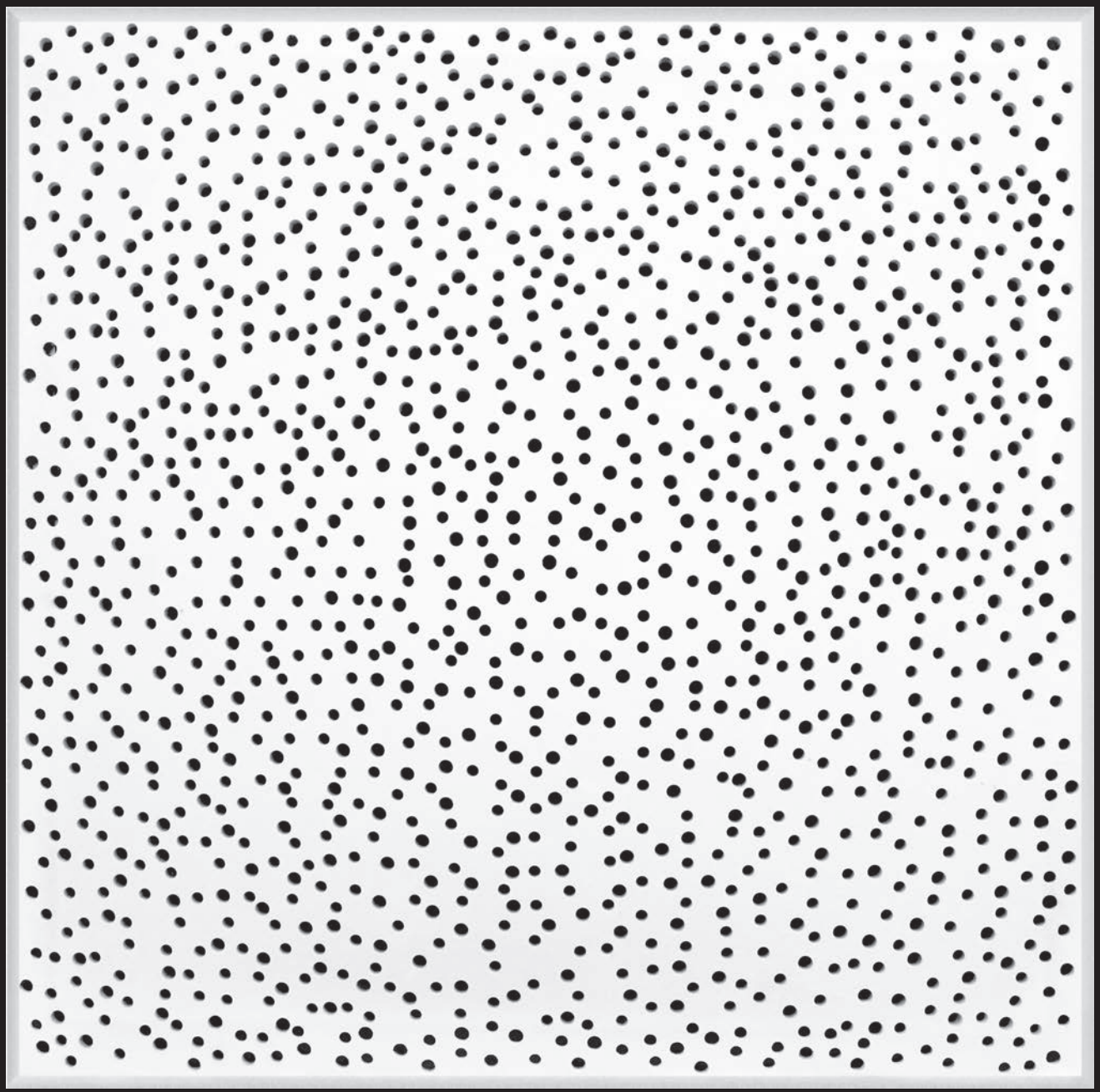
Signatory:
Tester: N Gabriels B.Arch, FAAS

Date: 3-Apr-15

Checked: K Hearne B.Arch, MAAS

TEST RESULTS

Random Nail Up



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: **AC270-06-1**

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

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: 3.6 x 3.0 m (10.8 m²), Test configuration: Type E-400]

Description: • Bailey "Random" nail-up acoustic ceiling tiles
• with integral glass fibre batt behind, non-encapsulated

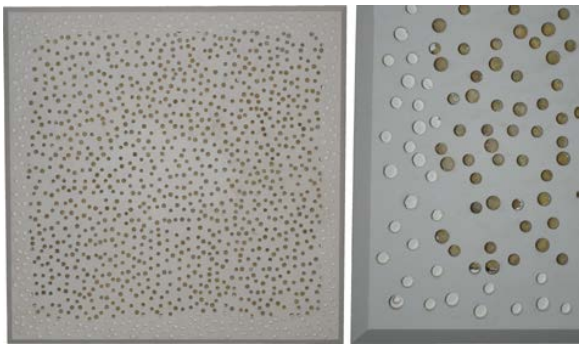
Tile Details[3]

- 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, 32 kg/m³, 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 in a random pattern with a mixture of 6.5 and 8.0 mm dia holes (approx 915 and 475 of each size respectively); the perforations in the vicinity of the perimeter being open only at the face (closed at the rear), with the perforations away from the perimeter being open front and back (exposing the glass fibre batt behind).
- Open area percentage[4] (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 400 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, 11° off parallel with the walls. The enclosure was taped at all joints to prevent air leakage between the enclosed space and the outside.
- A system of steel wall studs/track was set up inside the enclosure to support the specimen tiles. The cavity behind the panels was a single undivided cavity without internal partitions.
- Specimen tiles were arranged in a 6 x 5 array on the support system; tiles installed along two of the edges of the enclosure were rasped as required to fit into the 3.6 x 3.0 m enclosure.
- All edges where adjacent tiles met each other and at the perimeter junction with the enclosure, were sealed with PVC electrical tape or paper masking tape.
- Specimen installation was carried out by laboratory staff.

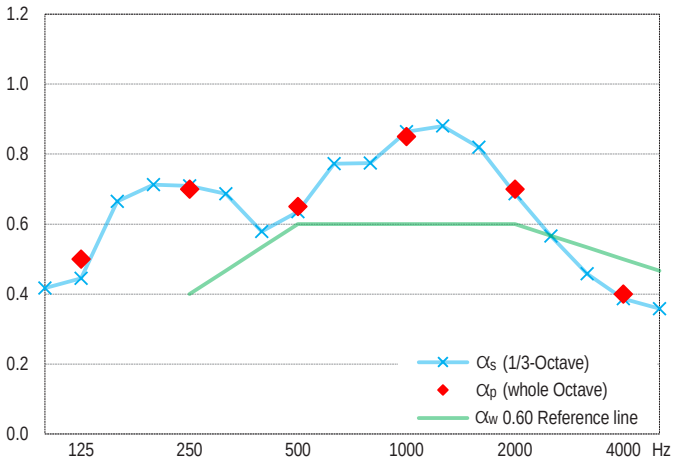
Test specimen installed for testing (image inverted to depict ceiling installation)



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

Measurement Details & Results

Freq	Absorption coefficients			Reverberation times, T_{60} (sec)	
Hz	α_s	α_p	95% Conf (δ)	Empty room	with Specimen
100	0.42		0.07	5.82	3.20
125	0.44	0.50	0.07	6.86	3.38
160	0.66		0.06	6.59	2.66
200	0.71		0.08	6.43	2.52
250	0.71	0.70	0.07	5.40	2.35
315	0.69		0.05	6.57	2.60
400	0.58		0.04	6.31	2.82
500	0.64	0.65	0.04	5.91	2.60
630	0.77		0.06	5.47	2.25
800	0.77		0.03	5.00	2.17
1000	0.86	0.85	0.04	4.84	2.01
1250	0.88		0.04	4.30	1.89
1600	0.82		0.04	3.93	1.89
2000	0.69	0.70	0.03	3.53	1.94
2500	0.57		0.03	3.22	1.98
3150	0.46		0.03	2.96	2.00
4000	0.39	0.40	0.03	2.58	1.88
5000	0.36		0.03	2.21	1.67



Performance Indices[1,2]
α_w = 0.60 (LM)
SAA = 0.72
NRC = 0.75

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:	15 Jan 2020	15 Jan 2020
Temperature & humidity:	27 °C, 58 % R.H.	28 °C, 46 % R.H.
Atmospheric pressure:	996 mBar	995 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: 24 January 2020

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 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

ACOUSTIC LABORATORIES AUSTRALIA PTY LTD

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

Airborne Sound Attenuation between Rooms Sharing Common Ceiling Plenum

ALA Test No.: 15-086-3
Project: Bailey Interiors
Specimen: Nail-up Random CAC Meas.
Detail: 600 x 600 Plaster Acoustic Tile

Description of Specimen:

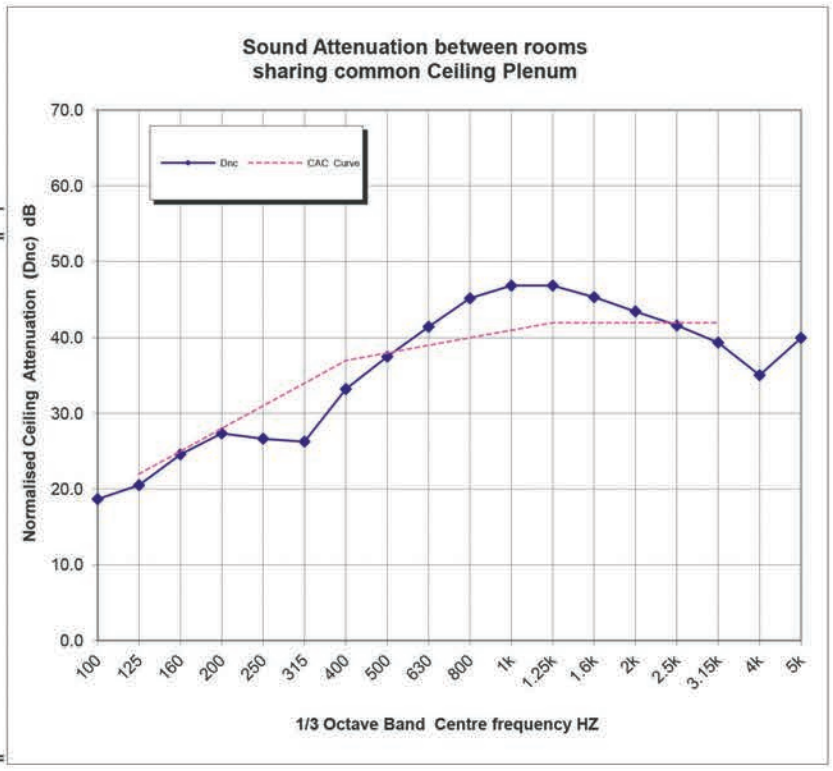
Nail-up Random 'straight edge' 600 x 600 X 28mm thick Plaster Acoustic Tile
25mm glasswool insulation @ 32 kg/m3; compressed to 20mm
Thin plaster skim coat over insulation to seal tile
Sides of tile screw fixed to furring chennels
Plaster Acoustic Tile has Butt joints to ends between furring channels
Nominal open area 8.7%
Nominal surface density 14.4 kg/m2

Meas. Date: 16-Apr-15

Tested in accordance with
ASTM E1414 / E1414M - 11a

CEILING ATTENUATION CLASS **CAC** **38**

Centre Frequency	Dnc	CAC Curve	Deficiencies
Hz	dB	dB	dB
100	**18.7**		
125	**20.5**	22	1.5
160	**24.6**	25	0.4
200	**27.4**	28	0.6
250	**26.7**	31	4.3
315	**26.3**	34	7.7
400	**33.2**	37	3.8
500	**37.5**	38	0.5
630	**41.4**	39	
800	**45.2**	40	
1k	**46.9**	41	
1.25k	**46.9**	42	
1.6k	**45.4**	42	
2k	**43.5**	42	
2.5k	**41.6**	42	0.4
3.15k	**39.4**	42	2.6
4k	**35.1**	42	6.9
5k	**40.0**		
			Total
CAC	**38**		28.8



Signatory:
Tester: N Gabriels B.Arch, FAAS

Date: 18-Apr-15

Checked: K Hearne B.Arch, MAAS

AWTA PRODUCT TESTING

TEST REPORTS

AWTA PRODUCT TESTING

Australian Wool Testing Authority Ltd - trading as AWTA Product Testing
A.B.N 43 006 014 106
1st Floor, 191 Racecourse Road, Flemington, Victoria 3031
P.O Box 240, North Melbourne, Victoria 3051
Phone (03) 9371 2400 Fax (03) 9371 2499

TEST REPORT

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

Test Number : 14-001048
Issue Date : 31/10/2014
Print Date : 1/10/2019

Sample Description
Clients Ref : "New Shadex, Eco Check; Hush Tile; Shadex; Random"
White molded plaster ceiling tiles - pre insulated with glass fibre batt
Colour : White
End Use : Ceiling tiles
Nominal Composition : Plaster/fibreglass

ASTM C518-2010 **Steady-State Thermal Transmission Properties by Means of the Heat Flow Apparatus**

Date of Testing		20/10/2014	
Test Date		27/10/2014	
Test Apparatus		Lasercomp Fox 600	
Sample Orientation		Horizontal	
Mean Test Temperature		23	°C
Temperature Differential		20	°
Estimated uncertainty in results		3.9	
Specimen	1	2	
Specimen Thickness (as received)	40	39	mm
Specimen Thickness (as tested)	40	39	mm
Specimen Density (as tested)	391	403	kg/m³
Test Duration	01:55	02:00	hrs:mins
Measured Heat Flux	26.0	27.8	W/m²
Measured Thermal Conductivity	0.0520	0.0544	W/m.K
Thermal Resistance	0.8	0.7	m²K/W

181403 1202 Page 1 of 1

NATA Accredited for compliance with ISO/IEC 17025 - Testing
- Chemical Testing : Accreditation No. 983
- Mechanical Testing : Accreditation No. 985
- Performance & Approvals Testing : Accreditation No. 1356

Samples and their identifying descriptions have been provided by the client unless otherwise stated. AWTA Ltd makes no warranty, implied or otherwise, as to the source of the tested samples. The above test results relate only to the sample or samples tested. This document shall not be reproduced except in full and shall be rendered void if amended or altered. This document, the names AWTA Product Testing and AWTA Ltd may be used in advertising providing the content and format of the advertisement have been approved by the Managing Director of AWTA Ltd.

AWTA LIMITED

0204/11/06

APPROVED SIGNATORY

MICHAEL A. JACKSON B.Sc.(Hons)
MANAGING DIRECTOR

AWTA PRODUCT TESTING

Australian Wool Testing Authority Ltd - trading as AWTA Product Testing
A.B.N 43 006 014 106
1st Floor, 191 Racecourse Road, Flemington, Victoria 3031
P.O Box 240, North Melbourne, Victoria 3051
Phone (03) 9371 2400 Fax (03) 9371 2499

TEST REPORT

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

Test Number : 15-002457
Issue Date : 09/06/2015
Print Date : 29/06/2018

Replacement of Report dated :08/05/2018

Sample Description

Clients Ref : "Shadex; Hush; Eco Check; New Shadex; Random; Casino; Open Cell; NUTR 2000 Super Diamond; Open Slot; Moon""
White molded plaster ceiling tiles
Colour : White
End Use : Acoustic paneling
Nominal Composition : Plaster
Nominal Thickness : 28mm

ISO 5660.1-2002 Reaction to Fire Tests - Heat Release Smoke Production and Mass Loss Rate Part 1: Heat Release Rate (Cone Calorimeter Method)

	Specimen 1	2	3	Mean	
Average Heat Release Rate	fti	fti	fti	fti	kW/m²
Group Number Classification	1	1	1		

(In Accordance with New Zealand Building Code Verification Method C/VM2 Appendix A)

Average Specific extinction area	0.2	0.1	1.4	0.6	m²/kg

Test orientation : Horizontal

	Specimen 1	2	3	Mean	
Irradiance	50	50	50	50	kW/m²
Exhaust flow rate	24	24	24	24	L/sec
Time to sustained flaming	fti	fti	fti	fti	sec
Test duration	1800	1800	1800	1800	sec

15644 5140

NATA
Accredited for compliance with ISO/IEC 17025 - Testing
- Chemical Testing : Accreditation No. 983
- Mechanical Testing : Accreditation No. 985
- Performance & Approvals Testing : Accreditation No. 1356

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MICHAEL A. JACKSON B.Sc.(Hons)
MANAGING DIRECTOR

0204/11/06

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P.O Box 240, North Melbourne, Victoria 3051
Phone (03) 9371 2400

TEST REPORT

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

Test Number : 19-007603
Issue Date : 4/02/2020
Print Date : 4/02/2020

Sample Description Clients Ref : "Shadex, Hush,Eco Check,New Shades, Random, Casino,Open Cell, Nut R2000, Super Diamond, OpenSlot,Moon"
Moulded Plaster Ceiling Tiles

Dimensional Stability

Date of Testing 04/02/2020

Change In Specimen	Length (%)	Width (%)	Thickness (%)
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	0.0	0.0	0.0
Mean	0.0	0.0	0.0

Tested conditions: 168 hours at 50degC and 95% Relative Humidity
Observation: After exposure no change in dimension and appearance

192823 41504

AWTA LIMITED

APPROVED SIGNATORY

MICHAEL A. JACKSON B.Sc.(Hons)
MANAGING DIRECTOR

0205/11/06

GABRIELS HEARNE FARRELL

Enquiries: Norbert Gabriels
norbert@gabriels.net.au
Ph (08) 9474 5966

19 November 2019

BAILEY INTERIORS
83 to 85 Boundary Road
Mortdale NSW 2223

Attention: Roger Bailey

EFFECT OF INSULATION OVER PLASTER CEILING TILES

ACOUSTIC OPINION

Dear Roger,

As requested, we provide an acoustic opinion on the improvement in the Ceiling Attenuation Class (CAC) performance of Bailey Interior Plaster Acoustic tiles resultant from an insulation blanket strip located above the ceiling tiles either side of the ceiling height partition wall.

1. BACKGROUND.

As discussed, an acoustic opinion provided by Gabriels Environmental Design dated 27 March 2015 indicated that In 2015, the Acoustic Laboratories Australia Pty Ltd carried out acoustic test of the Room-to-room sound insulation of Plaster Acoustic panels as manufactured by Bailey Interiors. The tests were carried out in accordance with the Australian Standard AS2499:2000, *Acoustics – Measurement of sound insulation in buildings and of building elements – Laboratory measurement of room-to-room airborne sound insulation of a suspended ceiling with a plenum above it.*

The room-to-room sound insulation tests was carried out on a typical Bailey Interior product "Old Shadex" plaster acoustic tile, and a second test was carried out of same ceiling with a 1.8m wide strip of R3.5 Earthwool insulation located both side of the separating wall below the ceiling.

The result of the above tests was a 4 dB improvement in the room-to-room sound insulation performance in terms of the the Weighted Suspended Ceiling Normalised Level ($D_{n,c,w.}$).

Gabriels Hearne Farrell Pty Ltd have been requested by Bailey Interiors to provide an opinion of the expected improvement of providing a 1.8m wide strip of insulation on both sides of the separating partition wall in terms of the Ceiling Attenuation Class (CAC) performance; (ASTM E1414/E1414M – 11a *Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum*).

2. COMPARATIVE TEST PROCEDURES:

The test procedure for the Australian and American Standards are very similar. The laboratory set up at Acoustic Laboratories Australia can be set up to measure in accordance with both standards. The main difference in the two standards is that the Australian standard ($D_{n,c,w.}$) requires acoustic absorption in the ceiling plenum space on the two end plenum walls and one side plenum wall. The American Standard (CAC) requires acoustic absorption on all four plenum walls.

3. ASSESSMENT

The effectiveness of the acoustic absorbent R3.5 Earthwool insulation installed as a 1.8m strip of insulation on both sides of the ceiling height partition wall is to a large extent dependant on the increase in the total absorption in the ceiling void. In the American (CAC) test method there is additional acoustic absorption in the ceiling void plenum space compared to the Australian ($D_{n,c,w'}$) set up. It is therefore expected that the decibel (dB) improvement in sound insulation if tested in accordance with the American Standard would be less than when tested in the Australian standards.

Based on the above, it is our opinion that the improvement in the room-to-room CAC performance if the Bailey Interior "Old Shadex" plaster acoustic tile with strip acoustic absorption on either side of the partition were carried out to American Standard the improvement in Ceiling Attenuation Class (CAC) performance would be in the order of 2 to 3 dB

Conditions

The information given in this opinion represents extrapolation based on laboratory test carried out on Bailey Interiors plaster acoustic tile products. The assessment and opinions expressed refer to the expected comparative laboratory performance of the product when tested and rated in accordance with America Standard ASTM E1414/E1414M – 11a.

The assessment and opinions expressed refer to the expected laboratory performance of the product. It is assumed that when installed in the field the products are installed in accordance with manufacturer's instructions and installed with good workmanship. No allowance is made for flanking transmission and acoustic leakage via the construction, as these are construction and design issues that must be considered in the design and construction of individual projects.

This assessment is only valid for 5 years. It assumes there is no change in the construction of the material systems. This assessment addresses the acoustic performance only.

Where construction systems are to be extensively used, or are required to comply with specific or stringent specification requirements, it is strongly recommended that the product be laboratory tested. It must be noted that an acoustic opinion provides an estimate of performance and that the likely performance is usually within +/- 3 dB of the opinion.

We trust this proposal meets your requirements. Please call if you require any clarifications.

Yours Faithfully

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

GABRIELS HEARNE FARRELL PTY LTD
Member Firm – Association of Australasian Acoustical Consultants

A Unit 3 / 2 Hardy St, SOUTH PERTH WA 6151 **P** (08) 9474 5966
E kingsley @gabriels.net.au **W** gabriels.net.au**M** 0407 470 865

BAILEY Interiors
Architectural Plaster

83 Boundary Road
(PO Box 78)
Mortdale NSW 2223

ABN 36 003 722 665

T 612 9153 9326
F 612 9534 6532
E sales@baileyinteriors.com.au
W www.baileyinteriors.com.au

7 October 2015

Northern Territory Government
Department of Infrastructure
Level 5 Highway House
Palmerston Circuit
P O Box 61 Palmerstone N T 0831

Attention: Kurt Leerburg

"ACOUSTIC CEILING PRODUCTS AS PROJECT SPECIFIC FACTORY DIRECT PACKAGES "
"INCLUSIVE GRID WITH WARRANTY"

Australian Plaster Acoustics has been developing these plaster tiles in conjunction with its parent company Bailey Interiors for the last 5 years.

The organisation has a strong commitment to innovation with major research and development programmes resulting in producing outstanding designs that are truly innovative, lightweight exceptionally high acoustic ratings (NRC) (CAC) and R values . The tiles are fire resistant, pre painted with anti mould paint, will not warp or buckle under humid conditions.

Big innovations have been

1) The reduction in weight of each tile bringing overall weight down from approx. 19.50 Kilos m2 - 12.75 kilos m2(in most cases)this has resulted in being able to use a lighter grid for installation as per Rondo Design confirmation REF 4562-15-001.

2) The introduction of silicone rubber moulds this has made it possible to create very strong, clean, and sharply designed undercut ceiling tiles which are truly innovative this has only been possible with our strong commitment to R & D.

Australian Plaster Acoustics warrants all plaster products in conjunction with Rondo grid systems from the date of purchase for a period of 10 years.

This warranty does not apply to damage caused by

1) Normal wear and tear.
2) The fitting of components not supplied by Australian plaster Acoustics /Bailey Interiors or Rondo.
3) Repair ,Maintenance or service by a person not authorised by Rondo /Bailey Interiors

We Rondo and Bailey Interiors are jointly marketing these products, plaster acoustic tiles and ceiling grid as a package directly to the builder after nomination from the Department of Infrastructure.

Yours Faithfully,
Bailey Interiors Pty Ltd

Roger Bailey
Managing Director
Phone 02 91539326
Fax 0295346532
Email: roger@baileyinteriors.com.au

RONDO®
Rondo Building Services Pty Limited
ABN 69 000 289 207

NATIONAL
57–87 Lockwood Rd, Erskine Park,NSW, 2759
(PO Box 324 St Marys NSW 1790)
TEL (02) 9912 7300 FAX: (02) 9912 7310

CUSTOMER SERVICE HOTLINE
1300-36-RONDO (1300-36-7663)

www.rondo.com.au

To whom It may concern

Rondo Building Services is Australasia's largest manufacturers of roll formed lightweight steel building products for internal and external use, from steel stud and track drywall systems to building board finishing sections and from exposed and concealed ceiling systems to access panels and other ancillary products.

Rondo has been producing product to serve the building industry for over 50 years and not only has manufacturing facilities in Australia but also New Zealand, Malaysia and India as well as JV's elsewhere.

During that period Bailey Interiors manufacturers of Australian Plaster Acoustics panels has been a valued customer of Rondo.

Rondo has been pleased to partner with Bailey Interiors in the development of its innovative plaster acoustic panels by providing specification assistance in the use of the Rondo Duo^{R} Exposed Ceiling Grid System in conjunction with their panels, thereby ensuring their clients have a code compliant suspended ceiling grid system to support their plaster acoustic ceiling panels.

Steve Jupp
Product & Innovation Manager
Rondo Building Services Pty Ltd

AUSTRALIA • NEW ZEALAND • MALAYSIA • MIDDLE EAST • INDOCHINA

GYPROCK™
Everything else is just plasterboard

Bradford™
more than insulation

TO WHOM IT MAY CONCERN

Gyprock provides a comprehensive range of high performance plasterboard wall and ceiling lining solutions across all segments of the construction industry. Gyprock is also a supplier of casting plaster used in the manufacture of cast plaster products and decorative cornices. Gyprock is one of the many companies owned and operated by CSR Limited, one of Australia's oldest and most respected public companies founded in Sydney in 1855 as the Colonial Sugar Refining Company.

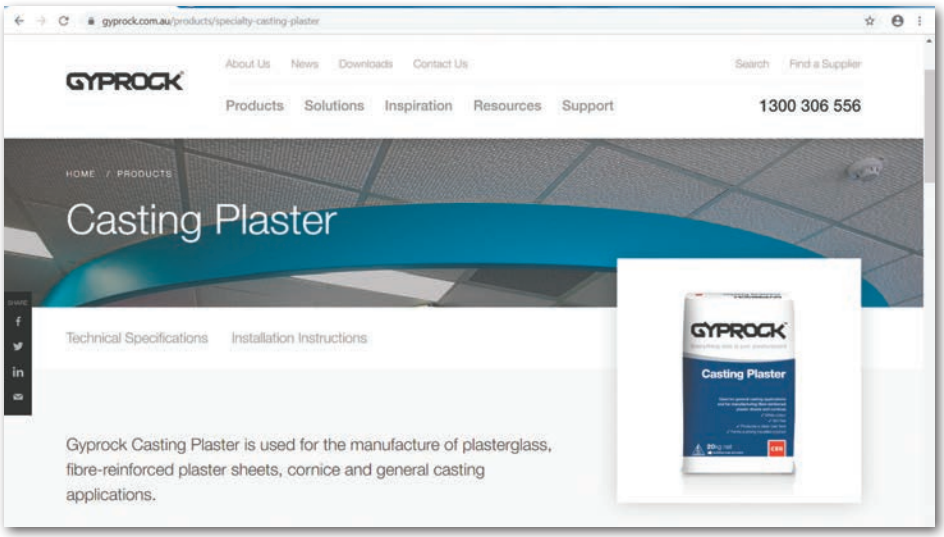
When Gyprock opened its Concord Plaster Mills in 1942, it soon became a supplier of casting plaster to Ernest Alfred Bailey who had established E. A. Bailey & Sons Pty Ltd in Boundary Road, Mortdale in 1938. Since that initial supply, Gyprock has maintained its long association with the Bailey family and continues today to supply its casting plaster to Bailey Interiors.

Over that time, Bailey Interiors has grown in significance to become the largest supplier of all types of architectural plaster products in Sydney and one of Gyprock's major customers for casting plaster. Bailey Interiors has always employed continuously innovative approaches to the manufacture of cast plaster products and demonstrates considerable expertise in moulding and casting from simple to complex shapes.

For over 80 years, CSR has manufactured glasswool insulation under the Bradford brand. Bradford is a supplier of insulation batts and acoustic fabrics used by Bailey Interiors in the manufacture of their exceptionally high performing plaster acoustic ceiling tiles namely for NRC and CAC.

CSR Building Products Limited ABN 55 008 631 356
Commercial Design Centre 7 Slough Avenue Silverwater NSW 2128
Mobile: 0419 477 359 Telephone: 02 8748 1450
Facsimile: 02 8748 1488 Email: aveling@csr.com.au

CSR



GYPROCK
Everything else is just plasterboard

Bradford
more than insulation

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Gyprock is the major supplier of casting plaster used by Australian Plaster Acoustics in the manufacture of their innovative plaster acoustic tiles. These exceptionally high performing plaster acoustic ceiling tiles are manufactured at Bailey Interiors' modern facility utilising the latest, innovative plaster tile manufacturing process. Gyprock has been a casting plaster supplier to Bailey Interiors for over 75 years.

CSR also manufactures Bradford glasswool insulation. Bradford is a supplier of insulation batts and acoustic fabrics used by Australian Plaster Acoustics. The resulting range of plaster acoustic tiles have exceptionally high performing acoustics for NRC and CAC with a modern architectural appearance.

Gyprock and Bradford are proud to be associated with Australian Plaster Acoustics and we feel confident that, based on our long association, Australian Plaster Acoustics will provide a high level of product quality, reliable service, trusted performance and industry compliance associated with their large range of plaster acoustic tiles.

Antoine Veling
NSW Commercial Segment Manager
CSR Lightweight Systems

CSR Building Products Limited ABN 55 008 631 356
Commercial Design Centre 7 Slough Avenue Silverwater NSW 2128
Mobile: 0419 477 359 Telephone: 02 8748 1450
Facsimile: 02 8748 1488 Email: aveling@csr.com.au

CSR

MATERIAL SAFETY DATA

Product Name: FBS-1 Glasswool Insulation

is classified as **Non-Hazardous** according to the criteria of the Australian Safety and Compensation Council ASCC (formerly NOHSC) Approved Criteria For Classifying Hazardous Substances. FBS-1 Glasswool Insulation is classified as **Non-Dangerous Goods** according to the Australian Code for the Transport of Dangerous Goods by Road and Rail.

- Full test results of each product for acoustic NRC and CAC can be viewed online at www.australianplasteracoustics.com.au.
- All ceiling grid and steel support systems by Rondo can be viewed from PDF files on request.
- All acoustic test are NATA approved

DISCLAIMER

Products manufactured and systems designed by Bailey Interiors are produced in accordance with the building code of Australia and New Zealand Building Code and also relevant Australian and New Zealand standards.

All acoustic testing for NRC - (Noise Reduction Coefficients) was carried out in accordance with these standards at RMIT University, Melbourne, Australia and CSIRO, Melbourne, Australia.

All sharing common ceiling testing CAC - (Ceiling Attenuation Class) was also carried out in accordance to Australian and New Zealand standards at Acoustic Laboratories Australia Pty Ltd.

All fire resistance Group 1, thermal resistance testing were also carried out to the latest Australian and New Zealand standards at AWTA a product testing in Melbourne, Australia.

All light reflective tests carried out by Light Lab International, QLD Australia in accordance with NATA accreditation.

All these products received excellent results in all instances they were tested in true laboratory situations which may differ to readings recorded on site.

Australian Plaster Acoustics will not be held responsible for any claims resulting from installation of its products not in accordance with manufacturers recommendations or relevant Australian and New Zealand standards.

Bailey Interiors has been supplying the building and architectural industry with the finest quality acoustic tiles for nearly eighty years. The Acoustic Tile Range features outstanding quality, elegant style, finish and functionality.

Green Product Sheet

Made to last a lifetime

Bailey Interiors Architectural products are made of the finest Gypsum. They have timeless features and built for longevity.

Made of natural Gypsum

Bailey Interiors Architectural products are a unique blend of at least 75% naturally occurring Gypsum.

Energy and water-efficient

Bailey Interiors Architectural products are more energy and water-efficient than alternative acrylic and resin based products. Bailey Interiors have installed a unique water recycling process whereby excess water from the production runs are recycled and used again in further production. The high Gypsum content also outperforms acrylic, which quickly dissipates water heat, resulting in reduced use of water.

Minimal manufacturing impact

Bailey Interiors Architectural products are created by a combination of machine made and hand made production methods. This combination allows for a better quality product as compared with acrylic, and composite products.

Bailey Interior's Architectural products also use significantly less energy than electrically high – heat ovens. They use a combination of natural drying and gas operated ovens.

Additionally Bailey Interiors Architectural products are hand finished by craftsmen, further reducing reliance on non renewable resources.

Minimal impact on the environment

Bailey Interiors Architectural Products are made of the finest Gypsum.

Bailey Interiors have installed two filtration units on top of the bulk silo bin. These units absorb any excess plaster dust from going in to the atmosphere whilst the plaster silo is being loaded with plaster which is pumped by compressed air from the bulk plaster truck. These filtration units allow for the air to remain clean and clear which does not impact on the environment.

Recycled Shipping

Bailey Interiors Architectural products are shipped on pallets made of reclaimed wood, with strapping made from recycled bottles.

Recycled Waste Plaster

Bailey Interiors have a special method of recycling excess casting plaster and fibre glass reinforcement. This material is tranported form Bailey's current work place to be recycled as part of road base material .

Customers who choose Bailey Interiors Architectural products know they are making an environmentally good choice because they are making a purchase lasting a lifetime.

AUSTRALIAN
PLASTER ACOUSTICS
Innovative Sound Solutions

Australian Plaster Acoustics Pty Ltd
ABN 69 610 255 242

Visit our showroom at

83-85 Boundary Road
Mortdale NSW 2223
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Tel: +612 9533 3909
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