

**REPORT ON THE DETERMINATION OF SOUND
ABSORPTION COEFFICIENTS OF CUSHION BAC 746g/m² CARPET TILES
WITHOUT UNDERLAY 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: InterfaceFLOR
14 Henry Street.
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Australia

Date of Test: 18th of October 2010

Date of Report: 26th October 2010

Report Number: 1211/10-132/JW

Testing Officer: John Watson



John Watson
Approved NATA Signatory



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REPORT ON THE DETERMINATION OF SOUND ABSORPTION COEFFICIENTS OF CUSHION BAC 746g/m² CARPET TILES WITHOUT UNDERLAY IN A REVERBERATION ROOM.

1. INTRODUCTION

The tests described in this report were carried out at the request of InterfaceFLOR to determine the sound absorption coefficients of a sample of Cushion Bac 746g/m² carpet tiles laid directly on to the floor of the Reverberation Chamber.

The tests were carried out using the Reverberation Chamber 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 α_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 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

Sample: Cushion Bac 746g/m² carpet tiles laid on.

As provided by Client:

Cushion Bac 746g/m² Carpet Tiles

Product Name:

Cushion Bac 746g/m²

Construction Materials:

<u>Construction Detail</u>	<u>Material</u>
Carpet	100% solution dyed nylon tufted fibre (746g/m ²)
Primary Backing	100% polyester with a EVA latex precoat
Carpet Backing	Flocked Polyester Stitch Bond Scrim Cushion Bac Backing

Measured Nominal Surface Density:

4.944 kg/m²

Individual Tile Dimensions:

0.50metres x 0.50 metres

Dimensions of Sample:

4.00m x 2.50m (8 x 5 tile array)

Area of Sample:

10.00m²

The detail of the face of the InterfaceFLOR Cushion Bac Carpet Tile is depicted below in Figure 1. The installation for testing of the Cushion Bac 746g/m² carpet tiles with out underlay is shown in Figure 2 below. The sample was tested on the 18th of October 2010.

Figure 1: Surface Detail – InterfaceFLOR Cushion Bac 746g/m² Carpet Tile.



Figure 2: InterfaceFLOR Cushion Bac 746g/m² Carpet Tile Sample Installed in Chamber –.



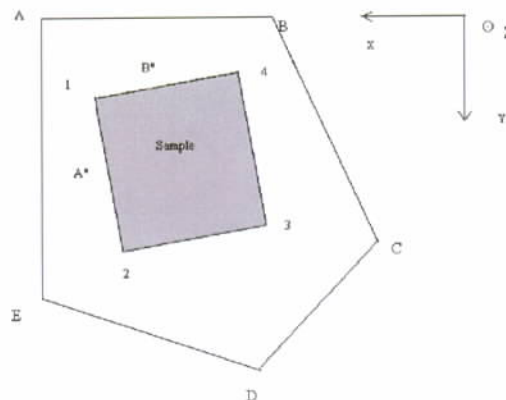
4. LOCATION OF SAMPLE IN THE REVERBERATION ROOM

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	-1.02	1.25
2	-1.11	5.25
3	-3.61	5.19
4	-3.52	1.19

Descriptor	Diagram Reference	Length (m)
Sample Length 1 to 2	Diagram Ref. A''	4.00
Sample Length 1 to 4	Diagram Ref. B''	2.50



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 19.0°C,
Relative Humidity 48%
Barometric Pressure 0.7665 metre of mercury.

Room with Sample: Air temperature 19.0°C,
Relative Humidity 48%
Barometric Pressure 0.7675 metres of mercury

Table 1: Reverberation times and Sound Absorption Coefficients of InterfaceFLOR Cushion Bac 746g/m2 carpet tiles laid directly on to the floor.

Octave Centre Frequency Bands, Hz	Average RT's for Empty Room T_{60_e}	Average RT's for Room with Sample $T_{60_{e+s}}$	Sound Absorption Coefficient α_s	95% Confidence Interval for α_s
100	8.544	8.516	0.00	0.05
125	9.210	8.556	0.03	0.05
160	9.392	8.878	0.02	0.03
200	9.873	9.102	0.03	0.03
250	9.498	8.319	0.05	0.02
315	8.926	6.632	0.13	0.02
400	8.015	4.778	0.27	0.03
500	7.637	3.488	0.50	0.02
630	7.127	4.340	0.29	0.02
800	6.629	4.599	0.21	0.02
1000	5.991	4.300	0.21	0.01
1250	5.379	3.947	0.22	0.02
1600	4.712	3.394	0.27	0.01
2000	4.010	2.928	0.30	0.02
2500	3.497	2.565	0.34	0.02
3150	2.873	2.185	0.35	0.03
4000	2.262	1.793	0.37	0.03
5000	1.840	1.483	0.42	0.05

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:

$$\alpha_w = 0.25(H)$$

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	0.00	0.05	0.35	0.20	0.30	0.40

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

Graph 1: Sound Absorption Coefficients of InterfaceFLOR Cushion Bac 746g/m² carpet tiles laid directly on to the floor.

