Reference no. T1638-1

Laboratory measurements of the reduction of transmitted impact sound by floor coverings on a heavyweight reference floor (According to ISO 10140-3)

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 10140-3)

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Dr. Michael Kingan.

Reduction of impact sound pressure level according to ISO 10140-3
Laboratory measurements of the reduction of transmitted impact sound by floor coverings on a heavyweight reference floor

Client: Jacobsen Creative Surfaces

Date of test: 18-Jul-16

Test rooms: Reverberation Chambers A and B

Description and identification of the test specimen and test arrangement:

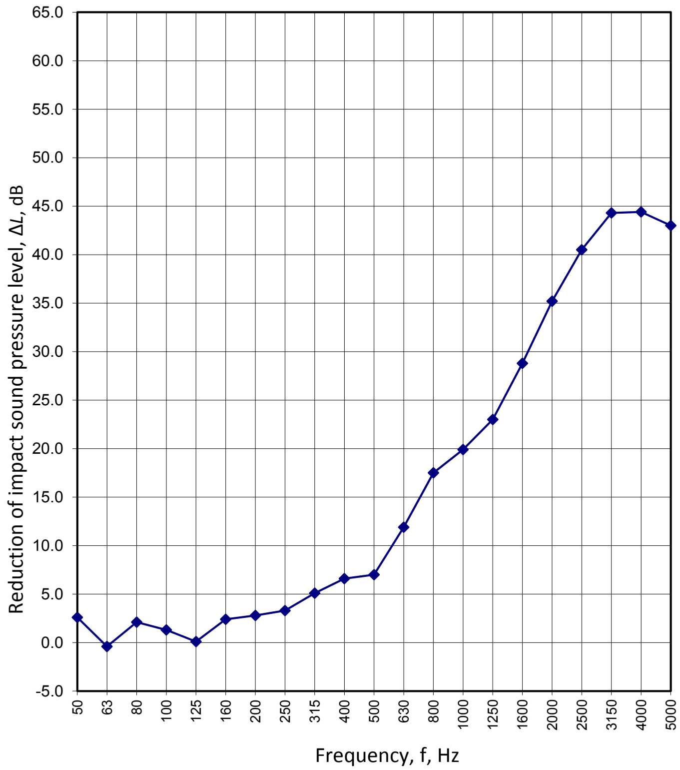
Source chamber side: 3240 x 3175mm of 8mm *Pergo PerfectFold 3.0* laminate flooring (71.5kg) loose laid on *Silent Shield* underlay (2.95kg) loose laid on a concrete slab.
Receiving chamber side: nil

Source chamber was Chamber A and receiving chamber was Chamber B .

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.

Mass per unit area: 7.271 kg/m^2
Air temp in the test rooms: 16 ^{o}C
Air humidity in test rooms: 61 %
Receiving room volume: 153 m^3

Frequency f Hz	$L_{n,0}$ One-third octave dB	ΔL One-third octave dB
50	53.7	2.6
63	47.8	-0.4
80	53.8	2.1
100	**61.7**	**1.3**
125	**63.5**	**0.1**
160	**64.4**	**2.4**
200	**67.6**	**2.8**
250	**70.7**	**3.3**
315	**71.5**	**5.1**
400	**69.9**	**6.6**
500	**71.3**	**7.0**
630	**71.7**	**11.9**
800	**71.4**	**17.5**
1000	**72.4**	**19.9**
1250	**72.5**	**23.0**
1600	**71.4**	**28.8**
2000	**72.6**	**35.2**
2500	**72.8**	**40.5**
3150	**72.8**	**44.3**
4000	71.4	44.4
5000	68.4	43.0



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 = 18 dB $C_{I,\Delta}$ = -11 dB $C_{I,r}$ = -1 dB $C_{I,50\text{-}2500}$ = 0 dB

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

No. of test report: **T1638-1** First test on sam[ple Name of test institute: University of Auckland Acoustics Testing Service.

Date: 31-October-2016 Signature:

ANNEX A.

PHOTOS AND DETAILS OF THE TEST SPECIMEN

Figure 1: Boards in place on underlay.

Figure 2: Packaging for floor boards

Figure 3: Packaging for Silent Shield Underlay

ANNEX B.

ADDITIONAL INFORMATION ABOUT EQUIPMENT USED

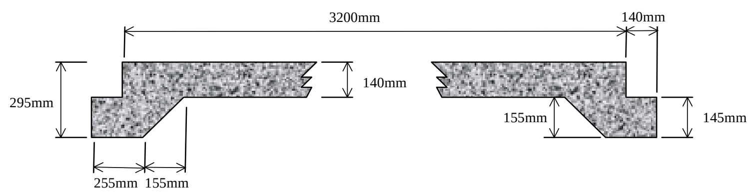
	EQUIPMENT	TYPE / SERIAL No.
INSTRUMENTATION	CHAMBER C SOURCE ROOM	
	1/2" Microphone	4165 / 1622303
	Preamplifier	2619 / 9459549
	Rotating Boom	3923 / 936497
	CHAMBER A RECEIVING ROOM	
	1/2" Microphone	4190 / 2150379
	Preamplifier	2619 / 945952
	Rotating Boom	3923 / 936496
	Calibration of the above equipment was conducted by Electroacoustic Calibration Services (ECS), an IANZ registered laboratory.	
	BOTH ROOMS	
	Calibrator	4231 / 2241899
	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 that 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 self adhesive plastic tape if necessary.

METHOD

The normalized impact sound pressure levels are obtained in accordance with the recommendations of ISO standard 10140-3 2010-09-01 “Laboratory measurements of sound insulation of building elements. Part 3: Measurement of impact sound insulation”

The 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 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 THE REVERBERATION CHAMBERS AT THE UNIVERSITY OF AUCKLAND

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 has 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 3.2 m 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 (4.6 m wide x 2.74 m 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 1 m x 1 m. 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 four 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 repositioned 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