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CERTIFICATE OF PERFORMANCE

IMPACT SOUND INSULATION

GERFOR AUSTRALASIA

Date: Friday, 22 March 2024

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TABLE OF APPENDICES

1.0 INTRODUCTION

Koikas Acoustics Pty Ltd was requested by Gerfor Australasia to conduct impact noise testing on the following floor systems:

- Test 01: Kenbrock CushionOak Supreme

A total of one (1) test was conducted which included the base ceiling/floor system of a concrete slab and suspender ceiling.

The purpose of undertaking these impact noise tests was to quantify the acoustic performance of the flooring systems.

Test results were compared to the acoustic requirements of Part F5 of BCA *(Building Codes of Australia)* and the standards prescribed by the *Association of Australasian Acoustical Consultants (AAAC).*

All measurements were carried out as per the guidelines and procedures outlined in:

- *AS/NZS ISO 140.7:2006 "Field measurements of impact sound insulation of floors"*

The rating was determined as per

- *AS ISO 717.2-2004 "Rating of sound insulation in buildings and of building elements"*.

2.0 TEST LOCATION AND CONDITIONS

2.1 TESTING SITE

The following impact noise tests were undertaken:

- The un-furnished bedroom on the upper floor (the source room);
- The un-furnished bedroom on the lower floor (the receiver room)

of a residential apartment building in the suburb of Carlingford on Wednesday 6th March 2024.

2.2 SUB-BASE AND FLOORING SYSTEM

Koikas Acoustics has been advised that the common ceiling/floor system of the subject residential unit is constructed of:

- Approximately 200 mm thick concrete slab;
- Suspended ceiling cavity, and
- Plasterboard ceiling.

Hereafter referred to as the *"existing ceiling/floor system (ECFS)".*

2.3 TESTING SAMPLES

The tests were conducted on the ECFS described in Section 2.2 of this report with the following floor covering and underlay samples:

- Test 00: Bare concrete floor (ECFS only) – *for comparison purposes only*
- Test 01: Kenbrock CushionOak Supreme + ECFS

3.0 IMPACT NOISE RATING CRITERIA

3.1 BCA 2022

Regarding the current BCA 2022, a floor in a Class 2 or Class 3 building must have a weighted standardised impact sound pressure level (L'_{nTw}), not more than 62 determined under AS/ISO 717.2 if it separates sole-occupancy units.

3.2 AAAC STAR RATING SYSTEM

Furthermore, the Association of Australian Acoustical Consultants (AAAC) Guideline for Apartment and Townhouse Acoustic Ratings, the following Table (Section C) describes the acoustic ratings concerning the Star Rating System as listed in Table 1 below.

Table 1. Star Rating Requirements for Inter-tenancy Activities – Published by the AAAC

INTER-TENANCY ACTIVITIES	2 Star	3 Star	4 Star	5 Star	6 Star
(c) Impact isolation of floors					
- Between tenancies $L_{nTw} \leq$	65	55	50	45	40
- Between all other spaces & tenancies $L_{nTw} \leq$	65	55	50	45	40

Note, Koikas Acoustics is of the understanding that the impact noise ratings in Table 1 infer L'_{nTw} and not L_{nTw}. L_{nTw} is an impact noise rating derived from tests undertaken in a laboratory and L'_{nTw} is derived from field tests.

4.0 ASSESSMENT/TESTING PROCEDURES

4.1 PARTITION TESTING

4.1.1 Generation of the sound field in the source room

The sound field was generated by a Cesva MI006 tapping machine situated in the source room on the specific floor under test. Several measurement positions on each floor were tested as required by the standard.

4.1.2 Receiving space measurement

Impact noise levels were recorded in the receiving space with an NTi Audio XL2 spectrum analyser sound level meter. The spatial-averaging method of measurement was employed for impact noise tests with relevant traverse durations and minimum distances to reflectors and boundary walls observed.

4.1.3 Reverberation time and background noise

Additional measurements were taken of the background noise (L_b) and reverberation time (T). The background noise measurement was used to ensure that existing ambient noise did not influence the internal noise measurement. The reverberation time was used to calculate the amount of absorption (A) in the receiving room so that the measurement can be standardised to a reference reverberation time of 0.5 seconds.

5.0 MEASURED RESULTS AND ANALYSIS

The results of the acoustic tests are tabulated below. Comprehensive measurement and analysis data are presented as an Appendix to this report.

Table 2. Summary of impact noise test results

System Tested[2]	L'_{nTw}[4]	FIIC[5,6]	AAAC[7]
Test 00: Bare concrete floor (ECFS only) – *for comparison purposes only*	$L'_{nT,w}$ 63	41	2 Star
Test 01: Kenbrock CushionOak Supreme + ECFS	$L'_{nT,w}$ 55	53	3 Star

Detailed calculations of the partition system impact noise insulation (ceiling/floor) are attached as **Appendix A**.

The following is also noted:

1. The acoustic ratings provided in this report are indicative and for a comparative purpose only.
2. All floor testing samples were conducted on the existing sub-base detailed in this report.
3. Tests were also conducted on the bare slab area of the apartment (living/dining area) for comparison purposes.
4. The lower the rating number the better the acoustic performance for L'_{nTw} ratings.
5. The relation between Field Impact Insulation Class (FIIC) and Impact Insulation Class (IIC) can be described by the formula FIIC + 5 = IIC.
6. The Higher the IIC and FIIC the better the impact insulation.
7. The higher the AAAC start rating the better the impact insulation.
8. The acoustic ratings provided in this report are indicative of a 1 m^2 sample and should be used for comparative purposes only. Acoustic ratings will vary depending on the testing environment/conditions including, materials/structures of the existing ceiling/floor system, room volume, internal layout and workmanship. Even with the same testing environment, acoustic ratings can vary from room to room and between buildings as no two buildings are identical. A fully laid flooring system typically presents a lower acoustical rating, i.e. up to 3 rating points less. For example, where the test results are compared against a 1 m^2 sample flooring system resulting in L'_{nTw} 53, the same flooring laid from wall to wall could result in an acoustical rating of L'_{nTw} 56 or more, which is a reduction in the acoustical performance rating.

9. Product installation details and methodologies must be sought from product suppliers, installers or other experts. Koikas Acoustics is not liable for any product defects.
10. The information provided in this report relates to acoustic matters only. Supplementary advice should be sought for other matters relating to flooring installation, construction, design, structural, fire-rating, waterproofing, and the like.
11. The information contained herein should not be reproduced except in full.

6.0 CONCLUSION

Koikas Acoustics was requested by Gerfor Australasia to undertake impact noise testing of their underlay products. The acoustic performances of the various ceiling/floor systems were calculated and compared against the current BCA 2022 and AAAC Star Ratings commonly used in Australia.

The calculated acoustic ratings of the tested flooring systems are summarised and presented in Table 2 of this report. A detailed graphical presentation of the acoustic performance of the tested flooring is attached as **Appendix A**. This report should be reproduced in full including the attached appendix.

The acoustic ratings provided in this report are indicative of the acoustical impact rating performance. Acoustic ratings will vary depending on the testing environment/conditions including, materials/structures of the existing ceiling/floor system, room volume, internal layout and workmanship. Even with the same testing environment/conditions, acoustic ratings can vary from building to building.

It is recommended that in-situ testing be conducted before any full fit-out as the sub-base ceiling/floor system and the wall junctions could impact the noise transfer to the unit below.

Floor coverings must not make contact with any walls or joineries (kitchen benches, cupboards etc). Hard floor coverings must not touch the walls and/or joineries and skirtings attached to the wall must not touch the flooring. Gaps should be filled with a suitable mastic-type sealant. Acoustic ratings will be degraded if the above precautions and treatments are not implemented.

APPENDIX A

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FIELD MEASUREMENTS OF IMPACT SOUND INSULATION OF FLOORS

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Date of Test :	Wednesday, 6 March 2024
Project No. :	3739
Testing Company :	Koikas Acoustics
Checked by :	Nick Koikas
Place of Test:	Residential Units at Carlingford
Client	Kenbrock Flooring
Client Address	-

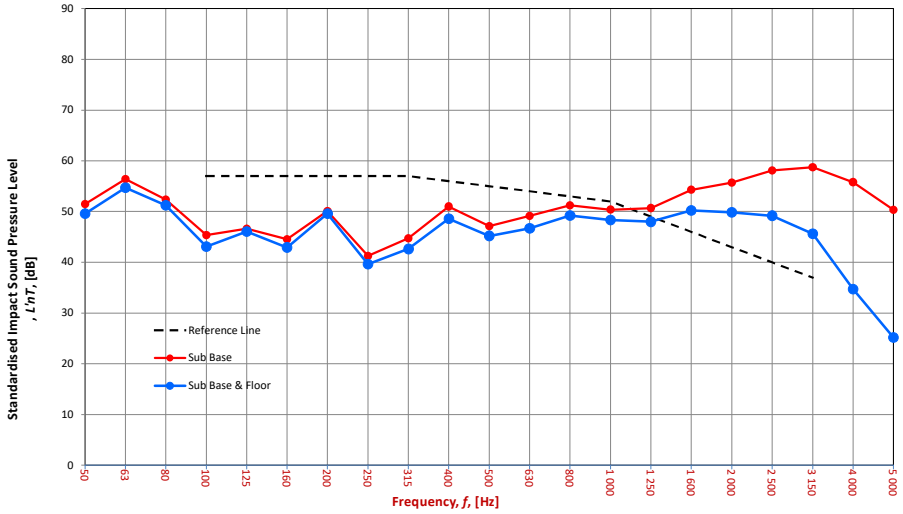
	Name	Thickness (mm	Density (Sl)
Description of Floor System	Kenbrock Cushion Oak Supreme	5	--
	NA	--	--
	Concrete	200	--
	Suspended Ceiling (plasterboard)	--	--

Room Floor Dimensions	Width :	3	m
	Length :	2.9	m
	Area :	8.70	m^2
Sample Dimensions	Width :	1	m
	Length :	1	m
	Area :	1	m^2

	Location	Width	Length	Area	Height	Volume
Receiver Rm	Bedroom	3	2.9	8.70	2.7	23.49

Room Surfaces		
Walls	Floor	Ceiling
Gyprock	Concret	Gyprock

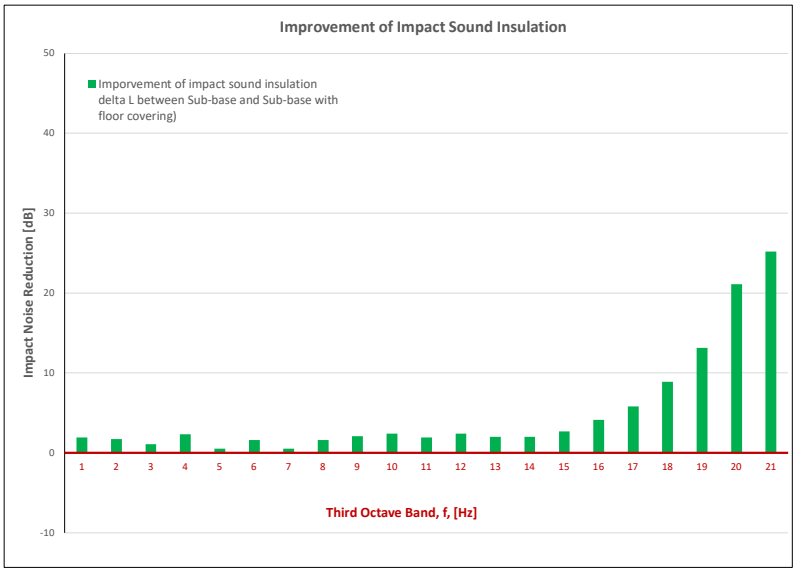
Frequency f Hz	L'nT (one-third octave) dB Sub Base	Sub Base Floor	Sub Base Floor Underlay
50	51.5	49.6	NA
63	56.4	54.7	NA
80	52.4	51.3	NA
100	45.4	43.1	NA
125	46.6	46.1	NA
160	44.5	42.9	NA
200	50.1	49.6	NA
250	41.2	39.6	NA
315	44.7	42.6	NA
400	51.0	48.6	NA
500	47.1	45.2	NA
630	49.1	46.7	NA
800	51.2	49.2	NA
1 000	50.4	48.4	NA
1 250	50.7	48.0	NA
1 600	54.3	50.2	NA
2 000	55.7	49.9	NA
2 500	58.1	49.2	NA
3 150	58.7	45.6	NA
4 000	55.8	34.7	NA
5 000	50.4	25.2	NA



Sub Base		
L'nT,w	63	AS ISO 717.2 - 2004
Ci	-15	AS ISO 717.2 - 2004
Ci(50-2500)	-13	AS ISO 717.2 - 2004
Ci(63-2000)	-15	AS ISO 717.2 - 2004
AAAC★	2 Star	AAAC Guideline
FIIC	41	ASTM E1007-14

Sub Base & Floor		
L'nT,w	55	AS ISO 717.2 - 2004
Ci	-11	AS ISO 717.2 - 2004
Ci(50-2500)	-9	AS ISO 717.2 - 2004
Ci(63-2000)	-9	AS ISO 717.2 - 2004
AAAC★	3 Star	AAAC Guideline
FIIC	53	ASTM E1007-14

Sub Base, Floor & Underlay		
L'nT,w	NA	AS ISO 717.2 - 2004
Ci	NA	AS ISO 717.2 - 2004
Ci(50-2500)	NA	AS ISO 717.2 - 2004
Ci(63-2000)	NA	AS ISO 717.2 - 2004
AAAC★	NA	AAAC Guideline
FIIC	NA	ASTM E1007-14



Definitions of Noise Metrics

FIIC:
Field Impact Insulation Class is a single-number rating of how well a floor system attenuates impact type sounds, such as footsteps. Calculated from third-octave band normalised impact sound pressure level data and referenced to 10 m^2 as described in ASTM E989. The higher the single-number rating, the better its impact insulation performance.

L'nT,w:
The Weighted Standardised Impact Sound Pressure Level when measured in situ referenced to a reverberation time (RT60) of 0.5 seconds. Used by the AAAC to determine their respective Star Rating.

Ci:
Spectrum adaption term is a low frequency correction factor. Typically for massive floors such as concrete, the values are about zero while for timber joist floors Ci is positive because of the low resonant frequencies. Considers frequency range between 100 -and 2500 Hz.

Ci(50-2500):
Same as above, but for the frequency range 50 -2500 Hz.

Ci(125-2000):
Same as above, but for the frequency range 125 -2000 Hz.

AAAC Star R.	2	3	4	5	6
L'nT,w	65	55	50	45	40
FIIC	45	55	60	65	70
Comments	Below BCA 62	Clearly Audible	Audible	Barely Audible	Normally Inaudible