MARSHALL DAY Acoustics

12MM TIMBER FLOORING ON ACOUSTICK-MAT UNDERLAY IMPACT SOUND OPINION

Rp 001 20230465 | 27 July 2023

84 Symonds Street
PO Box 5811
Victoria Street West
Auckland 1142 New Zealand
T: +64 9 379 7822 F: +64 9 309 3540
www.marshallday.com

Project: **12mm Timber Flooring on Acoustick-Mat: IIC Opinion**

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

Attention: **Jonas Piesse**

Report No.: **Rp 001 20230465**

Disclaimer

Reports produced by Marshall Day Acoustics Limited are based on a specific scope, conditions and limitations, as agreed between Marshall Day Acoustics and the Client. Information and/or report(s) prepared by Marshall Day Acoustics may not be suitable for uses other than the specific project. No parties other than the Client should use any information and/or report(s) without first conferring with Marshall Day Acoustics.

The advice given herein is for acoustic purposes only. Relevant authorities and experts should be consulted with regard to compliance with regulations or requirements governing areas other than acoustics.

Copyright

The concepts and information contained in this document are the property of Marshall Day Acoustics Limited. Use or copying of this document in whole or in part without the written permission of Marshall Day Acoustics constitutes an infringement of copyright. Information shall not be assigned to a third party without prior consent.

Document Control

Status:	Rev:	Comments	Date:	Author:	Reviewer:
Approved			27 July 2023	Raditya Putra	Malcolm Dunn

TABLE OF CONTENTS

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

1.0 INTRODUCTION

Marshall Day Acoustics were asked to provide an opinion on the Impact Sound Insulation (IIC) rating that would be achieved by Acoustick-Mat underlay below 12mm timber flooring by Forté.

This opinion is based on previous laboratory tests conducted of a 14.2mm and 21mm timber flooring on Acoustick-Mat underlay on a monolithic test slab. Based on these test results, we provide concrete floor slab and ceiling configurations to achieve Building Code requirements with the 12mm timber flooring.

2.0 CONSTRUCTIONS

2.1 Floor Covering Construction

The floor covering for which the opinion is provided is:

- 12mm timber flooring by Forté, glued to
- Acoustick-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 including, but not limited to, the underlay adhesive. 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 9.6 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 200 mm ceiling cavity), installed in accordance with manufacturers recommendations.
- Supported on one of the following ceiling suspension systems:
    - USG Boral ScrewFix® steel frame suspension system comprising 2.5 mm wire hangers at 1200 mm centres supporting DJ38 strongback channels spaces at 1200 mm centres and FC37 furring channels spaced at 600 mm centres maximum.
    - Rondo KEY-LOCK® system comprising wire hangers at 1200 mm supporting 127 Top Cross Rails at 1200mm centres and 129 Furring Channels and **STSU Furring Channel Clips** at 600mm centres
    - Rondo KEY-LOCK® system: comprising wire hangers incorporating **WHI Green Resilient Hanger** Element at 1200 mm supporting 127 Top Cross Rails at 1200mm centres and 129 Furring Channels at 600mm centres
- The perimeter of the ceiling is sealed with flexible acoustic sealant such as Gib® Soundseal.

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

3.0 TEST RESULTS

The floor covering constructions described in Section 1.0 was tested by the University of Auckland Acoustic Testing Service (Test Report: T1635-7 dated 19 July 2016 and T1635-8 dated 19 July 2016).

Figure 1 and Figure 2 reproduces the test results.

4.0 OPINION

Table 1 details the expected impact sound insulation performance of the 12mm timber flooring laid on top of the Acoustick-Mat underlay system as described in Section 2.1, for a range of ceiling and floor slab combinations, including whether cavity absorption is installed.

For typical concrete floor slabs with an average thickness of 120mm and 150mm, one of the following ceiling constructions is expected to achieve Building Code requirements:

- 13mm standard plasterboard with 200mm cavity and insulation in the cavity
- 10mm standard plasterboard with 100mm cavity and insulation in the cavity

The opinion only applies to the 12mm timber flooring product installed on a concrete sub-floor. For applications above a timber joist or cross laminated timber floor structure, we recommend contacting a suitably qualified acoustic consultant.

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 STC/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 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 (FIIC) is no less than FIIC 50.

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.

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

The use of materials other than those referred to in Section 2.0 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). We strongly recommend trial performance testing on site before proceeding with full installation.

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

Figure 1: 14.2mm Woodline 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, , , , ,

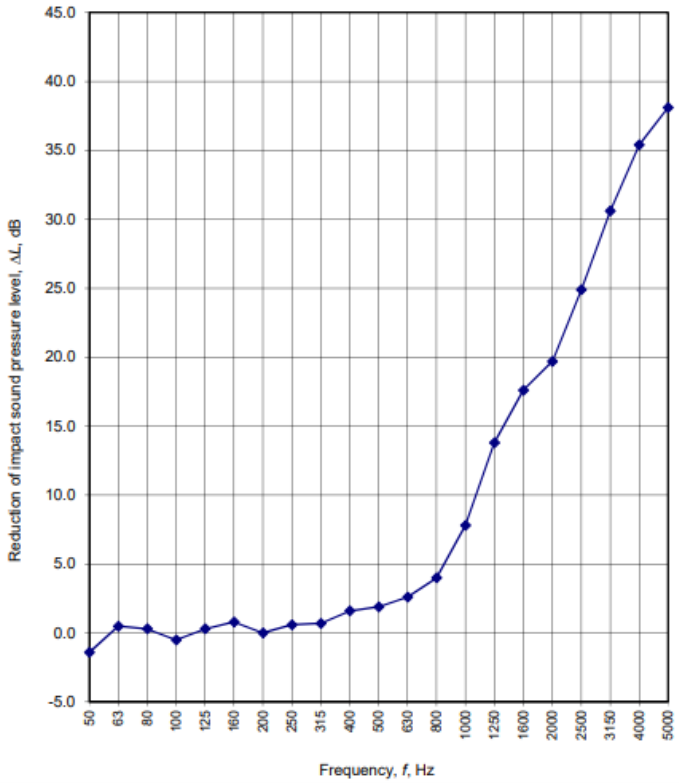
s of specimen per unit area: kg/m^2

Air temp in the test rooms: 15 °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**

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

Figure 2: 21mm Ultra 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: 7-Jul-16

Test rooms: Reverberation Chambers A and B

Description and identification of the test specimen and test arrangement:

21mm Ultra Engineered multilayer T&G 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: : T1631, , , , , : C:\...\T1635-8.CMG, , , , ,

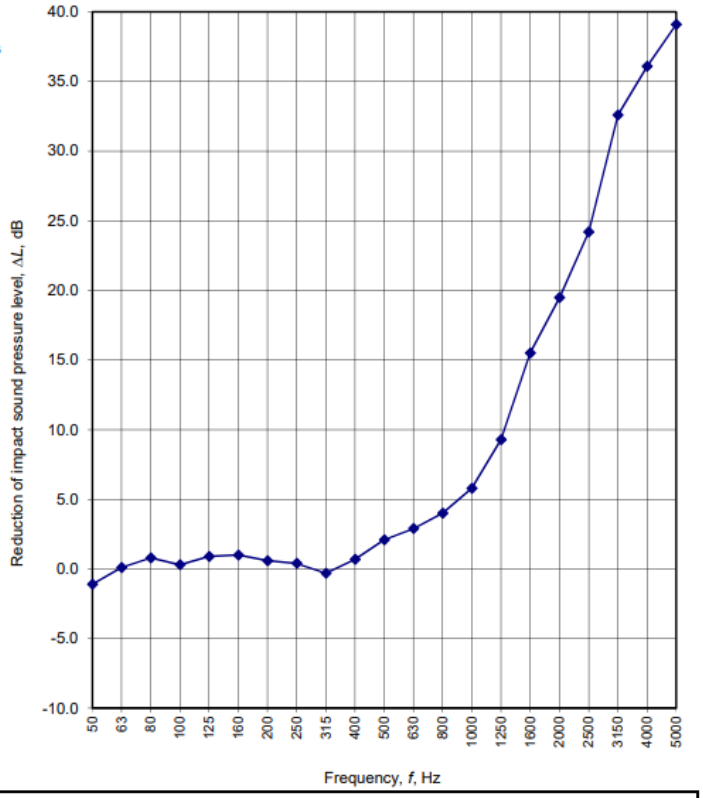
s of specimen per unit area: kg/m^2

Air temp in the test rooms: 15 °C

Air humidity in test rooms: 61 %

Receiving room volume: 153 m^3

Frequency *f* Hz	$L_{n,0}$ One-third octave dB	ΔL One-third octave dB
50	50.9	-1.1
63	46.0	0.1
80	53.4	0.8
100	**60.5**	**0.3**
125	**61.3**	**0.9**
160	**63.6**	**1.0**
200	**64.3**	**0.6**
250	**67.1**	**0.4**
315	**66.0**	**-0.3**
400	**65.4**	**0.7**
500	**68.6**	**2.1**
630	**68.7**	**2.9**
800	**67.4**	**4.0**
1000	**68.3**	**5.8**
1250	**69.1**	**9.3**
1600	**68.4**	**15.5**
2000	**69.8**	**19.5**
2500	**70.2**	**24.2**
3150	**69.8**	**32.6**
4000	68.3	36.1
5000	65.3	39.1



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 $C_{I,\Delta}$ = 10 dB $C_{I,r}$ = -2 dB $C_{I,50\text{-}2500}$ = -1 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: **T1635-8** Name of test institute: University of Auckland Acoustics Testing Service.

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

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

Table 1: 12mm timber flooring on Acoustick-Mat underlay – Impact Insulation Prediction

Ceiling		Floor Average Concrete Thickness (Refer to **Table 2** for construction options)		
		90 mm[(1)]	120 mm	150 mm
Thickness /layers	Cavity Absorption Present?	Impact Insulation Class	Impact Insulation Class	Impact Insulation Class
No plasterboard ceiling	N/A	IIC 35	IIC 40	IIC 43
1 x 10 mm plasterboard (100 mm cavity)	No	IIC 42	IIC 46	IIC 48
	Yes	IIC 52	IIC 56	IIC 57
1 x 13 mm plasterboard (200 mm cavity)	No	IIC 46	IIC 51	IIC 53
	Yes	IIC 56	IIC 60	IIC 62
2 x 13 mm plasterboard (200 mm cavity)	No	IIC 50	IIC 54	IIC 57
	Yes	IIC 57	IIC 62	IIC 64

1 A floor slab of less than 120 mm is not recommended where horizontal transmission is a concern.

2 Where the New Zealand Building Code sound insulation requirements are achieved, the results are highlighted in blue.

3 Performances have been calculated using INSUL version 9.0.7

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

Table 2: Floor systems equating to average concrete thickness (ACT)

Floor Type	ACT	Construction
Rib and Infill	90 mm	Rib and Infill flooring system with 90 mm concrete topping
	120 mm	Rib and Infill flooring system with 120 mm concrete topping
	150 mm	Rib and Infill flooring system with 150 mm concrete topping
Double Tee	90 mm	Double Tee with 50 mm flange and 40 mm topping
	120 mm	Double Tee with 50 mm flange and 70 mm topping
	150 mm	Double Tee with 50 mm flange and 100 mm topping
Comflor 60	90 mm	125 mm overall thickness
	120 mm	155 mm overall thickness
	150 mm	185 mm overall thickness
Comflor 80	90 mm	140 mm overall thickness
	120 mm	170 mm overall thickness
	150 mm	200 mm overall thickness
Traydec	90 mm	90 mm overall thickness
	120 mm	120 mm overall thickness
	150 mm	150 mm overall thickness
Unispan	90 mm	90 mm overall thickness
	120 mm	120 mm overall thickness
	150 mm	150 mm overall thickness
ACT Average Concrete Thickness		
Surface mass of 90 mm ACT:	211 kg/m^2	
Surface mass of 120 mm ACT:	281 kg/m^2	
Surface mass of 150 mm ACT:	251 kg/m^2	

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited

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.
IIC	Impact Insulation Class 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.

This document may not be reproduced in full or in part without the written consent of Marshall Day Acoustics Limited