ACOUSTIC LABORATORIES AUSTRALIA PTY LTD

AIRBORNE SOUND ATTENUATION BETWEEN ROOMS SHARING A COMMON CEILING PLENUM

New Shadex – Plaster Acoustic Tile with Polyester Insulation

Report No. ALA 20-093-1

Tested to ASTM E1414/E1414M – 11A

8th September 2020

For

AUSTRALIAN PLASTER ACOUSTICS

83 – 85 Boundary Road
MORTDALE NSW 2223

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Rev No.	Rev Date	Revision Description	Prep by
initial	8 Sept. 2020	Issued to Client	N Gabriels

The report author is a fellow of the Australian Acoustical Society.

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1. TEST OBJECTIVE

Australian Plaster Acoustics commissioned Acoustic Laboratories Australia to measure the room-to-room airborne sound insulation of the 'New Shadex' plaster acoustic ceiling tile with tegular edge with a plenum above ceiling. The test was carried out on August 27, 2020.

The test was carried out at the Heafod Laboratory facility in Bayswater, Western Australia. The ceiling sample under test was installed in an exposed Tee Bar ceiling suspension system with a plenum above a dividing wall that separates the two rooms of the test facility. The laboratory space is arranged so that it simulates a pair of horizontally adjacent rooms sharing a common suspended ceiling system, plenum and dividing wall. The dividing wall extends to the underside of the ceiling system which is continuous over the two rooms.

The test was carried out in general accordance with ASTM E1414/E1414M-16 - Standard Test Method for *Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.*

2. DESCRIPTION

2.1 Test Sample

The plaster acoustic tile sample under test as described by the manufacturer consists of:

- Australian Plaster Acoustics 'New Shadex' 600 x 600 plaster acoustic ceiling tile
- 25mm Polyester insulation at 32 kg/m3 backing each tile compressed to 20mm thickness
- The tile is perforated with 7mm holes at 13mm centres. This provided 22% opening within the perforation and 19% open area in the 600 x 600mm tile. A thin skim coat of plaster between insulation and the tile closed many of the perforations in each tile
- 2mm plaster skim coat over insulation to seal the back of the tile
- Overall thickness of tile is 28mm
- Nominal weight 4.5 kg / tile
- Tiles supported on Rondo Duo 2, exposed 24mm main and cross Tee bars
- Ceiling continuous over Partition Cap separating the two rooms

2.2 Installation of the Sample:

The tile was installed within a 600 x 600mm exposed Aluminium Tee bar grid. The tiles were set out with a Tee Bar occurring over the Partition Cap separating the two rooms

The tee bar was suspended on 20 hangers connected to a secondary support system of 5 tee bars suspended 220 mm from the soffit of the slab. Ceiling grid was suspended off this secondary grid. The overall ceiling plenum depth is 740mm.

The ceiling was continuous over the 75mm by 50mm partition capping. Two strips of Raven RP 48 soft EPDM "D" seal were adhered to the partition capping to provide a seal to the plaster acoustic tile continuous over the capping.

The ceiling system was set out with a Main Tee Bar over the partition capping.

3. TEST FACILITIES

3.1 Size of test Rooms

The test facility consists of a parallelepiped room 9.0m long, 4.9m wide and 3.6m high. A barrier from floor to underside of ceiling divides the space unequally into two areas 4m and 4.5 metres long. The rooms are constructed of reinforced concrete with a vibration break in the walls, floor and roof in the line of the barrier.

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3.2 **Separating Wall**

The dividing barrier is constructed as a dual stud, insulated plasterboard partition wall with 3 layers 13mm fire rated plasterboard each side of the partition. The wall is 4.9 metres wide and tapered at its upper extremity. The cap on top of the wall is 75mm x 50mm. The dividing barrier wall has a design sound reduction performance of > Rw 60.

3.3 **Plenum**

3.3.1 *Plenum Height*: The plenum height is 740mm.

3.3.2 *Plenum Width*: The plenum width at the separating wall was set in accordance with ASTM 1414 clause 7.1.4 at 4.3 metres. The restriction in the plenum width was achieved by installing small 16mm fire-rated plasterboard barriers on either side of the plenum. Plenum barriers extended from the top of ceiling tile to underside of slab over.

3.3.3 *Plenum Lining*: All sides of the plenum are lined with perforated foil faced 75mm 32Kg/m3 density perforated foil faced Glasswool insulation.

3.4 **Acoustic Diffusion**

Sound diffusion is achieved in each room by 6 off 1.2m square 19mm structural ply panels randomly oriented and suspended on two poles within the room. 8.64m^2 of one-sided acoustic diffusion is provided in each room.

3.5 **Temperature / Humidity**

The temperature and relative humidity conditions during the test were:

Acoustic Chamber 2		Acoustic Chamber 3	
Temperature.	**Rel. Humidity**	**Temperature.**	**Rel. Humidity**
19 ^oC	40 %	20 ^oC	40%

Table 1 Temperature and Relative Humidity Data

4. TEST PROCEDURE

The test procedure involves a sound source fed to loudspeaker in the source room being measured in both the Source and Receiver room, and the measurement of Reverberation Times in the Receiver room. The normalised ceiling attenuation is determined from the measurement data.

4.1 **Sound Source**

The sound signal used for the test was wide band random noise over the full frequency spectrum of the test. Two loudspeakers were used.

The noise level of the source was adjusted so that the sound levels in the receiving room were at least 10 dB above the Background noise level in all relevant frequency bands.

4.2 **Microphone Positions**

A single microphone was used for the measurement in both the source and receiver rooms. A total of 8 microphone positions were used in both the source and receiving room.

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4.3 Reverberation Time Measurements

The Reverberation Time in the receiving room was measured using two source positions and 4 microphone positions, providing 8 independent source / microphone positions. The Reverberation Time was evaluated over a 30 dB range. Six (6) decays were measured for each source / microphone positions

The 6 decays at each source / microphone position were first ensemble averaged, and then the results at each of the 8 measurement positions were then arithmetically averaged, equating to a total of 48 decays.

4.4 Test Equipment

- B&K Analyser Type 2270 Serial No 2644641 – (Cal: 6/4/20)
- B&K Microphone Type 4189 Serial No 3100167 - (Cal: 6/04/20)
- Norsonic Nor1256 Calibrator Serial No 125626205 - (Cal: 20/08/20)
- NTI Minirator PRO MR1 Serial No. G2P-RAEXX-G0 and G2P-RAFE0-GO.
- Yamaha Power Amp. P5000S Serial ACQX01003 390W - 8 Ω / channel
- Behringer Xenyx Q802 Serial S14211325ALM
- Lorantz Speakers
- Vaisla HM34C Humidity & Temperature Meter Serial No: V2910014

5. RESULTS

5.1 Results

5.1.1 Ceiling Attenuation Class

The airborne sound attenuation between rooms of the Test Sample was tested at each one third octave band with centre frequencies between 100 and 5000 Hertz. The results of the measurements in 1/3 octave bands are given in the attached Data Sheet.

The Ceiling Attenuation Class was determined at: **CAC 38**

The Ceiling Attenuation Class CAC was determined in accordance with ASTM E413 *Classification for Rating of Sound Insulation*

5.1.2 Sound Absorption Area of Receiving Room

The sound absorption of the receiving room in sabins (m^2) was determined from the measured reverberation time in accordance with AS/IS0 354 and set out in Table 2.

5.1.3 Normalised Ceiling Attenuation $D_{n,c}$

The normalised Ceiling Attenuation ($D_{n,c}$) between rooms in 1/3 octave bands as set out in the attached Data Sheet is set out in Table 2. Octave Band Data is also provided

5.1.4 Confidence Intervals

Confidence intervals are determined in accordance AS1191, Appendix B.

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Frequency	Total Absorption	Normalised Ceiling Atten. D_{nc} (dB)		Deficiency	95% conf.
(Hz)	Sabine (m^2)	1/3 Octave	Octave	(dB)	(δ) (dB)
100	14.14	**19.2**			
125	11.10	**19.4**	19	2.6	2.51
160	8.16	**20.9**		4.1	1.88
200	7.87	**27.2**		0.8	2.34
250	9.37	**24.9**	28	6.1	1.91
315	9.50	**29.3**		4.7	2.11
400	11.20	**34.3**		2.7	2.57
500	10.89	**38.4**	37		0.91
630	9.54	**41.6**			1.03
800	9.36	**43.1**			0.74
1k	8.59	**44.8**	45		0.84
1.25k	7.71	**47.3**			1.04
1.6k	7.32	**45.8**			0.59
2k	6.90	**44.4**	43		0.42
2.5k	6.96	**41.5**		0.5	0.57
3.15k	7.27	**40.5**		1.5	0.43
4k	7.73	**40.3**	42	1.7	0.46
5k	8.58	**47.0**			

Table 2 Results of Measurements

Ceiling Attenuation Class (CAC) 38
Deficiencies: 25

5.2 Significance

The data in this report was obtained in a laboratory environment specified in ASTM E1414. According to ASTM E1414-11A Section 5, this environment does not include many elements typical in the real world environments which may substantially alter the performance of a system by providing alternate paths for the sound to be transmitted between rooms. However, this type of test method has been used successfully for a number of years to compare ceiling systems.

Test & Report by:
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6. PHOTO

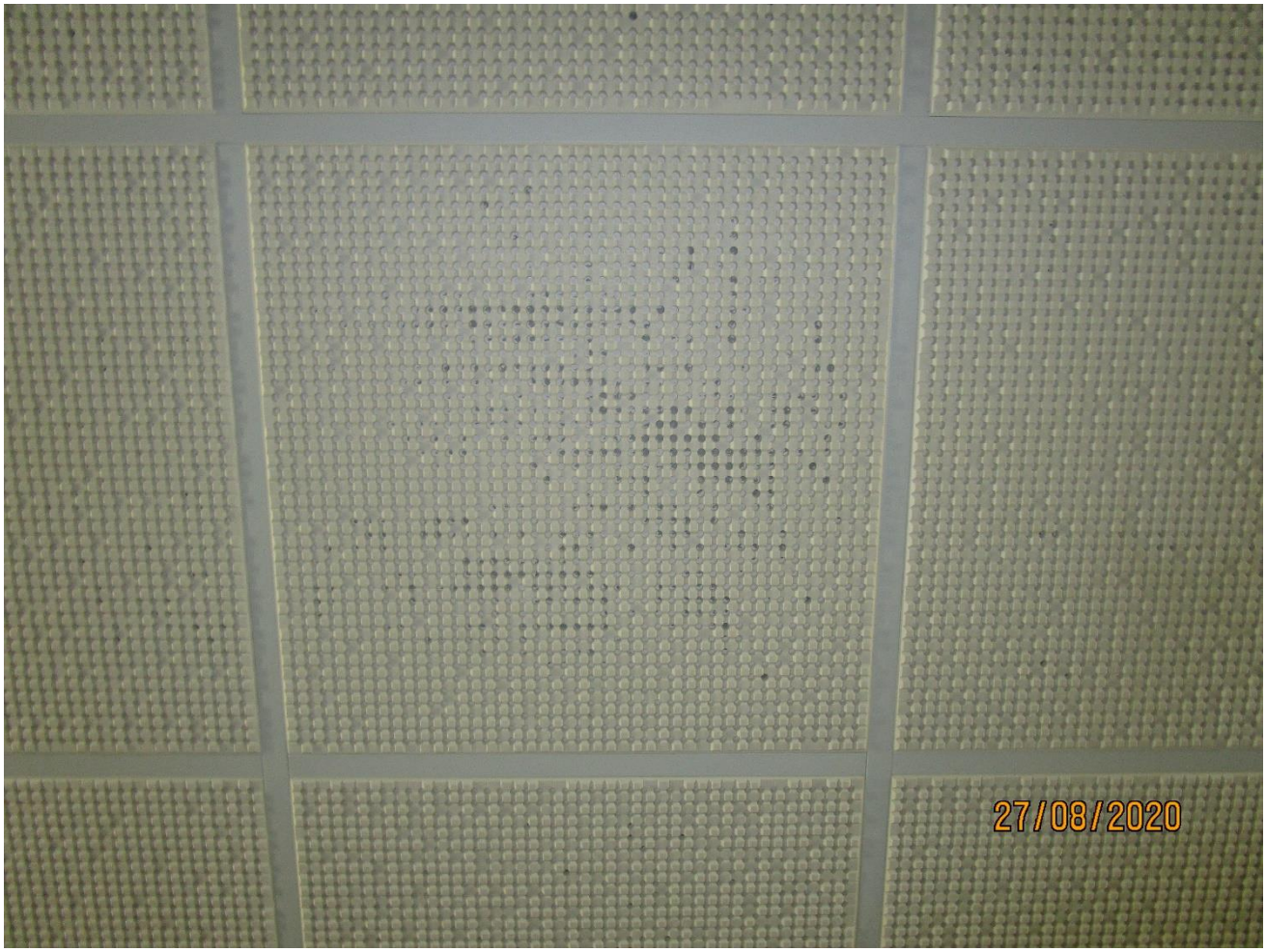

Photo of New Shadex Plaster Acoustic Ceiling tile in Grid

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AIRBORNE SOUND ATTENUATION BETWEEN ROOMS SHARING COMMON CEILING PLENUM

Client: Australian Plaster Acoustics
ALA Test No.: **20-093-1**
Specimen: New Shadex Plaster Acoustic Tile
Detail: Polyester Insulation

Description of Specimen:

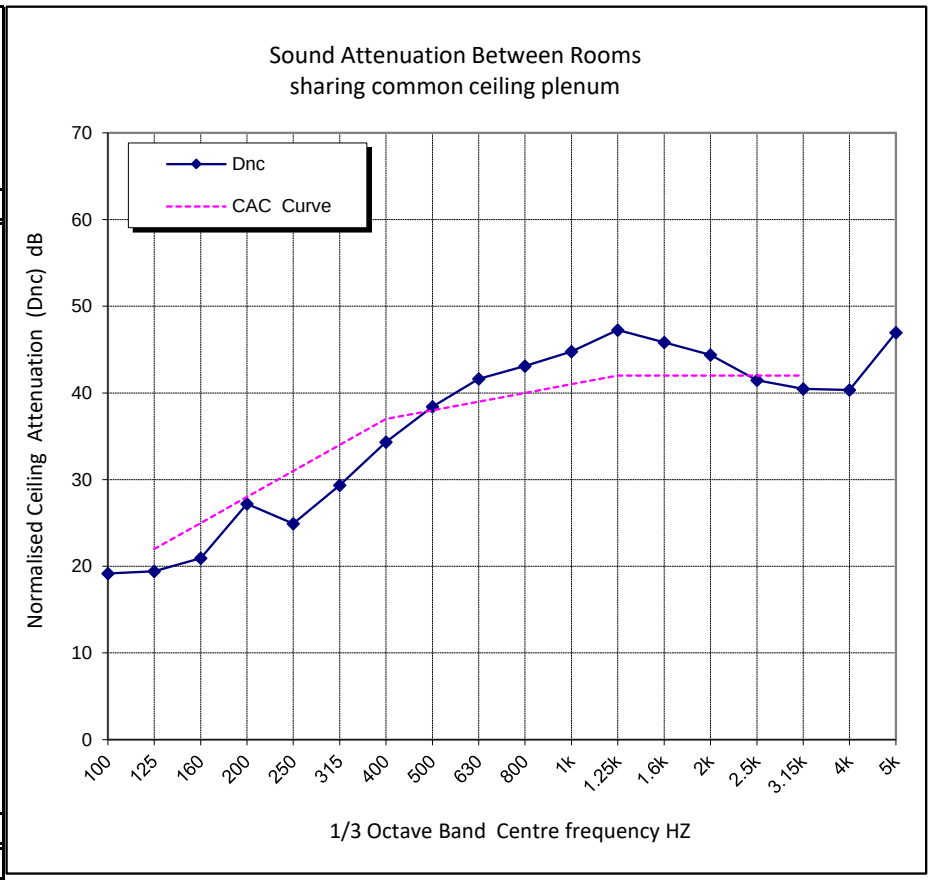
New Shadex Tile, Tegular Edge 600 x 600 X 28mm thick Plaster Acoustic Tile
25mm Polyester insulation @ 32 kg/m3; compressed to 20mm
Tile is perforate with 7mm holes at 13mm centres
This provides 22% open area in perforation, 19% in Tile
Skim coat plaster over large percetage of holes
Rondo Duo 2, Exposed 24mm Main and Cross Tee bar grid
Ceiling continuous over Partition Cap

Meas. Date: 27-Aug-20

Test Standard:
ASTM E1414 / E1414M - 16

CEILING ATTENUATION CLASS **CAC 38**

Centre Frequency	Dnc	CAC Curve	Deficiencies
Hz	dB	dB	dB
100	**19**		
125	**19**	22	2.6
160	**21**	25	4.1
200	**27**	28	0.8
250	**25**	31	6.1
315	**29**	34	4.7
400	**34**	37	2.7
500	**38**	38	
630	**42**	39	
800	**43**	40	
1k	**45**	41	
1.25k	**47**	42	
1.6k	**46**	42	
2k	**44**	42	
2.5k	**41**	42	0.5
3.15k	**40**	42	1.5
4k	**40**	42	1.7
5k	**47**		
			Total
CAC	**38**		24.6



This Data Sheet must only be read in conjunction with full report