CSIRO ACOUSTIC MEASUREMENT REPORT

Commonwealth Scientific and Industrial Research Organisation, Infrastructure Technologies
Acoustics Testing Laboratory, Research Way, Clayton, Vic 3168 Australia

Report No:
INR325-01-1

Client: Belgotex New Zealand Limited
25 Leslie Hills Drive, Riccarton, Christchurch 8011, New Zealand

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 (2024): *Acoustics – Rating of sound insulation in buildings and of building elements. Part 2: Impact sound insulation.*

Test Specimen

(Area of test floor: 10.8 m² [3.6 x 3.0 m])

Description: • Belgotex 'Academia' carpet tiles with ProBac backing
• laid on a 150 mm thick concrete subfloor (no adhesive).

Materials[7]:

a] Carpet tiles:-
- Name: Belgotex Academia.
- Composition: Tufted pattern colour placement loop pile carpet (solution dyed nylon), on *ProBac* backing.
- Pile: 4 mm pile height, 1/10th gauge, loop pile, 450 gsm pile weight
- Tile size: 500 x 500 mm; overall thickness 7 mm
- Weight (meas): 2.33 kg/m²

b] Concrete slab subfloor (of the laboratory), 150 mm thick, 360 kg/m² approx.

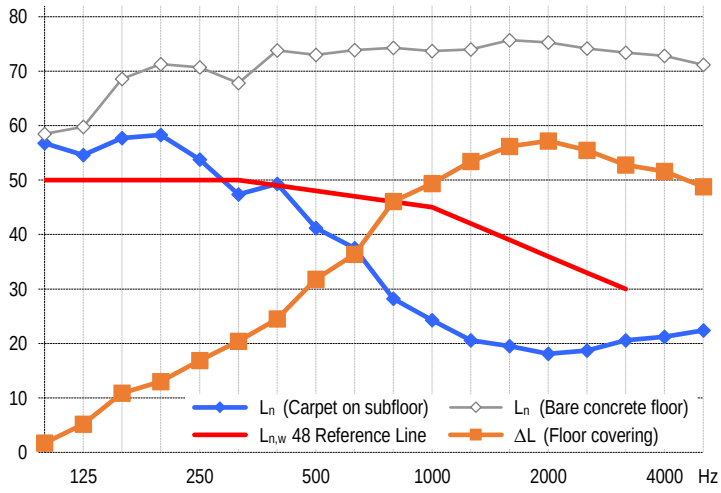
Installation details:
- The concrete subfloor [item b] was cleaned in preparation for flooring installation.
- The test specimen carpet tiles [item a] were laid directly on top of the concrete subfloor and butted tightly together avoiding any gaps between adjacent tiles.
- An 8 x 6 array of tiles was laid, covering the 3.6 m length of the concrete test floor with approx 200 mm overhang at each end, and neatly covering the 3.0 m width.
- Installation was carried out by the laboratory staff; no adhesives were used in installation.

Close-up photo showing both sides of carpet, and edge

Test specimen installed for testing

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	56.8	58.5	1.7
125	54.6	59.8	5.2
160	57.7	68.6	10.9
200	58.3	71.3	13.0
250	53.8	70.7	16.9
315	47.4	67.8	20.4
400	49.3	73.8	24.5
500	41.2	73.0	31.8
630	37.5	73.9	36.4
800	28.2	74.3	46.1
1000	24.3	73.7	49.4
1250	20.6	74.0	53.4
1600	≤ 19.5	75.7	≥ 56.2
2000	≤ 18.1	75.3	≥ 57.2
2500	≤ 18.7	74.2	≥ 55.5
3150	≤ 20.6	73.4	≥ 52.8
4000	≤ 21.2	72.8	≥ 51.6
5000	≤ 22.4	71.2	≥ 48.8



Performance Index Numbers (laboratory method)

$L_{n,w}$ (C_I) = 48 (1) dB
IIC[5] = 62 dB
ΔL_w = 27 dB
ΔL_{lin} = 15 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 (32 sec) at each location, and the results averaged.

Measurement Conditions	With Floor Covering	Bare Concrete Floor
Date of measurement:	1 December 2025	1 December 2025
On top of floor:	15 °C, 57 % R.H.	16 °C, 57 % R.H.
Chamber underneath floor:	15 °C, 64 % R.H.	15 °C, 64 % R.H.
Atmospheric pressure:	994 mbar	994 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) = 81 (-11) dB, IIC = 27 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 E989-06 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. Material details stated are as per client advice; unless identified as (meas), indicating measured by CSIRO.
8. The test specimen material suffered no visible damage during the course of the test.

Issuing Authority

Signed: David Truett
Date: 20 March 2026

Acoustic Instrumentation

Real time analyser: • Brüel & Kjær PULSE LAN-XI type 3169-A-042
Microphone/preamp: • GRAS 46AQ microphone/preamp set, rotating continuously with 32 sec period about 1.32 m radius.
Noise source: • Norsonic Nor277 tapping machine (complies with ISO 140)
Calibration: • Brüel & Kjær type 4231 Calibrator: Feb 2025 (NATA cal)
• Analyser: Feb 2025 (ILAC cal) • Mic/Preamp: Feb 2025 (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 m³ vol, 212 m² surface area (approx)
• receiving room (lower): 105 m² vol, 135 m² surface area (approx).
Diffusers: • 200 m³ room: 20 diffusers (approx 40 m²) • 100 m³ room: none.
Test floor: • Homogeneous heavyweight concrete slab, 150 mm thick, 3.58 x 2.98 m, resting on a full perimeter support ledge in the upper chamber; the perimeter gap filled with sand, with foam backing rod on top.