

**REPORT ON THE DETERMINATION OF SOUND  
ABSORPTION COEFFICIENTS OF INTERFACE PET  
CUSHIONBACRE 780G/M<sup>2</sup> 500MM X 500MM CARPET TILES TESTED  
WITH NO AIR GAP IN A REVERBERATION ROOM.**

Testing Procedure: AS ISO 354 - 2006

Testing Laboratory: Applied Acoustics Laboratory  
RMIT University, School of Electrical and Computer Engineering  
Melbourne, Victoria 3000, Australia  
NATA Accreditation Number 1421

Client: Interface Australia  
Level 1, 101 Queen Street,  
Campbelltown, New South Wales 2560  
Australia

Date of Test: 1<sup>st</sup> of June 2015

Date of Report: 2<sup>nd</sup> of June 2015

Report Number: 15-112/JW

Testing Officer: John Watson



John Watson  
Testing Officer



Accredited for compliance with ISO/IEC 17025

**REPORT ON THE DETERMINATION OF SOUND  
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A REVERBERATION ROOM.**

## **1. INTRODUCTION**

The tests described in this report were carried out at the request of the Interface Australia to determine the sound absorption coefficients of a sample of Interface PET CushionBacRE 780 g/m<sup>2</sup> 500mm x 500mm Carpet Tiles tested with no air gap in a Reverberation Room.

The tests were carried out using the reverberation room of the School of Electrical and Computer Engineering, The Royal Melbourne Institute of Technology Limited.

Testing has been carried out in accordance with AS ISO 354–2006 “Acoustics: Measurement of sound absorption in a reverberation room”.

At the request of the Client, the weighted sound absorption coefficient  $\alpha_w$  has been determined in accordance with AS ISO 11654-2002 “Acoustics: Sound Absorbers for Use in Buildings - Rating of sound absorption”.

The equipment used to perform these tests has been calibrated at an accredited laboratory and is in current calibration.

## **2. TEST FACILITIES AND PROCEDURES**

**2.1 Facilities** The reverberation room is of pentagonal plan with the ceiling inclined with respect to the floor. No two room dimensions are equal or in the ratio of small whole numbers. The volume of the room is 200.0 cubic metres. A sufficiently diffuse sound field is established by the inclusion of 17 stationary diffusing boards of panelboard, each of one-sided area approximately one square metre and suspended with random orientation. The total two-sided area of the diffusing elements is 0.16 of the total boundary surface area of the room. Previous tests carried out in the room have established that diffusivity of the room sound field is acceptable.

The total surface area of the room boundaries and diffusing elements is 235.6 square metres.

**2.2 Generation of sound field** The test signals is random noise, band limited to a frequency range of 40Hz to 6300Hz. Three individual loudspeaker positions are used to excite the sound field in the reverberation chamber. The signal is fed to each loudspeaker in turn.

**2.3 Receipt of signals** Four microphones each mounted in statistically independent locations in the reverberation room are used to measure the sound field decays in the room. Ten sound decays are obtained at each of the twelve loudspeaker/microphone combinations, thus representing 120 decays for each frequency band.

The microphone signal is relayed via a microphone amplifier, to a Bruel & Kjaer 3560 Pulse Multi Channel Analyser System. The Pulse analyser is interfaced to a personal computer. A program running on the personal computer allows the determination of the reverberation time from the 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:

#### Interface PET CushionBacRE 780 g/m<sup>2</sup> 500mm x 500mm Carpet Tiles:

Product Name:	PET CushionBacRE 780 g/m <sup>2</sup> Carpet Tiles
Construction Carpet:	100% Solution Dyed Nylon Tufted Fibre (780g/m <sup>2</sup> )
Primary Backing:	100% Polyester With EVA Latex Precoat
Carpet Backing:	PET CushionBacRE Backing
Measured Nominal Surface Density:	10.4 Kg/m <sup>2</sup>
Individual Tile Dimensions:	500m x 500mm

The data above was provided by Interface Australia.

RMIT Measured Tile Mass:	1.04kg
RMIT Measured Surface Density:	4.16kg/m <sup>2</sup>
Nominal Individual Module/Tile Size:	500 mm x 500 mm
Nominal Box Quantity:	5.0m <sup>2</sup> (20 tiles per box)

Dimensions of Sample:	2.51m x 4.01m
Area of Sample:	10.07m <sup>2</sup>

The sample provided by the Client for testing comprised of a nominally single colour/pattern of Interface PET CushionBacRE 780 g/m<sup>2</sup> 500mm x 500mm Carpet Tiles. Depicted in Figure 1a below is the detail of the sound incident face of the carpet tile. Figure 1b depicts the sound incident face of a single carpet tile. Figure 2 below depicts the underside of the Interface PET CushionBacRE 780 g/m<sup>2</sup> 500mm x 500mm Carpet Tiles.

The Carpet Tiles were tested by mounting the carpet tiles directly on the floor of the Reverberation Chamber with the carpet pile exposed to the sound-field as depicted below in Figure 3. There was no underlay installed under the Carpet tiles. The tiles were arranged in a rectangular array of 8 x 5 carpet tiles with the sides of the sample enclosed by metallic slats in accordance with the recommendations in AS ISO 354–2006 “Acoustics: Measurement of sound absorption in a reverberation room”.

The sample was tested on the 1<sup>st</sup> of June 2015.

**Figure 1a:** Carpet Tile Face Detail – Interface PET CushionBacRE 780 g/m<sup>2</sup> 500mm x 500mm Carpet Tiles



**Figure 1b:** The sound incident face of the Interface PET CushionBacRE 780 g/m<sup>2</sup> 500mm x 500mm Carpet Tiles.



**Figure 2:** The underside of the Interface PET CushionBacRE 780 g/m<sup>2</sup> 500mm x 500mm Carpet Tiles



**Figure 2:** Interface PET CushionBacRE 780 g/m<sup>2</sup> 500mm x 500mm Carpet Tiles installed into the Reverberation Chamber for testing.



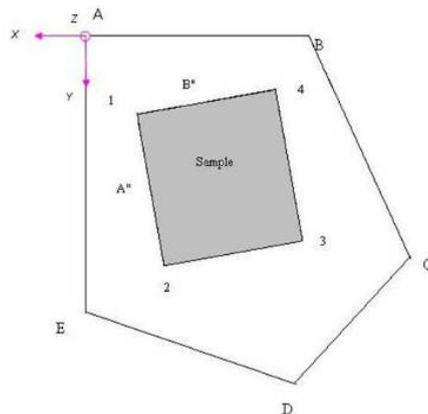
#### 4. LOCATION OF SAMPLE IN THE REVERBERATION ROOM

Reverberation Chamber (Not to scale)

X and Y co-ordinates of the sample location in the Reverberation Room

Corner Ref. Number	X Co-ordinate (metres)	Y Co-ordinate (metres)
1	-1.32	1.94
2	-1.95	5.90
3	-4.43	5.51
4	-3.80	1.55

Descriptor	Diagram Reference	Length (m)
Sample Length 1 to 2	Diagram Ref. A''	4.00
Sample Length 1 to 4	Diagram Ref. B''	2.51



## 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 37%  
Barometric Pressure 0.7693 metre of mercury.

**Room with Sample:** Air temperature 21.0°C,  
Relative Humidity 39%  
Barometric Pressure 0.7696 metre of mercury.

**Table 1:** Reverberation times and Sound Absorption Coefficients of Interface PET CushionBacRE 780 g/m<sup>2</sup> 500mm x 500mm Carpet Tiles tested with a no air gap in a Reverberation Chamber.

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 $\alpha_s$	95% Confidence Interval for $\alpha_s$
100	8.773	8.917	0.00	0.03
125	9.447	8.874	0.02	0.03
160	9.934	9.081	0.03	0.04
200	9.681	9.055	0.02	0.03
250	8.158	7.213	0.05	0.05
315	8.157	6.577	0.09	0.03
400	8.539	5.027	0.26	0.02
500	7.415	3.559	0.47	0.03
630	7.079	4.320	0.29	0.02
800	6.271	4.337	0.23	0.02
1000	5.752	4.268	0.19	0.02
1250	5.179	3.722	0.24	0.02
1600	4.530	3.281	0.27	0.02
2000	3.968	2.894	0.31	0.02
2500	3.232	2.448	0.33	0.02
3150	2.599	2.041	0.36	0.04
4000	1.970	1.647	0.36	0.04
5000	1.631	1.410	0.37	0.03

N.R.C. of the sample calculated in accordance with ASTM C423-90A is: 0.25.

The weighted sound absorption coefficient  $\alpha_w$  of the sample determined in accordance with AS ISO 11654-1997 “Acoustics: Sound Absorbers for Use in Buildings - Rating of sound absorption” is:

$$\alpha_w = 0.25$$

The Practical Sound Absorption Coefficients are detailed below in Table 2. These values have been determined in accordance with AS ISO 11654-2002 “Acoustics: Rating of sound absorption – Materials and systems”.

**Table 2:** Practical Sound Absorption Coefficients for the Sample

Frequency (Hz)	125	250	500	1000	2000	4000
Practical Sound Absorption Coefficient, $\alpha_p$	0.00	0.05	0.35	0.20	0.30	0.35

**Graph 1:** Sound Absorption Coefficients of Interface PET CushionBacRE 780 g/m<sup>2</sup> 500mm x 500mm Carpet Tiles tested with no air gap in a Reverberation Chamber.

