

Commercial 1 (Unit 27)

+612 9587 9702

DELIVERING SOUND ADVICE

637-645 Forest Road

office@koikasacoustics.com

Bexley NSW 2207

www.koikasacoustics.com

ABN: 12 058 524 771

CERTIFICATE OF PERFORMANCE

IMPACT SOUND INSULATION

RIVERHILL FLOORS PTY LTD

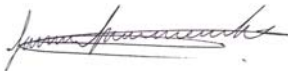
14 MM ENGINEERED FLOORING WITH 5 MM REGUPOL SONUS

CORE 5 UNDERLAY

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Prepared By	James Tsevrementzis  Senior Acoustical Consultant (M.A.A.S.)			
Client	Riverhill Floors Pty Ltd Attention: Jennifer E-mail: accounts@riverhillfloors.com.au			

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CERTIFICATE OF PERFORMANCE

IMPACT SOUND INSULATION

RIVERHILL FLOORS PTY LTD

14 MM ENGINEERED FLOORING WITH 5 MM REGUPOL SONUS CORE 5 UNDERLAY

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1.0 CONSULTANT'S BRIEF

Koikas Acoustics was requested by Riverhill Floors Pty Ltd to conduct impact noise tests of the 14 mm Engineered Flooring with 5 mm Regupol Sonus Core 5 Underlay.

A total of two (2) tests were conducted which included the base ceiling/floor system of a concrete slab and suspended ceiling, and the test of the aforementioned flooring product.

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 F7 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:

- *ISO 16283-2:2020 Acoustics - Field measurement of sound insulation in buildings and of building elements - Part 2: Impact sound insulation*

The rating was determined as per

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



2.0 IMPACT NOISE TESTING

2.1 PARTITION SYSTEM

Koikas Acoustics has been advised that the ceiling/floor system between the residential units is constructed with the following building materials:

- Approximately 200 mm thick concrete slab,
- Approximately 100 mm suspended ceiling cavity (no cavity insulation), and
- Plasterboard ceiling (unknown thickness, typically 10 mm or 13 mm).

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

The tests were conducted with the following floor covering in conjunction with the selected flooring over the ECFS:

- Test 00: Bare concrete floor (ECFS only) – *for comparison purposes only*
- Test 01: 14 mm Engineered Flooring + 5 mm Regupol Sonus Core 5 Underlay + ECFS

The samples tested were approximately 1 m².



2.2 IMPACT NOISE REQUIREMENTS

2.2.1 BCA REQUIREMENT

For verification of the impact noise rating for floors, Part F7V53 (b) of the latest update of the Building Code of Australia (BCA) 2022 states:

Impact: a weighted standardised impact sound pressure level ($L_{nT,w}$) not more than 62 when determine under AS ISO 717.2.

2.2.2 AAAC STAR RATING PERFORMANCE REQUIREMENTS

Reproduced from the Association of Australasian Acoustical Consultants (AAAC) Guideline for Apartment and Townhouse Acoustic Ratings, the following Table (Section C) describes the acoustic ratings regarding the Star Rating System.

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.



3.0 ASSESSMENT/TESTING PROCEDURES

3.1 PARTITION TESTING

3.1.1 Generation of the sound field in the source room

The sound field was generated by a BSWA Technology Co. Type TM002 S/N 440504 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.

3.1.2 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.

3.1.3 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.



4.0 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			
Flooring Sample	$L'_{nT,w}$	AAAC Star Rating	FIIC
Test 00: Bare concrete floor (ECFS only) – for comparison purposes only	58	2	45
Test 01: 14 mm Engineered Flooring + 5 mm Regupol Sonus Core 5 Underlay + ECFS	46	4	64

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



The following are also noted:

1. All tests were undertaken with the existing ceiling/floor system as described previously in this report.
2. The tested flooring system as listed in Table 2 (Test 01) has achieved both the BCA 2019 minimum requirement ($L_{nT,w} \leq 62$) and the AAAC Star rating of 4 for impact noise insulation.
3. The lower the $L'_{nT,w}$ rating the better the impact insulation.
4. The relation between Field Impact Insulation Class (FIIC) and Impact Insulation Class (IIC) can be described by the formula $FIIC + 5 \approx IIC$.
5. The higher the IIC and FIIC the better the impact insulation.
6. The higher the AAAC Star Rating the better the impact insulation.
7. The information contained herein should not be reproduced except in full.
8. 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.
9. Product installation details and methodologies must be sought from the product supplier, installer or other experts. Koikas Acoustics is not liable for any product defects.
10. The acoustic ratings provided in this report are indicative of a 1 m² sample and should be used for comparative purposes only. Acoustic ratings will vary depending on:
 - the testing environment/conditions,
 - 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 m² sample flooring system resulting in L'_{nTw} 46, the same flooring laid from wall to wall could result in an acoustical rating of up to L'_{nTw} 49 or more, which is a reduction in the acoustical performance rating.

11. Floor covering must not make contact with any walls or joineries (kitchen benches, cupboards etc). During the installation of any hard floor coverings, temporary spaces of 5~10mm should be used to isolate the floor covering from walls and/or joineries and the resulting gaps should be filled with a suitable mastic type sealant or off-cut of underlay or the equivalent where available. The acoustic integrity could be degraded if the above precautions and treatments are not implemented. Refer to Figures 1 and 2 below for details of the proper installation of flooring materials.

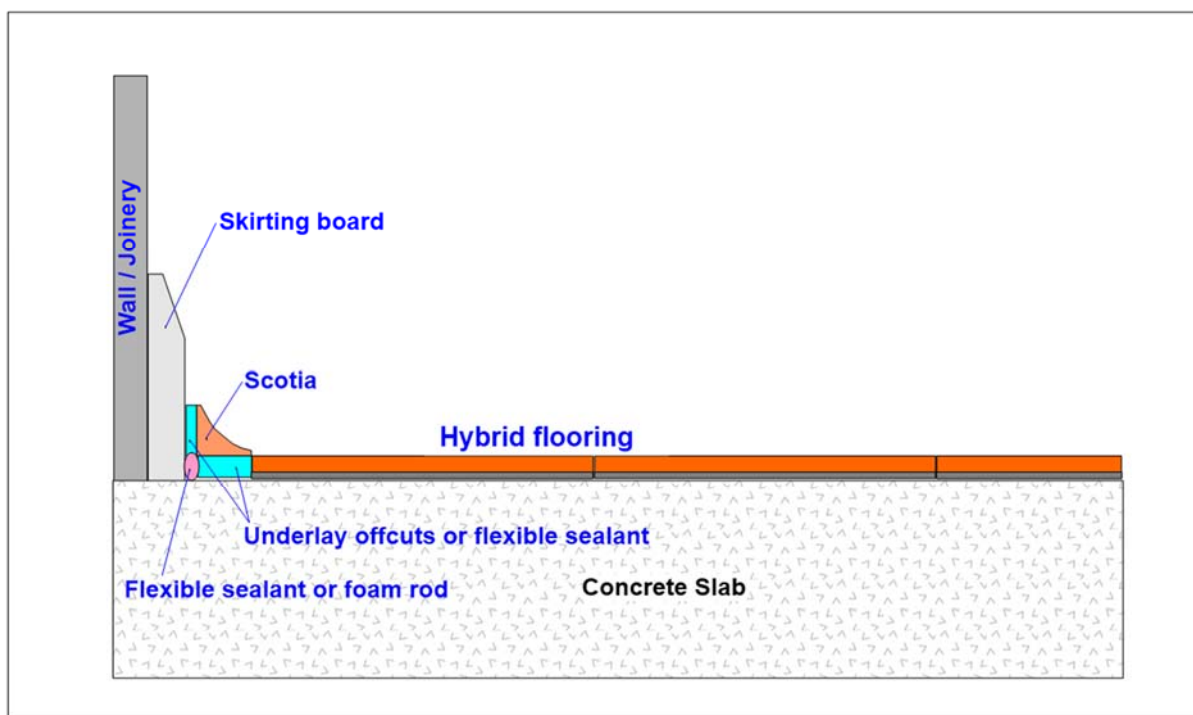


Figure 1. Wall / Joinery details (skirting board & scotia)

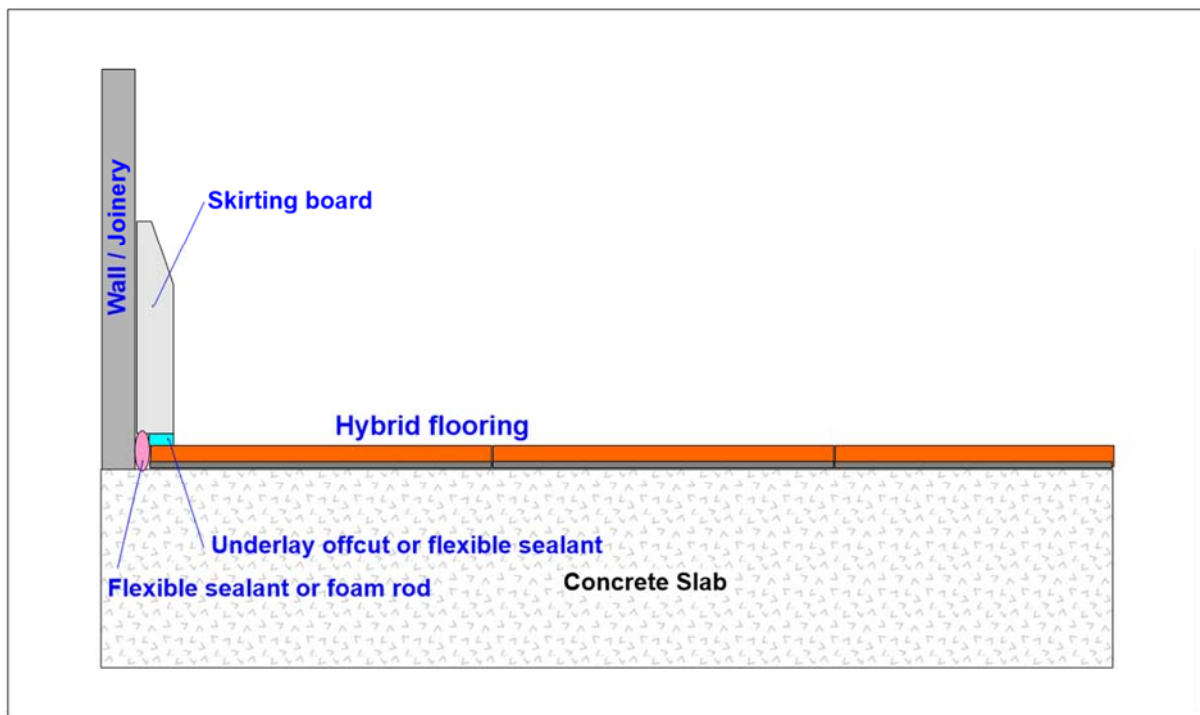


Figure 2. Wall / Joinery details (skirting board)

5.0 CONCLUSION

Koikas Acoustics was requested by Riverhill Floors Pty Ltd to undertake impact noise tests of the 14 mm Engineered Flooring with 5 mm Regupol Sonus Core 5 Underlay. The acoustic performances of various ceiling/floor configurations were calculated and compared against the acoustic requirements of the current BCA and AAAC Star Ratings that are commonly used in Australia.

The calculated acoustic rating of the tested flooring system is summarised and presented in **Table 2** of this report. A detailed test certificate is provided in **Appendix A**.

The acoustic ratings provided in this report are indicative and should be used for comparative purposes only. Acoustical ratings will vary depending on several factors:

- the testing environment/conditions
- materials/structures of the existing ceiling/floor system,
- room volume,
- internal layout and
- workmanship.

Even with the same testing environment/conditions, acoustic ratings would still 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.

This report should be reproduced in full including the attached Appendix.

Floor covering must not make contact with any walls or joineries (kitchen benches, cupboards etc). During the installation of any hard floor coverings, temporary spaces of 5~10 mm should be used to isolate the floor covering from walls and/or joineries and the resulting gaps should be filled with a suitable mastic type sealant or off-cut of underlay or the equivalent where available. The acoustic integrity could be degraded if the above precautions and treatments are not implemented.



APPENDIX A

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APPENDIX A

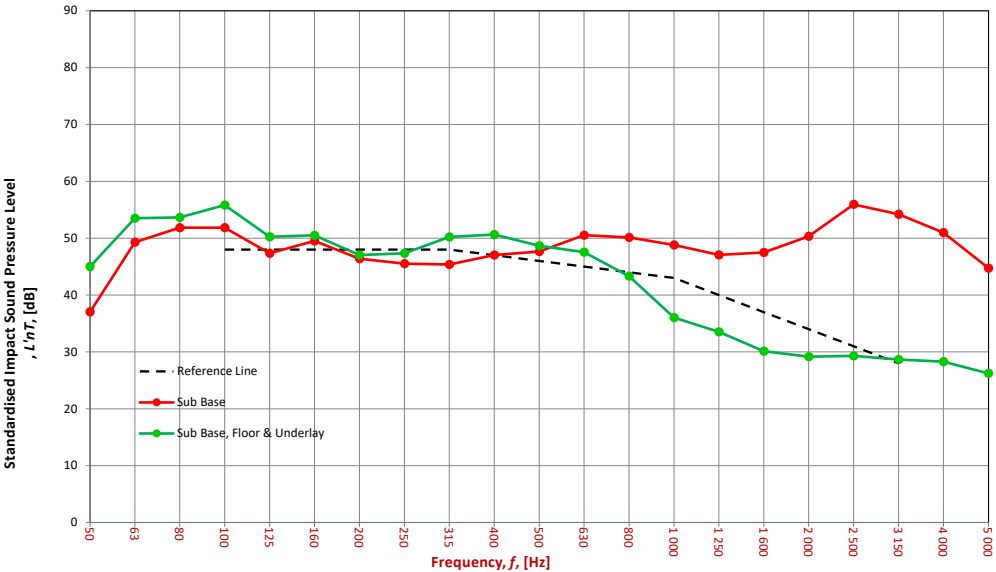
FIELD MEASUREMENTS OF IMPACT SOUND INSULATION OF FLOORS



Date of Test :	Wednesday, 24 May 2023		
Project No. :	5198		
Testing Company :	Koikas Acoustics		
Checked by :	Nick Koikas		
Place of Test:	Residential apartment in Sydney		
Client	Riverhill Floors Pty Ltd		
Client Address	-		
Description of Floor System	Name	Thickness (mm)	Density (SI)
	14mm Engineered Flooring	14	--
	5mm Regupol Sonus Core 5 acoustic underlay	5	--
	Concrete	200	--
Room Floor Dimensions	Width :	4	m
	Length :	8	m
	Area :	32	m ²
Sample Dimensions	Width :	1	m
	Length :	1	m
	Area :	1	m ²

Receiver Rm	Location	Width	Length	Area	Height	Volume	Room Surfaces		
							Walls	Floor	Ceiling
	Residential apartment below	4	8	32	2.7	86	Plasterboard	Timber	Plasterboard

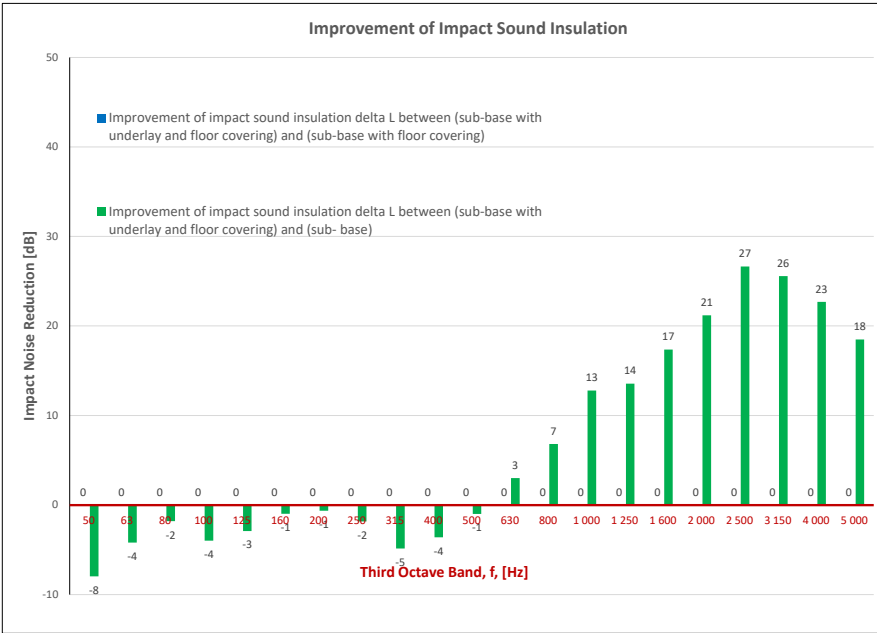
Frequency f Hz	L'nT (one-third octave) dB		
	Sub Base	Sub Base Floor	Sub Base Floor Underlay
50	37.0	N/A	45.0
63	49.3	N/A	53.5
80	51.8	N/A	53.6
100	51.8	N/A	55.8
125	47.3	N/A	50.3
160	49.5	N/A	50.5
200	46.4	N/A	47.0
250	45.5	N/A	47.3
315	45.4	N/A	50.2
400	47.0	N/A	50.6
500	47.7	N/A	48.7
630	50.5	N/A	47.5
800	50.1	N/A	43.3
1 000	48.8	N/A	36.0
1 250	47.1	N/A	33.5
1 600	47.5	N/A	30.1
2 000	50.3	N/A	29.2
2 500	56.0	N/A	29.3
3 150	54.2	N/A	28.6
4 000	51.0	N/A	28.3
5 000	44.7	N/A	26.2



Sub Base		
L'nT,w	58	AS ISO 717.2 - 2004
Ci	-11	AS ISO 717.2 - 2004
Ci(50-2500)	-11	AS ISO 717.2 - 2004
Ci(63-2000)	-12	AS ISO 717.2 - 2004
AAAC★	2 Star	AAAC Guideline
FIIC	45	ASTM E1007-14

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

Sub Base, Floor & Underlay		
L'nT,w	46	AS ISO 717.2 - 2004
Ci	-1	AS ISO 717.2 - 2004
Ci(50-2500)	1	AS ISO 717.2 - 2004
Ci(63-2000)	1	AS ISO 717.2 - 2004
AAAC★	4 Star	AAAC Guideline
FIIC	64	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 m² 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 Inaudible	Normally Inaudible