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LABORATORY MEASUREMENT OF THE REDUCTION OF TRANSMITTED IMPACT SOUND OF CARPET ON PINNACLE ECO-COMFORT UNDERLAY

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Date: 18th December 2009

Auckland UniServices Limited

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LABORATORY MEASUREMENT OF THE REDUCTION OF TRANSMITTED IMPACT SOUND BY FLOOR COVERINGS ON A STANDARD FLOOR.

(According to ISO 140-8)

Prepared for: Pinnacle Underlay Ltd.
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Acoustics Testing Service

Reduction of impact sound pressure levels according to ISO 140-8
Laboratory measurements of the reduction of transmitted impact sound by floor coverings on a standard floor

Client: Pinnacle Underlay Ltd.

Date of test: 7-Sep-09

Test rooms: Reverberation Chambers A and B

Description and identification of the test specimen and test arrangement:

Damask Suede Effect Velour carpet adhered to *Pinnacle Eco-Comfort* rubber underlay with *Polymer 999* acrylic waterbased adhesive applied with a 1.5mm notched trowel, *Pinnacle Eco-Comfort* underlay adhered to the test floor slab with *Green Solutions 300 (GS300)* acrylic waterbased adhesive applied with a 1.5mm notched trowel.

Source chamber was Chamber A and receiving chamber was Chamber B . Test specimen installed by the client. Curing time was: 4 days

Deviation from standard: The bare test floor used is of uniform thickness for an area of only 2.6m x 2.6m. The description of the bare test floor is given in the full report.

Computer Files: T0911-1 Bare Floor: ID.8, ID.9, ID.57, ID.10, ID.58, ID.59 T0911-1 Sample: ID.8, ID.9, ID.57, ID.10, ID.5

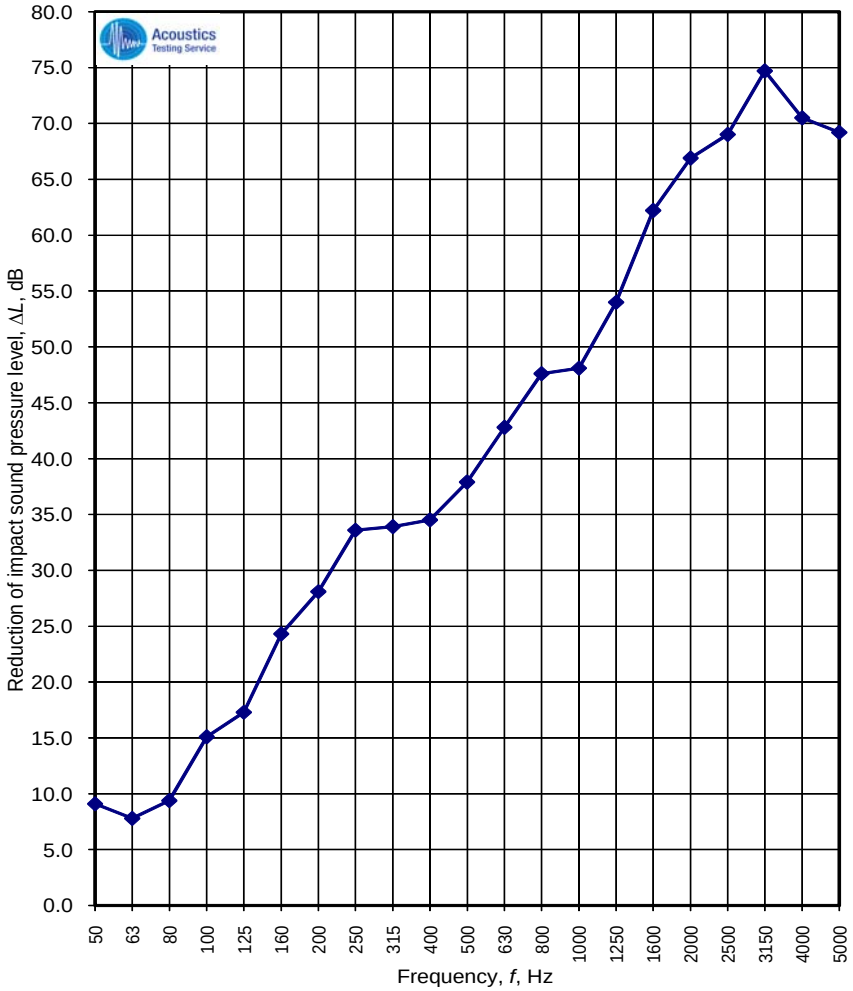
Mass per unit area: 6.25 kg/m^2

Air temp in the test rooms: 15 ^{o}C

Air humidity in test rooms: 60 %

Receiving room volume: 153 m^3

Frequency *f* Hz	$L_{n,0}$ One-third octave dB	ΔL One-third octave dB
50	56.4	9.1
63	51.4	7.8
80	55.3	9.4
100	**61.3**	**15.1**
125	**62.5**	**17.3**
160	**67.5**	**24.3**
200	**68.2**	**28.1**
250	**71.3**	**33.6**
315	**67.6**	**33.9**
400	**73.8**	**34.5**
500	**78.4**	**37.9**
630	**75.5**	**42.8**
800	**72.4**	**47.6**
1000	**72.5**	**48.1**
1250	**72.8**	**54.0**
1600	**79.1**	**62.2**
2000	**78.6**	**66.9**
2500	**76.6**	**69.0**
3150	**75.5**	**74.7**
4000	70.9	70.5
5000	67.0	69.2



Notes: #N/A = Value not available. **Bold** values are used to calculate ΔL_w.
< indicates that the true value is lower.
$L_{n,0}$ are the bare floor impact sound levels.

Rating according to ISO 717-2:

ΔL_w = 41 dB $C_{I,\Delta}$ = 14 dB $C_{I,r}$ = 2 dB $C_{I,50\text{-}2500}$ = 3 dB

These results are based on a test made with an artificial source under laboratory conditions (engineering Method).

No. of test report: **T0911-1**

Name of test institute: University of Auckland Acoustics Testing Service.

Date: 22-December-2009

Signature:

Acoustics Testing Service

ANNEX A.

PHOTOS OF TEST SPECIMEN IN CHAMBER.

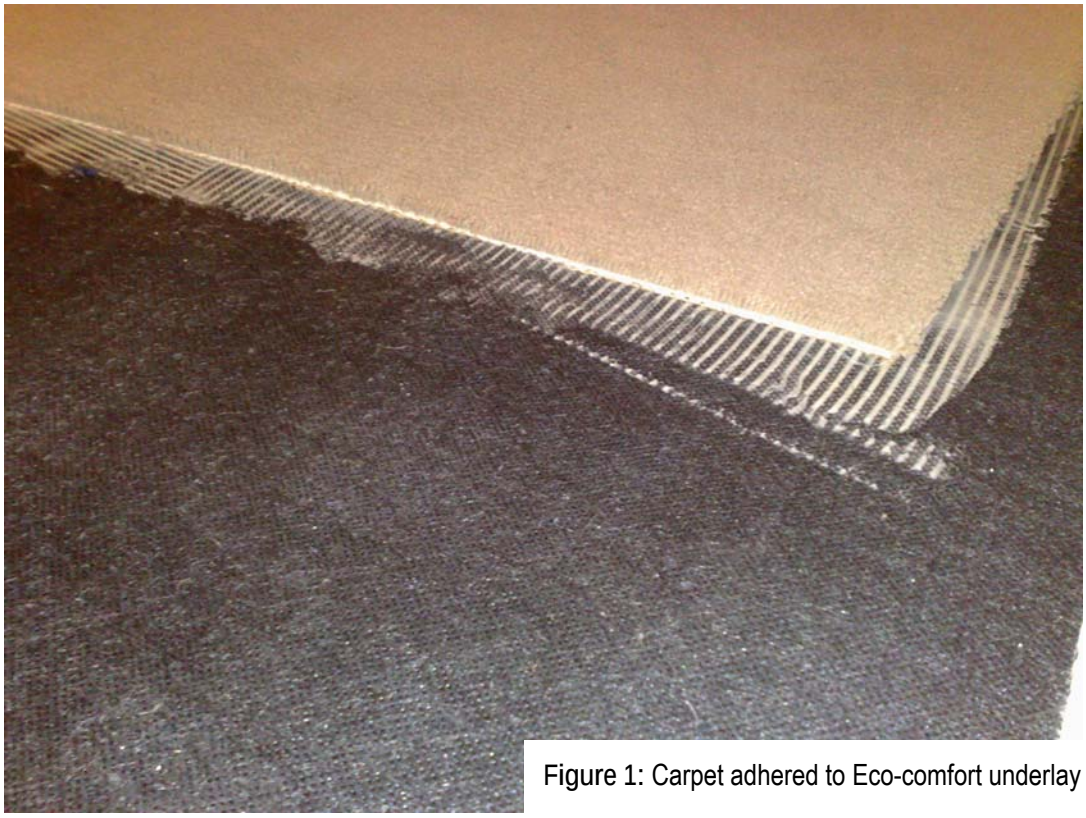


Figure 1: Carpet adhered to Eco-comfort underlay

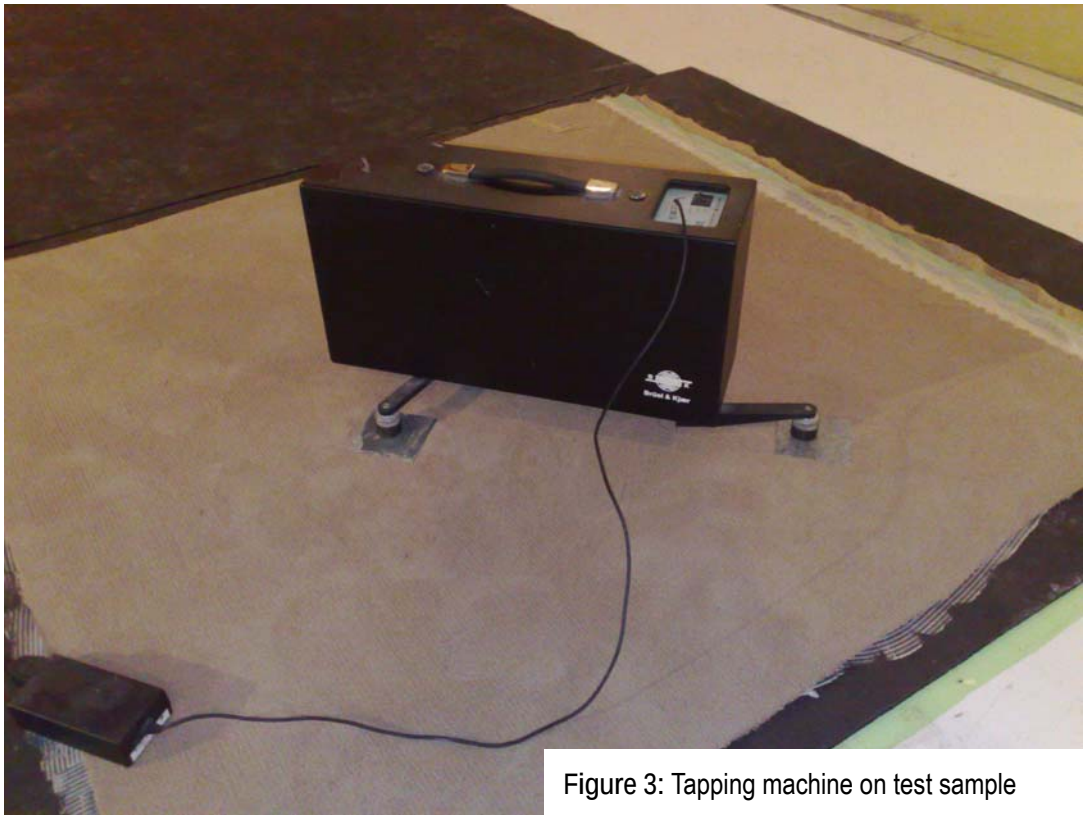


Figure 3: Tapping machine on test sample

ANNEX B.

ADDITIONAL INFORMATION ABOUT EQUIPMENT USED.

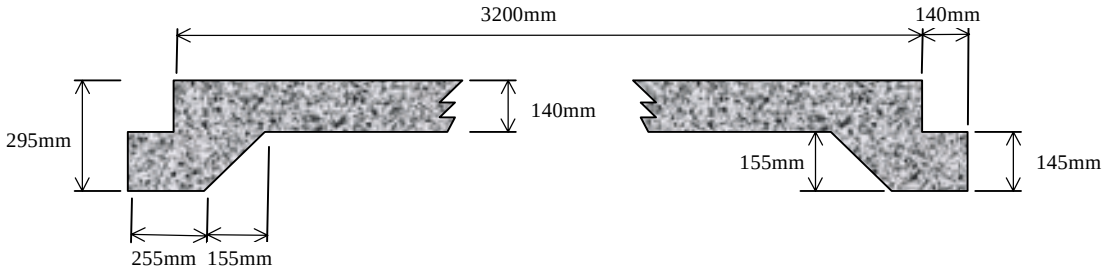
INSTRUMENTATION	EQUIPMENT	TYPE / SERIAL No.
	CHAMBER C SOURCE ROOM	
	1/2" Microphone	4179 / 1307311
	Preamplifier	2660 / 1198606
	Rotating Boom	3923 / 936497
	Calibrator	4231 / 2241899
	CHAMBER A RECEIVING ROOM	
	1/2" Microphone	4190 / 2150379
	Preamplifier	2619 / 945949
	Rotating Boom	3923 / 936496
	Pistonphone	4220 / 1048366
	Calibration of the above equipment was conducted by Electroacoustic Calibration Services (ECS), an IANZ registered laboratory.	
	BOTH ROOMS	
	Analyzer	01dB Stell / 01381

ANNEX C.

SUMMARY OF THE MEASUREMENT OF IMPACT SOUND INSULATION OF FLOORS.

INSTALLATION OF TEST SAMPLE

The floor covering is installed on a concrete floor plug which is positioned in the opening between two large reverberation chambers – chambers B and A. These chambers are vibration isolated from each other which results in a structural discontinuity at the middle of the test opening. This gap is covered over by a wooden collar, which seals the gap and provides for ease of fixing of samples. The concrete floor plug is made of concrete reinforced with steel and is covered with a layer of hard resin. The dimensions of the floor plug are given in the following elevation diagram.



If the floor covering is flexible, three samples to be tested are laid by the client following the techniques normally used in practice for that type of floor covering, with the constraint that the concrete floor plug be protected by a layer of thin plastic or paper if necessary.

METHOD

The normalized impact sound pressure levels are obtained in accordance with the recommendations of ISO standard 140-8:1978 “Laboratory measurements of the reduction of transmitted impact sound by floor coverings on a standard floor.”

The BK3204 tapping machine is placed on the three different covering samples. The impact sound pressure level is measured in the room below the floor, using a rotating microphone, in third octave frequency bands.

The BK3204 tapping machine is also placed on the bare concrete floor plug in positions on both sides of each floor covering sample, and the sound pressure level is again measured in the chamber below the floor.

The difference between the sound levels for when the tapping machine is on the samples and for when the tapping machine is on the bare floor gives the reduction of transmitted impact sound by the floor covering ΔL.

The impact sound pressure levels are normalized against the room absorption. The room absorption is calculated from the reverberation time and room volume. The reverberation time is measured from the decay of a steady state sound field.

Corrections are applied, where necessary, for airborne sound transmission and background noise. The airborne sound transmission is determined using a loudspeaker and the microphone.

RESULTS

The third octave band change in impact sound pressure levels ΔL are presented in both table and graph formats. The third octave band normalized impact sound pressure levels for the bare floor, $L_{n,0}$, are also presented in table.

Single figure ratings are also presented. The weighted change of impact sound pressure level ΔL_w, determined according to ISO 717-2, is presented. ΔL_w is determined by fitting a reference curve to the third octave band normalized impact sound pressure levels from 100Hz to 3150Hz for the change in impact sound pressure levels ΔL which have been added to the normalized impact sound levels of a standard floor (as given in ISO 717-2). From this curve a weighted change of impact sound pressure level ΔL_w is produced, and gives a single figure determination of the improvement of the normalized sound levels transmitted through the floor from impacts, which the floor covering can give (higher is better).

ANNEX D.

DESCRIPTION OF REVERBERATION CHAMBERS AT THE ACOUSTICS RESEARCH CENTRE

There are three large interconnected reverberation chambers at the Acoustics Research Centre, two at ground level (Chambers C and A) and the third (Chamber B) below A.

All three reverberation chambers may be described as hexagonal prisms; each have 6 vertical sided walls, perpendicular to the floor. The roofs of chamber A and C are plane, but inclined at 12 degrees from horizontal. Chamber B has a plane, horizontal roof which is the floor of chamber A above it. The floor of chamber B is also horizontal, but has two angled sections at its north west and south east ends. The centre section is horizontal because a floor jack is installed there. The floor jack may be raised hydraulically to the ceiling of chamber B, the centre of which consists of a floor plug between the two chambers. This plug may be disconnected from chamber A and lowered down into chamber B, leaving a 3.2m x 3.2 m opening between the two chambers. This allows for the measurement of airborne and impact insulation of floor and roof elements.

The wall of chamber C adjacent to chamber A is left open, and the corresponding wall of chamber A consists of a pair of iron doors that are clamped against the chamber. The clamps may be removed and the iron doors pulled back, leaving the entire wall area (4.6m wide x 2.74m high) between the chambers open. This allows for the measurement of airborne sound insulation of wall elements.

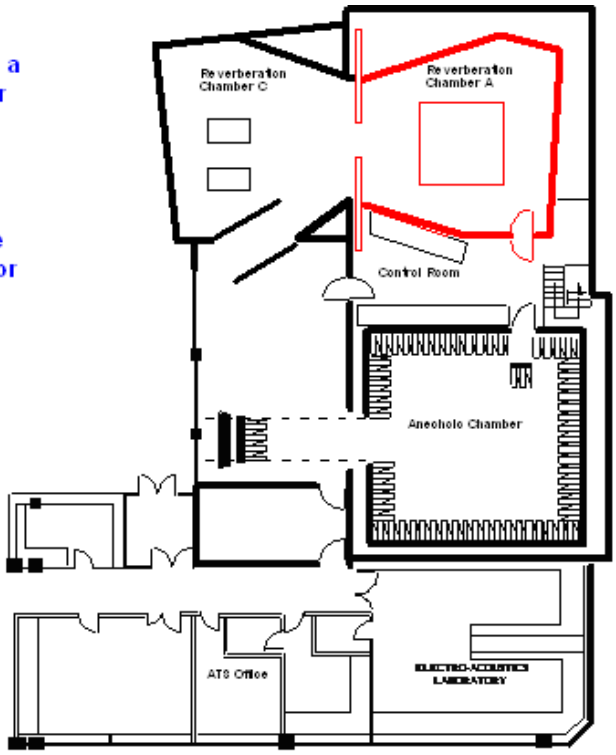
Chamber A has a rotating vane diffuser in a central position with an area (both sides) of about 53 m^2. It has the shape of two cones with their bases joined, with the two opposite quadrants of one cone open and the complementary quadrants in the other cone open. Chamber C has a similar rotating vane diffuser but it is smaller, having a total area of about 27 m^2.

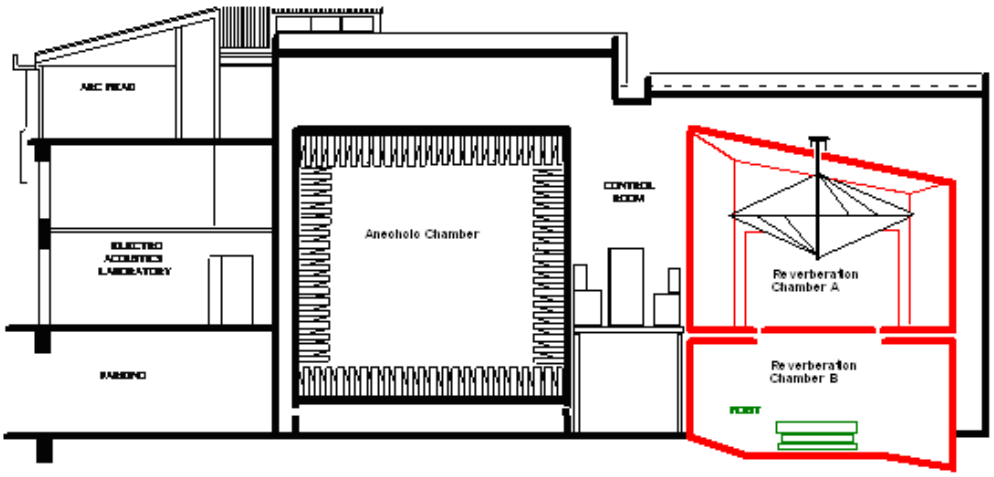
In addition, up to ten static diffusers may be employed if needed. These are constructed of two laminated layers of dense formica, of dimensions 2m x 2m. The formica elements are riveted to a frame constructed of aluminium T section. Four aluminium arms may be bolted onto the frame to allow the diffusers to be mounted as desired.
Currently two of these are used in chamber C, and three are used in chamber B.

The volumes and surface areas of the reverberation chambers are as follows:

	VOLUME (m^3)	SURFACE AREA (m^2)
Chamber A	202 ± 3	203.6 ± 0.9
Chamber B	153 ± 2	173 ± 1
Chamber C	209 ± 4	214 ± 0.9

The three Reverberation Chambers are linked by heavy steel doors and a removable Standard Industrial Floor Section which is removed and repositionde by a hydraulic hoist. The three chambers are vibration isolated from one another so that sound can only pass from one to the other via the intervening Test Wall or Test Floor/Ceiling Section.





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