14MM ENGINEERED WOOD FLOORING ON ACOUSTICK-MAT UNDERLAY
IIC OPINION

Rp 007 2016596A | 4 August 2016

84 Symonds Street
PO Box 5811 Wellesley Street
Auckland 1141 New Zealand
T: +64 9 379 7822 F: +64 9 309 3540
www.marshallday.com

Project: **14mm Engineered Wood Flooring on Acoustick-Mat: IIC OPINION**

Prepared for: **Forte Flooring**
3 Keith Place
Pukekohe 2340

Attention: **James Piesse**

Report No.: **Rp 007 2016596A**

Document Control

Status:	Rev:	Comments	Date:	Author:	Reviewer:
Approved			4 Aug 2016	Keith Ballagh	Malcolm Dunn

TABLE OF CONTENTS

1.0 INTRODUCTION

Marshall Day Associates were asked to provide an opinion on the Impact Insulation Class (IIC) rating that would be achieved by Acoustick-Mat underlay beneath 14.2mm Woodline engineered wood flooring. This opinion is based on a laboratory test of the timber and underlay systems on a monolithic test slab which was applied to a variety of concrete floor slabs and ceiling configurations.

2.0 CONSTRUCTION

2.1 Floor covering construction

The floor covering for which the opinion is provided is:

- 14.2mm Woodline engineered multilayer flooring glued to
- Acoustik-Mat underlay glued to the concrete floor slab

The impact performance provided by an underlay system is the results of the combination and interaction of all components. For the predicted results to be accurate, the underlay and all associated products must be installed as undertaken in the laboratory. Adequate perimeter isolation must also be used.

2.2 Cavity Absorption

The cavity absorption referred to in Table 1 is as follows:

- R1.8 Pink Batts, Autex Greenstuff or approved equivalent such as 75 mm thick fibreglass of minimum density 9 kg/m^3.

2.3 Ceiling Construction

The plasterboard ceiling referred to in Table 1 is as follows:

- 10 mm standard Gib®, (minimum 100 mm ceiling cavity), 13 mm standard Gib® or 2 layers of 13 mm standard Gib® as specified (minimum 300 mm ceiling cavity), installed in accordance with manufacturers recommendations.
- USG ScrewFix steel frame suspension system comprising 2.5 mm wire hangers at 1200 mm centres supporting DJ38 strongback channels spaced at 600 mm centres maximum.
- The perimeter of the ceiling is sealed with flexible acoustic sealant such as Gib® Soundseal.

3.0 TEST RESULTS

The floor covering construction described in Section 2.1 was tested by the University of Auckland Acoustic Testing Services.

Figure 1 reproduces the test results from their test report T1635-1.

4.0 OPINION

Table details the expected impact performance of the 14.2mm Woodline engineered multilayer flooring laid on top of the Acoustik-Mat underlay as described in Section 2.0 with various ceiling and floor slab combinations, including whether cavity insulation is installed.

5.0 LIMITATIONS

The above opinion is an estimate of the laboratory performance not the field performance. The estimate is based on the original laboratory tests, the materials as currently manufactured and the construction details set out above. Readers are advised to check that this opinion has not been revised by a later issue. The estimate is expected to be in error by less than 3 IIC/dB.

6.0 INTERPRETATION

6.1 Rating Systems

6.1.1 NZ Building Code

The Impact Insulation Class (IIC) of a floor/ceiling system reflects its ability to prevent impact on its surface from being transmitted as structure-borne vibration and radiating as air-borne noise. Higher IIC ratings indicate that less noise is transmitted to the room below. The existing NZ Building Code requires that new floors have a laboratory rating of IIC 55 or higher. In addition the floor must be constructed to ensure the on-site Field Impact Insulation Class (IIC) is no less than FIIC 50.

6.1.2 Proposed Building Code

The proposed NZ Building Code (G6) requires a Standardised Impact Sound Pressure ($L'_{nT,w}$) of not more than 57 dB between trafficable surfaces in other household units to habitable spaces in a household unit, and a rating of not more than 52 dB between trafficable surfaces in other spaces (e.g. commercial spaces) and habitable spaces in household units. This is a rating for the impact sound measured rather than a floor performance rating. Therefore, the lower the $L'_{nT,w}$ the lower the impact noise and correspondingly the higher the performance of the floor.

The calculation of $L'_{nT,w}$ from a laboratory measurement requires an estimation of room size. The results presented in the table above have been based on a receiving room size of 50 m^3. It should be noted that the figures would not be appropriate for rooms considerably larger or smaller than 50 m^3 and calculation of alternative allowances would be required.

The performance estimates have been made considering only vertical transmission of impact borne sound. It should also be noted that whilst $L'_{nT,w}$ describes a field measurement in this instance, no allowance has been made for on-site flanking transmission and no consideration has been given to horizontal transmission.

6.2 Field Performance

To ensure the on-site measurements are similar to the laboratory results the products must be installed and constructed in a similar way to the laboratory tests and any substitution of materials must be approved by the project's Acoustic Consultant. In addition, potential flanking paths, such as external walls, need to be considered and mitigated against.

Structure-borne vibration is readily transmitted in all directions in concrete flooring substructures. There is often little difference between measured impact noise levels in rooms directly below the source room compared with rooms that are diagonally below. Therefore the impact isolation to rooms other than those directly below the floor area should also be considered.

Where horizontal transmission or flanking is likely to be a concern it is recommended that concrete slabs of no less than 120 mm effective thickness be used. Hard floor surfaces on lightweight concrete floors are likely to require specialist isolation to avoid high levels of impact noise being transmitted to adjacent spaces.

The use of materials other than those referred to in Section 2 or the introduction of additional materials (e.g. underfloor heating), including the lack of any perimeter isolation, can significantly affect the field performance rating (i.e. may result in a failure in accordance with the NZ Building Code). MDA strongly recommend trial performance testing on site before proceeding with full installation.

Figure 1: 14.2mmWoodline Engineered multilayer flooring on Acoustick-Mat underlay

Reduction of impact sound pressure level according to ISO 10140
Laboratory measurements of the reduction of transmitted impact sound by floor coverings on a heavyweight reference floor

Client: Forte Flooring   Manufacturer: Forte Flooring   Date of test: 6-Jul-16
Test rooms: Reverberation Chambers A and B

Description and identification of the test specimen and test arrangement:

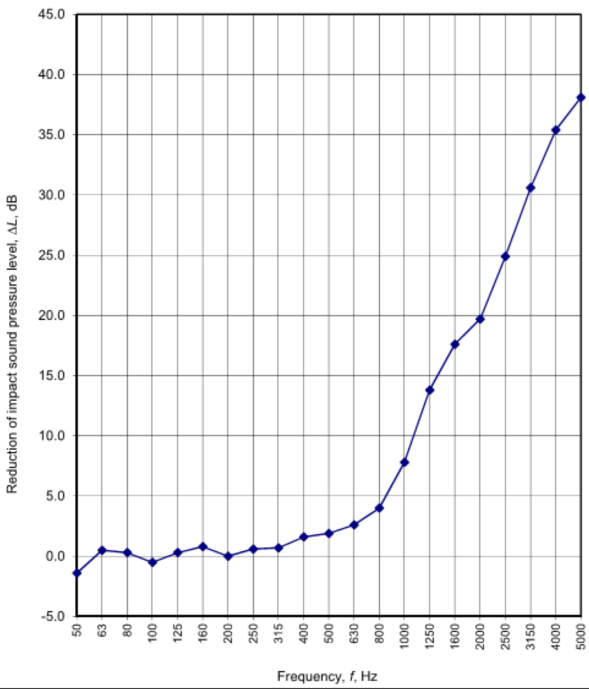
14.2mm Woodline engineered multilayer locking flooring glued to Acoustick-Mat underlay glued to the floor with Handleys Flex set adhesive

Source chamber was Chamber A and receiving chamber was Chamber B . Test specimen installed by the client. Curing time was 0 hours.
Deviation from standard: The bare test floor used is of uniform thickness for an area of only 2.6m x 2.6m. The description of the bare test floor is given in the full report.

Computer Files: : , , , , , : C:\...\T1635-7.CMG, , , , ,

s of specimen per unit area: kg/m^2
Air temp in the test rooms: 15 $^{\circ}$C
Air humidity in test rooms: 60 %
Receiving room volume: 153 m^3

Frequency f Hz	$L_{n,0}$ One-third octave dB	ΔL One-third octave dB
50	50.9	-1.4
63	46.0	0.5
80	53.4	0.3
100	**60.5**	**-0.5**
125	**61.3**	**0.3**
160	**63.6**	**0.8**
200	**64.3**	**0.0**
250	**67.1**	**0.6**
315	**66.0**	**0.7**
400	**65.4**	**1.6**
500	**68.6**	**1.9**
630	**68.7**	**2.6**
800	**67.4**	**4.0**
1000	**68.3**	**7.8**
1250	**69.1**	**13.8**
1600	**68.4**	**17.6**
2000	**69.8**	**19.7**
2500	**70.2**	**24.9**
3150	**69.8**	**30.6**
4000	68.3	35.4
5000	65.3	38.1



Notes: #N/A = Value not available. **Bold** values are used to calculate ΔL_w.
< indicates that the true value is lower.
$L_{n,0}$ are the bare floor impact sound levels.

Rating according to ISO 717-2:

ΔL_w = 13 dB $C_{I,\Delta}$ = 9 dB $C_{I,r}$ = -2 dB $C_{I,50\text{-}2500}$ = -2 dB

These results are based on a test made with an artificial source under laboratory conditions (engineering Method) with the specified reference floor.

No. of test report: **T1635-7**   Name of test institute: University of Auckland Acoustics Testing Service.

Date: 19-July-2016   Signature: **Preliminary Results Only**

Table 1: 14.2mmWoodline Engineered multilayer flooring on Acoustick-Mat underlay - Impact Insulation Prediction

Ceiling		Floor									
		120 mm Hibond (average concrete thickness 90 mm)		75 mm Unispan + 75 mm topping		200 mm Dycore with 65 mm topping		120 mm Stahlton/Interspan (minimum concrete thickness 120 mm on 20 mm timber infills)		90 mm Stahlton/Interspan (minimum concrete thickness 90 mm on 20 mm timber infills)[3]	
Thickness /layers	Cavity Insulation Present?	Impact Insulation Class	$L'_{nT,w}$ (See Note 1)	Impact Insulation Class	$L'_{nT,w}$ (See Note 1)	Impact Insulation Class	$L'_{nT,w}$ (See Note 1)	Impact Insulation Class	$L'_{nT,w}$ (See Note 1)	Impact Insulation Class	$L'_{nT,w}$ (See Note 1)
No plasterboard ceiling	N/A	IIC 35	75 dB	IIC 43	68 dB	IIC 43	67 dB	IIC 40	70 dB	IIC 37	IIC 35
1 x 10 mm plasterboard (100 mm cavity)	No	IIC 42	68 dB	IIC 48	62 dB	IIC 48	62 dB	IIC 46	64 dB	IIC 44	IIC 42
	Yes	IIC 52	57 dB	IIC 57	52 dB	IIC 57	51 dB	IIC 56	53 dB	IIC 55	IIC 52
1 x 13 mm plasterboard (200 mm cavity)	No	IIC 46	64 dB	IIC 53	57 dB	IIC 53	57 dB	IIC 51	59 dB	IIC 48	IIC 46
	Yes	IIC 56	54 dB	IIC 62	48 dB	IIC 63	47 dB	IIC 60	50 dB	IIC 58	IIC 56
2 x 13 mm plasterboard (200 mm cavity)	No	IIC 50	60 dB	IIC 57	53 dB	IIC 56	53 dB	IIC 54	55 dB	IIC 52	IIC 50
	Yes	IIC 57	53 dB	IIC 64	46 dB	IIC 65	46 dB	IIC 62	48 dB	IIC 59	IIC 57

1. The $L'_{nT,w}$ has been calculated based on a receiving room volume of 50 m^3. No allowance has been made for on-site flanking transmission
2. Refer to Section 2.0 for construction information in relation to Table 1 above
3. A floor slab of less than 120 mm average concrete thickness is not recommended where horizontal transmission is a concern
4. Results are highlighted in blue where compliance with the current requirements of the New Zealand Building Code Clause G6 is achieved

APPENDIX A GLOSSARY OF TERMINOLOGY

Sound Insulation	Provision of a degree of acoustical separation between two spaces such that sound is reduced in travelling between the two spaces.
Impact sound	Sound produced by an object impacting directly on a building structure, such as footfall noise or chairs scrapping on a floor.
Flanking Transmission	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.
Structure-Borne Transmission	The transmission of sound from one space to another through the structure of a building.
Impact Insulation Class (IIC)	A single number system for quantifying the transmission loss due to impact noise produced by a standard "Tapper Machine" through a building element.
FIIC	The 'field' or in situ measurement of Impact Insulation Class. Building tolerances and flanking noise have an effect on the performance of a partition when it is actually installed, which result in FIIC values lower than the laboratory derived IIC values, typically 5 dB less.
$L_{n,w}$	Weighted, Normalized Impact Sound Pressure Level 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.
$L'_{nT,w}$	Weighted, Standardised Impact Sound Pressure Level 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.
C_i	An impact sound insulation adjustment for footfall noise. Commonly used with $L_{n,w}$ and $L'_{nT,w}$. This term is used to provide information about the acoustic performance at different frequencies, as part of a single number rating system.