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CERTIFICATE OF PERFORMANCE

IMPACT NOISE TESTING

VIRTUO RIGID 55 LOCK HYBRID PLANKS

GERFLOR AUSTRALASIA PTY LTD

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1.0 CONSULTANT'S BRIEF

Koikas Acoustics was requested by Gerflor Australasia Pty Ltd to conduct an impact noise test of the Virtuo Rigid 55 Lock Hybrid Vinyl.

The purpose of undertaking the impact noise test was to quantify the acoustic performance of the hybrid vinyl flooring over a concrete sub-base with suspending ceiling.

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 Australian Acoustical Consultants (AAAC)*.

All measurements were carried out in accordance with the guidelines and procedures outlined in *AS/NZS ISO 140.7:2006 "Field measurements of impact sound insulation of floors"* with the rating determined in accordance with *AS ISO 717.2-2004 "Rating of sound insulation in buildings and of building elements"*.



2.0 IMPACT NOISE COMPLIANCE TESTING

The impact noise testing of the **Virtuo Rigid 55 Lock Hybrid Vinyl** was conducted inside the unfurnished bedrooms of one residential unit (upper-floor level) to another unit directly below (lower-floor level) within a residential building in Hurstville NSW on Wednesday, 12th June 2019.

2.1 PARTITION SYSTEM

The impact noise testing was conducted on the:

- **Virtuo Rigid 55 Lock Hybrid Vinyl** over;
- 200 mm thick reinforced concrete slab;
- 80~120 mm ceiling cavity, and
- 13 mm plasterboard ceiling.

2.2 IMPACT NOISE REQUIREMENTS

2.2.1 *BCA Requirement*

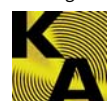
For verification of the impact noise rating for floors, Part FV5.1 (b) of the latest update of the Building Code of Australia (BCA) 2019 states:

Impact: a weighted standardised impact sound pressure level with spectrum adaptation term (L_{nTw}) not more than 62 when determine under AS/ISO 717.2

2.2.2 *AAAC Star Rating Performance Requirements*

Reproduced from the Association of Australian Acoustical Consultants (AAAC) Guideline for Apartment and Townhouse Acoustic Ratings, the following Table (Section C) describes the impact noise ratings with reference to 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



2.3 ASSESSMENT PROCEDURES & MEASUREMENTS

Spectrum sound level measurements of transmitted impact noise were recorded in 1/3 octave band centre frequencies between 50 and 10,000 Hertz.

A standardised BSWA Technology Co. Type TM002 S/N 440504 Tapping Machine was used to generate the sound field in the source rooms for the impact noise test. Impact noise measurements were carried out in accordance with the recommendations of *AS/NZS ISO 140.7:2006 “Field measurements of impact sound insulation of floors”*. This document provides information on appropriate measurement equipment and the proper implementation of measurement practices so as to achieve reliable results of impact sound insulation between rooms in buildings.

For determining a single number quantity for impact sound insulation between rooms in buildings when measurements are conducted “in-situ”, $L_{nT,w}$ (weighted standardised impact sound pressure level), the relevant standard is *AS/NZS ISO 717.2-2004 “Impact sound insulation”*. The calculated $L_{nT,w}$ derived from applying the formulae in this standard allows for a comparison between these calculated levels and the nominated acceptable levels outlined in the *Verification Methods of the Building Code of Australia (BCA)*.

2.3.1 Ambient Background Noise Measurement

A measure of the underlying ambient noise was taken in the receiving rooms to account for the perceived noise in the space. Inaccuracies in the measurements and calculations can occur in areas of high ambient noise however the location of the site and receiver rooms meant little ambient noise was evident in this case.

Ambient noise levels in each 1/3 octave frequency bands were measured to take into account the effect of ambient noise during the recording of the transmitted impact noise levels.

2.3.2 Reverberation Time Measurements

To determine the $L_{nT,w}$ reverberation time measurements need to be performed in the receiving rooms. The reverberation time in the receiver room is calculated to ‘standardise’ the impact noise transmission measurements to reference reverberation time of 0.5 seconds as required by AS/NZS ISO 140.7:2006 Section 3.4, and AS ISO 140.4-2006 Section 3.4.



Reverberation time measurements were conducted using the balloon source method. This consisted of bursting a large balloon and measuring the decay of sound pressure level using a spectrum analyser. This transient response was analysed by the sound level meter and a measure of the reverberation time in 1/3 octave bands was used to calculate the standardised impact noise rating.

2.3.3 Instrumentation and Calibration

NTi XL2 Type Approved (TA) precision spectrum analyser S/N A2A-06312-E0 was used to measure the impact noise levels. The equipment used for taking noise level measurements is traceable to NATA certification. Field calibrations were taken before and after the impact noise measurements with a NATA calibrated pistonphone. No system drifts were observed.

2.4 MEASURED RESULTS

The results of the impact noise tests are summarised in Table 2 Below.

Table 2. Impact Noise Insulation Performance Summary for Ceiling/Floor System			
System Tested	L'_{nTw}^3	AAAC ⁶ Star Rating	FIIC ^{4,5}
Bare concrete slab with suspended ceiling and without any floor covering (for comparison purpose only)	61	2	43
Vinyl flooring system consisting of: <ul style="list-style-type: none"> • Virtuo Rigid 55 Lock Hybrid Vinyl over; • 200 mm thick reinforced concrete slab; • 80~120 mm ceiling cavity, and • 13 mm plasterboard ceiling. 	43	5	66

Detail calculations of the partition system's impact noise insulation of the ceiling/floor systems are attached as **Appendix A**.



The following are also noted:

1. The existing ceiling/floor system (without any floor covering) consists of 200 mm thick reinforced concrete sub-base with approximately 80~120 mm suspended ceiling cavity and one layer of 13 mm thick plasterboard ceiling.
2. The *Virtuo Rigid 55 Lock* system tested in conjunction with the existing ceiling/floor system has met both the BCA 2016 criterion ($L'_{nT_w} \leq 62$) and the AAAC Star rating of 5 for impact noise insulation.
3. The lower the rating number the better the acoustic performance for L_{nT_w} ratings.
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, water proofing, and the likes.
9. Product installation details and methodologies must be sought from 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 and for comparative purpose 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 environmental, acoustic ratings can vary from room to room and so building to building as no two buildings are identical.
11. Floor covering must not make contact with any walls or joineries (kitchen benches, cupboards etc). During installation of any hard floor coverings, temporary spaces of 5-10mm should be used to isolated 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.



3.0 CONCLUSION

Koikas Acoustics was requested by Gerflor Australasia Pty Ltd to undertake an impact noise test of the Virtuo Rigid 55 Lock Hybrid Planks. The acoustic performances of hybrid flooring system were calculated and compared against the acoustic requirements of the current BCA and AAAC Star Ratings.

The calculated acoustic rating of the tested flooring system was summarised and presented in **Table 2** of this report. Detailed graphically presentation of the acoustic performance of the tested flooring is attached as **Appendix A**.

The acoustic ratings provided in this report are indicative and for comparative purpose 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/conditions, acoustic ratings would still vary from building to building.

It is recommended that in-situ testing be conducted prior to 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 installation of any hard floor coverings, temporary spaces of 5~10mm should be used to isolated 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, 12 June 2019
Project No. : 3760
Testing Company : Koikas Acoustics
Checked by : Nick Koikas
Place of Test: Residential building in Hurstville NSW
Client Gerflor Australasia Pty Ltd
Client Address -

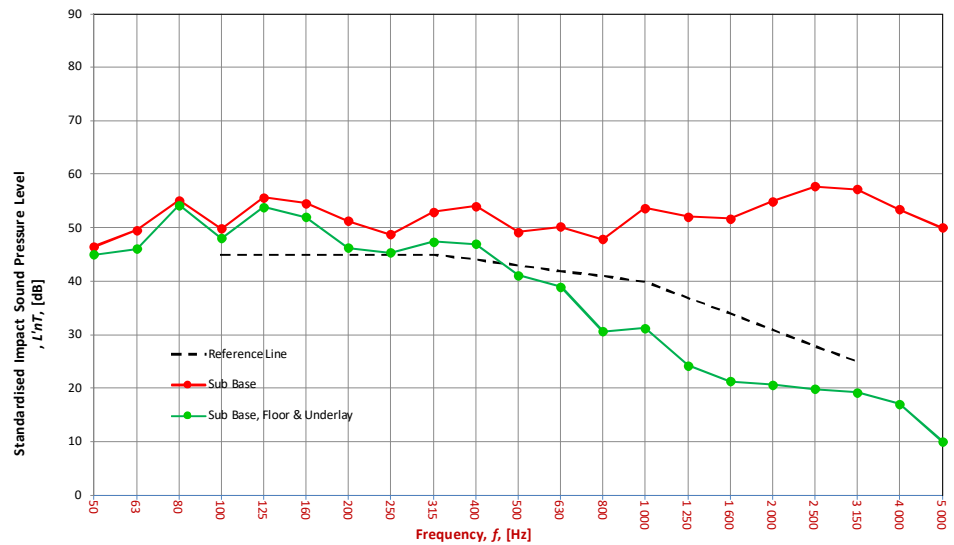
Description of Floor System	Name	Thickness (mm)	Density (SI)
Description of Floor System	Virtuo Rigid 55 Lock Hybrid Planks	--	--
	200 mm reinforced concrete slab	30~50 + 200	--
	80~120 mm suspended ceiling cavity	80~120	2540
	13 mm plasterboard ceiling	13	--

Room Dimensions
Width : 3.2 m
Length : 3.2 m
Area : 10.24 m²

Sample Dimensions
Width : 1 m
Length : 1 m
Area : 1 m²

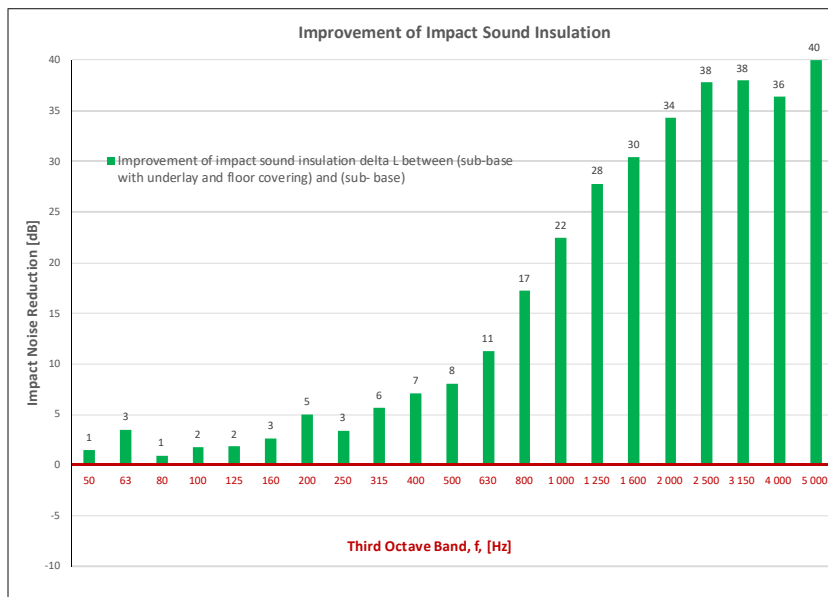
Receiver Rm	Location	Width	Length	Area	Height	Volume	Room Surfaces		
							Walls	Floor	Ceiling
Bedroom	Bedroom	3.2	3.2	10.24	2.7	27.648	Masonry/plasterboard	Concrete	Plasterboard

Frequency f Hz	L'nT (one-third octave) dB	
	Sub Base	Sub Base Floor Underlay
50	46.5	45.1
63	49.6	46.1
80	55.2	54.3
100	49.9	48.1
125	55.7	53.9
160	54.6	52.0
200	51.3	46.3
250	48.8	45.4
315	53.1	47.4
400	54.1	47.0
500	49.2	41.2
630	50.2	39.0
800	47.9	30.7
1 000	53.8	31.3
1 250	52.1	24.3
1 600	51.8	21.4
2 000	55.0	20.7
2 500	57.7	20.0
3 150	57.2	19.3
4 000	53.5	17.1
5 000	50.1	10.1



Sub Base		
L'nT,w	61	AS ISO 717.2 - 2004
Ci	-11	AS ISO 717.2 - 2004
Ci(50-2500)	-10	AS ISO 717.2 - 2004
Ci(63-2000)	-11	AS ISO 717.2 - 2004
AAAC★	2 Star	AAAC Guideline
FIC	43	ASTM E1007-14

Virtuo Rigid 55 Lock + Sub-base		
L'nT,w	43	AS ISO 717.2 - 2004
Ci	0	AS ISO 717.2 - 2004
Ci(50-2500)	2	AS ISO 717.2 - 2004
Ci(63-2000)	2	AS ISO 717.2 - 2004
AAAC★	5 Star	AAAC Guideline
FIC	66	ASTM E1007-14



Definitions of Noise Metrics

FIC:
 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):

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
FIC	45	55	60	65	70
Comments	Below BCA 62	Clearly Audible	Audible	Barely Inaudible	Normally Inaudible