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:
INR266-03-1

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])

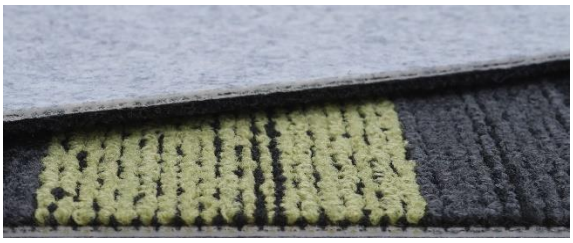
Description: Milliken 'WellBAC Function' carpet tiles
loose laid on a 150 mm thick concrete subfloor.

Materials[7]:

a] Carpet tiles:-
- Product designation: WellBAC Function
- Construction: nylon loop pile carpet on a primary backing, precoated and bonded to a fibreglass layer with hotmelt, on top of a polyester felt backing layer.
- Tile size: 500 x 500 mm, x 5.84 mm thick (average thickness, nominal).
- Overall weight: 3.4 kg/m^2 (nom).

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.
- Carpet tiles [item a] were laid in an arrangement of 7 x 6 tiles, on the concrete subfloor and butted tightly against each other.
- Installation was carried out by the laboratory.

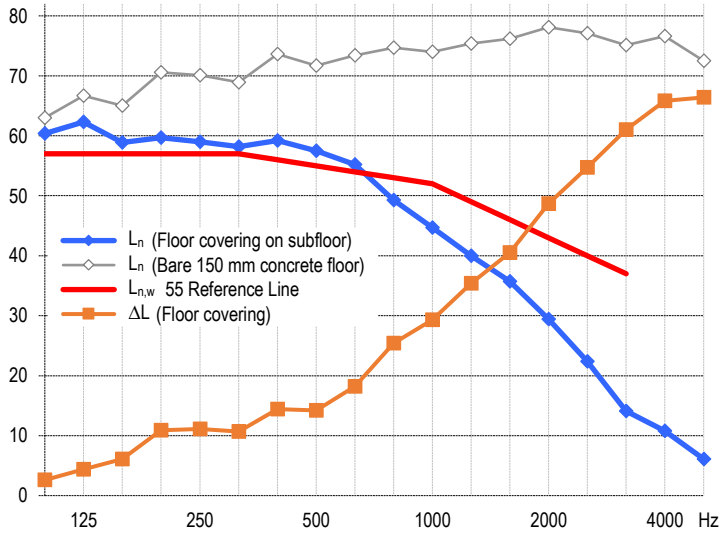


Close up of carpet tiles, showing face, edge and backing.

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	60.4	63.0	2.6
125	62.3	66.7	4.4
160	58.9	65.0	6.1
200	59.7	70.6	10.9
250	59.0	70.1	11.1
315	58.2	68.9	10.7
400	59.2	73.6	14.4
500	57.5	71.7	14.2
630	55.2	73.4	18.2
800	49.3	74.7	25.4
1000	44.7	74.0	29.3
1250	40.0	75.4	35.4
1600	35.7	76.2	40.5
2000	29.4	78.1	48.7
2500	22.4	77.1	54.7
3150	14.1	75.1	61.0
4000	10.8	76.6	65.8
5000	≤ 6.1	72.5	≥ 66.4



Performance Index Numbers (laboratory method)

$L_{n,w}$ (C_I) = 55 (-1) dB ie $L_{n,w}$ = 55 dB
IIC[5] = 52 dB
ΔL_w = 19 dB
ΔL_{lin} = 9 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:	17 August 2019	17 August 2019
On top of floor:	13 °C, 64 % R.H.	13 °C, 63 % R.H.
Chamber underneath floor:	12 °C, 77 % R.H.	12 °C, 77 % R.H.
Atmospheric pressure:	1005 mBar	1005 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) = 83 (-13) 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: July 2018 (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 10 mm thick rubber seal on a full perimeter support ledge in the upper chamber; the perimeter gap filled with sand, with backing rod on top.