CSIRO ACOUSTIC MEASUREMENT REPORT

Commonwealth Scientific and Industrial Research Organisation, Infrastructure Technologies
Acoustics Testing Laboratory, Gate 5, 2 Normanby Road, Clayton, Vic 3168 Australia

Report No:
INR266-09-1

Client: Milliken (Australia) Pty Ltd
171 Briens Road, Northmead, NSW 2152

Measurement Type: Impact Sound Insulation (Floor)

AS ISO 140.6-2006 and ISO 10140 Part 3 (2010): *Laboratory measurement of impact sound insulation of floors.*
AS ISO 140.8 (2006): *Laboratory measurement of reduction of transmitted impact noise by floor coverings on a heavyweight standard floor.*
AS ISO 717.2 (2004): *Acoustics – Rating of sound insulation in buildings and of building elements. Part 2: Impact sound insulation.*

Test Specimen

(Area of concrete test floor: 10.8 m^2 [3.6 x 3.0 m])

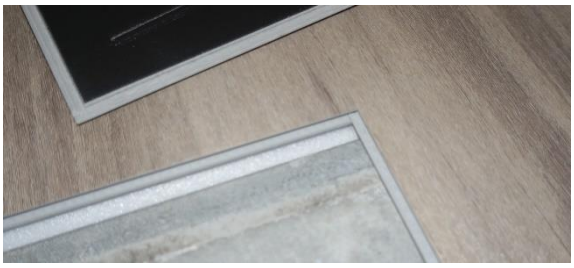
Description: Milliken *'Metro Park RigidForm LVT'* flooring planks laid resting on a 150 mm thick concrete subfloor.

Materials[7]:

a] Flooring planks:-
- Product designation: Metro Park RigidForm LVT
- Form: planks, 1219.2 x 177.8 mm (x 6.2 mm thick) with mating interlocking edge profiles
- Construction: rigid PVC composite core, with a 1 mm resilient polyester foam backing, and faced with a printed film carrying the timber appearance and covered with a 0.55 mm reinforced polyurethane coating embossed with a woodgrain texture.
- One plank selected at random was weighed: 2289 g, corresponding to 10.6 kg/m^2.

b] Concrete slab subfloor (of the laboratory), 150 mm thick, 360 kg/m^2 approx.

Installation details:
- The concrete subfloor [item b] was scraped and swept in preparation for flooring installation.
- The test specimen floor covering was laid directly on the concrete subfloor; planks secured together using their mating click-locking edge profiles. Three plank-lengths were used to span the 3.6 m dimension of the concrete subfloor, with the excess overhanging onto the flush surrounding floor. Adjacent rows of planks were installed with joins staggered (approx 150 mm from adjacent rows).
- Installation was carried out by the laboratory.



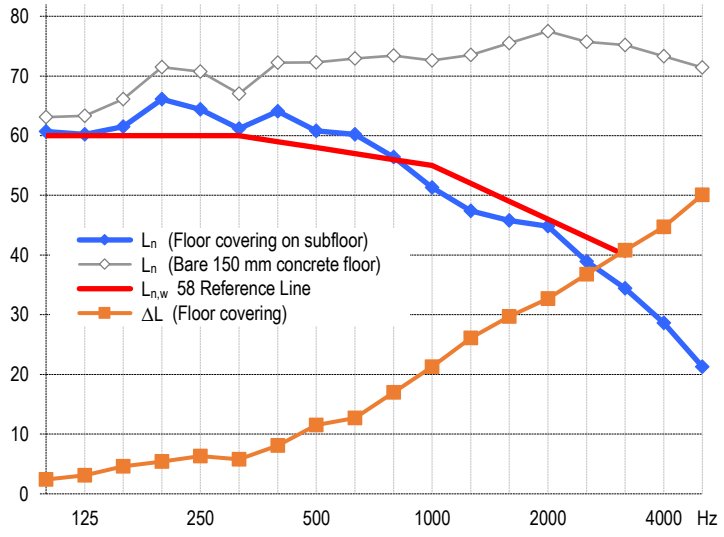
Close up of flooring planks, showing face, mating edge profile, and backing.



Test specimen installed in laboratory for test.

Measurement Details & Results[1,2,4]

Freq. (Hz)	Specimen Floor L_n (dB)	Bare Concrete[3] Floor $L_{n,0}$ (dB)	Improvement ΔL (dB)
100	60.7	63.1	2.4
125	60.2	63.3	3.1
160	61.5	66.1	4.6
200	66.1	71.5	5.4
250	64.4	70.7	6.3
315	61.2	67.0	5.8
400	64.1	72.2	8.1
500	60.8	72.3	11.5
630	60.2	72.9	12.7
800	56.4	73.4	17.0
1000	51.3	72.6	21.3
1250	47.4	73.5	26.1
1600	45.8	75.5	29.7
2000	44.8	77.5	32.7
2500	38.9	75.7	36.8
3150	34.4	75.2	40.8
4000	28.6	73.3	44.7
5000	21.3	71.4	50.1



Performance Index Numbers (laboratory method)

$L_{n,w}$ (C_I) = 58 (-1) dB ie $L_{n,w}$ = 58 dB
IIC^5 = 52 dB
ΔL_w = 20 dB
ΔL_{lin} = 10 dB

The tapping machine was placed diagonally in eight different locations across the test floor area; sound levels in the room below were measured over a whole microphone rotation (33 sec) at each location, and the results averaged.

Measurement Conditions	With Floor Covering	Bare Concrete Floor
Date of measurement:	13 November 2019	13 November 2019
On top of floor:	16 °C, 51 % R.H.	16 °C, 50 % R.H.
Chamber underneath floor:	16 °C, 60 % R.H.	16 °C, 58 % R.H.
Atmospheric pressure:	1004 mBar	1004 mBar

Notes, Deviations etc

1. ≤ and ≥ signify results, if any, where measurement was limited by proximity to background level.
2. L_n = dB re 20 µPa, ΔL = dB re bare floor.
3. Bare slab indices: $L_{n,w}$ (C_I) = 82 (-12) dB, IIC = 25 dB.
4. L_n results represent noise levels; i.e. lower = quieter. For ΔL and IIC results, higher = quieter.
5. IIC is calculated as per ASTM E989-89 but from measurements as per AS ISO 140.6 & ISO 10140 part 3.
6. Testing was carried out unloaded; the weight of the tapping machine being the only load on top of the floor.
7. Physical characteristics given for materials may be as per supplier's advice; not necessarily verified by CSIRO.
8. The test specimen material suffered no visible damage during the course of the test.

Issuing Authority

Signed: David Truett
Date: 22 November 2019

Acoustic Instrumentation

Real time analyser: • Brüel & Kjær PULSE LAN-XI type 3160-A-4/2
Microphone/preamp: • GRAS 40AP microphone on Brüel & Kjær 2669 preamp, rotating continuously with 33 sec period about 1.32 m radius.
Noise source: • Norsonic Nor277 tapping machine (complies with ISO 140)
Calibration: • Brüel & Kjær type 4231 Calibrator: September 2019 (NATA cal)
• Analyser: July 2018 (NATA cal)
• Sensitivity of measurement system was calibrated against the calibrator at the time of measurement.

Laboratory Construction

Chambers: • 300 mm thick concrete • parallelepiped with dimensional proportions 1:1.3:1.6 for uniform distribution of room modes
• source room (upper): 200 m^3 vol, 212 m^2 surface area (approx.)
• receiving room (lower): 105 m^2 vol, 135 m^2 surface area (approx.).
Diffusers: • 200 m^3 room: 20 diffusers (approx 40 m^2) • 100 m^3 room: none.
Test floor: • Homogeneous heavyweight concrete slab, 150 mm thick, 3.58 x 2.98 m, resting on a set of supports fixed to a full perimeter steel ledge in the upper chamber; the perimeter gap filled with sand, with soft seals top and bottom.

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