

23 July 2020

Sunstar Timber Flooring  
51 Atlantic Drive  
Keysborough VIC 3173

**Attention: Daniel Lyne**

Dear Daniel

## **IMPACT SOUND INSULATION PERFORMANCE OPINIONS FOR SUNSTAR FLOOR COVERS**

### **INTRODUCTION**

Sunstar Timber Flooring (Sunstar) has commissioned Marshall Day Acoustics to provide acoustic opinions of impact sound insulation performance for floor/ceiling systems which incorporate Sunstar floor coverings.

Sunstar has nominated four floor covers for evaluation. The floor covers are as follows:

- 5.5 mm Sunstar SPC Hybrid Flooring with integrated underlay
- 7 mm Sunstar Maxi Hybrid Flooring with integrated underlay
- 8.5 mm Sunstar Engineered Rigid Core Timber with underlay
- 14 mm Sunstar Engineered Timber with underlay

Impact sound insulation performance for in-situ floor/ceilings is generally expressed using  $L'_{nT,w}$  values<sup>1</sup>. These rating values relate to a whole floor/ceiling system which can include a floor cover as well as building substructure and a ceiling. To evaluate the  $L'_{nT,w}$  performance for systems incorporating Sunstar floor covers a nominal floor/ceiling arrangement is used which comprises a concrete slab and a suspended plasterboard ceiling.

As a simple indicator of performance, the impact sound insulation opinions are quantified using the star rating criteria provided in the Association of Australasian Acoustical Consultants' *Guideline for Apartment and Townhouse Acoustic Rating Version 1.0*. A brief discussion of relevant criteria from the guideline is provided in Appendix A.

A glossary of relevant acoustic terms is provided in Appendix B.

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<sup>1</sup> For  $L'_{nT,w}$ , a lower rating indicates a better acoustic performance.

## FLOOR COVERS

### Details

Physical properties of the Sunstar floor covers are summarised in Table 1.

**Table 1: Summary of base floor systems**

Floor cover	Underlay	Flooring Planks Surface Mass (kg/m <sup>2</sup> )	Underlay Surface Mass (gsm)	Total Thickness (mm)
5.5 mm Sunstar SPC Hybrid Flooring	Integrated 1.5 mm IXPE resilient backing	7.9	-	5.5
7 mm Sunstar Maxi Hybrid Flooring	Integrated 1.5 mm IXPE resilient backing	11.0	-	7
8.5 mm Sunstar Engineered Rigid Core Timber	3 mm Dunlop Aquacoustic	14.4	300	11.5
14 mm Sunstar Engineered Timber	2 mm Sunstar Polyethylene timber Underlay	9.1	160	16

### Impact sound insulation measurements

Sunstar has provided impact sound insulation test reports from recent laboratory measurements for each floor cover. In each laboratory test, a floor cover was installed on a concrete slab with measurements carried out according to AS ISO 140.6-2006<sup>2</sup> and ISO 10140 Part 3 (2010)<sup>3</sup> to determine  $L_{n,w}$  ratings<sup>4</sup>.

The  $L_{n,w}$  ratings relate to the whole floor system comprising floor cover and concrete slab.

Where the laboratory tests were carried out on a 150 mm thick concrete slab, the reduction in impact sound pressure levels due to the floor cover,  $\Delta L_w$ , has also been calculated in accordance with AS ISO 717.2 (2004)<sup>5</sup>:

Test results are summarised in Table 2.

<sup>2</sup> AS ISO 140.6-2006 *Acoustics - Measurement of sound insulation in buildings and of building elements Laboratory measurements of impact sound insulation of floors*

<sup>3</sup> ISO 10140 Part 3 (2010) *Acoustics — Laboratory measurement of sound insulation of building elements — Part 3: Measurement of impact sound insulation*

<sup>4</sup> For  $L_{n,w}$ , a lower rating indicates a better acoustic performance.

<sup>5</sup> AS ISO 717.2 (2004): *Acoustics — Rating of sound insulation in buildings and of building elements Part 2: Impact sound insulation*

**Table 2: Summary of base floor systems**

Floor cover	Floor	Test report number	Test date	Impact Sound Insulation Performance, $L_{n,w}$	Weighted reduction in Impact sound pressure level with floor covering $\Delta L_w$
5.5 mm Sunstar SPC Hybrid Flooring	150 mm concrete	INR269-08-1	21 October 2019	82	20
7 mm Sunstar Maxi Hybrid Flooring	150 mm concrete	INR269-10-1	13 March 2020	82	18
8.5 mm Sunstar Engineered Rigid Core Timber	150 mm concrete	INR269-07-1	21 October 2019	82	19
14 mm Sunstar Engineered Timber	200 mm concrete	INR269-09-1	14 November 2019	77	Not reported

## ACOUSTIC CONSIDERATIONS

### Nominal floor/ceiling construction

Impact sound insulation performance ratings  $L_{nT,w}$  and  $L_{n,w}$  relate to a whole floor/ceiling system which can include a floor cover as well as building substructure and a ceiling. To evaluate performance for systems which incorporate Sunstar floor covers, the following nominal floor/ceiling arrangement has been considered:

- 200 mm concrete slab floor, minimum surface density 465 kg/m<sup>2</sup>
- Suspended light steel grid<sup>6</sup>
- 250 mm cavity
- 13 mm standard plasterboard, minimum surface density 9 kg/m<sup>2</sup>

For this nominal floor/ceiling system, two different cavity infill arrangements have been considered:

- 75 mm thick, 10 kg/m<sup>3</sup> glass wool ceiling cavity insulation
- No ceiling cavity insulation

### Estimating performance

The laboratory test results provided by Sunstar, across a combination for 150 mm and 200 mm concrete slabs, have been used to calibrate prediction models<sup>7</sup> for the estimation of impact sound insulation performance. These prediction models have then been expanded to estimate the effects of the nominal floor/ceiling construction described above. The revised prediction models have then been compared with laboratory test data taken from Marshall Day Acoustics' inhouse database for related floor/ceiling constructions to evaluate the likely variability of the models.

<sup>6</sup> For example, Rondo Key-Lock Suspended Ceiling System or similar

<sup>7</sup> The prediction models used are based on established theoretical and empirical methods. Further details are available upon request.

## OPINION

The AAAC *Guideline for Apartment and Townhouse Acoustic Rating*<sup>8</sup> nominates a 5-star rating where impact sound insulation between rooms is  $L_{nT,w} \leq 45$ .

Our opinions of impact sound insulation performance for each Sunstar floor cover, when installed with the nominal floor/ceiling construction, are provided in Table 3 below.

**Table 3: Opinion of impact sound insulation of floor/ceiling systems incorporating Sunstar floor covers**

Nominal floor/ceiling construction	Floor description	Insulation	AAAC 5 Star Criteria, $L'_{nT,w}$	Estimated to achieved criteria
200 mm concrete slab floor, minimum surface density 465 kg/m <sup>2</sup>  Suspended light steel grid  250 mm cavity  13 mm standard plasterboard, minimum surface density 9 kg/m <sup>2</sup>	14 mm Sunstar Engineered Timber with underlay	75 mm 10 kg/m <sup>3</sup> glass wool	$\leq 45$	✓
		None	$\leq 45$	✗
	8.5 mm Sunstar Engineered Rigid Core Timber with underlay	75 mm 10 kg/m <sup>3</sup> glass wool	$\leq 45$	✓
		None	$\leq 45$	✗
	5.5 mm Sunstar SPC Hybrid Flooring with resilient backing	75 mm 10 kg/m <sup>3</sup> glass wool	$\leq 45$	✓
		None	$\leq 45$	✗
	7 mm Sunstar Maxi Hybrid Flooring with resilient backing	75 mm 10 kg/m <sup>3</sup> glass wool	$\leq 45$	✓
		None	$\leq 45$	✗

<sup>8</sup> Refer to Appendix A for further details

## LIMITATIONS

The opinions are based on the materials as currently manufactured and the construction details set out above.

The opinions are estimates of the in-situ impact sound insulation performance of the nominal floor/ceiling construction in conjunction with the nominated floor covers.

The opinions assume that the floor/ceiling system being evaluated presents the *primary* source of impact sound transmission. Importantly, the opinions assume that in-situ flanking paths are appropriately controlled such that they do not significantly influence the  $L'_{nT,w}$  ratings..

Any variations to the floor/ceiling systems detailed above have the potential to downgrade the impact sound insulation performance. For example, variations such as decreasing any of the ceiling cavity depth, ceiling plasterboard thickness and/or concrete slab thickness, or varying the cavity insulation may result in ratings of  $L'_{nT,w} \geq 45$ .

If performance certainty is required, it is recommended that acoustic tests are undertaken at a suitably qualified testing laboratory.

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Yours faithfully

**MARSHALL DAY ACOUSTICS PTY LTD**



**Liam Kemp**

**Consultant**

## APPENDIX A AAAC STAR RATING SYSTEM

The Association of Australasian Acoustical Consultants (AAAC) has established a star rating system which provides guidance on acoustic criteria and perceived quality for occupants as detailed in *Guideline for Apartment and Townhouse Acoustic Rating Version 1.0* dated June 2017. The star ratings range from 2 star to 6 star, with 6 star ratings reflecting the best levels of acoustic performance.

Figure 1 is an extract from the guideline and details star ratings for floor impact insulation with corresponding  $L_{nT,w}$  values. Refer to item (c) in the figure.

Figure 1: AAAC acoustic star rating summary: inter-tenancy sound insulation criteria

Intertenancy Activities	2 Star	3 Star	4 Star	5 Star	6 Star
<b>(a) Airborne Sound Insulation For Walls And Floors</b>					
Between Separate Tenancies $D_{nT,w} + C_{tr} \geq$	35	40	45	50	55
Between A Lobby/Corridor & Bedroom $D_{nT,w} + C_{tr} \geq$	30	40	40	45	50
Between A Lobby/Corridor & Living Area $D_{nT,w} + C_{tr} \geq$	25	40	40	40	45
<b>(b) Corridor, Foyer To Living Space Via Door(s) <math>D_{nT,w} \geq</math></b>	20	25	30	35	40
<b>(c) Impact Isolation Of Floors</b>					
Between Tenancies $L_{nT,w} \leq$	65	55	50	45	40
Between All Other Spaces & Tenancies $L_{nT,w} \leq$	65	55	50	45	40
<b>(d) Impact Isolation Of Walls</b>					
Between Tenancies	No	Yes	Yes	Yes	Yes
Between Common Areas & Tenancies	No	No	No	Yes	Yes

## APPENDIX B GLOSSARY OF ACOUSTIC TERMINOLOGY

<b>Flanking Transmission</b>	Transmission of sound energy through paths adjacent to the building element being considered. For example, sound may be transmitted around a wall by travelling up into the ceiling space and then down into the adjacent room.
<b>Impact sound</b>	Sound produced by an object impacting directly on a building structure, such as footfall noise or chairs scrapping on a floor.
<b><math>L_{n,w}</math></b>	<u>Weighted, Normalized Impact Sound Pressure Level</u> A single number rating of the impact sound insulation of a floor/ceiling when impacted on by a standard 'tapper' machine. $L_{n,w}$ is measured in a laboratory. The lower the $L_{n,w}$ , the better the acoustic performance.
<b><math>L'_{nT,w}</math></b>	<u>Weighted, Standardised Impact Sound Pressure Level</u> A single number rating of the impact sound insulation of a floor/ceiling when impacted on by a standard 'tapper' machine. $L'_{nT,w}$ is measured on site. The lower the $L'_{nT,w}$ , the better the acoustic performance.
<b>Sound Insulation</b>	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to ability of a material to stop sound travelling through it.