MARSHALL DAY Acoustics

FLOOR SOLUTIONS UTILISING INTEGRA PANELS

Rp 001 R01 20170530 | 14 August 2017

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Project: **FLOOR SOLUTIONS UTILISING INTEGRA 75mm PANELS**

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Report No.: **Rp 001 R01 20170530**

Document Control

Status:	Rev:	Comments	Date:	Author:	Reviewer:
DRAFT			11 Aug 2017	R Hay	
Approved	R01	Particle board comparison	14 Aug 2017	R Hay	R Blakelock

EXECUTIVE SUMMARY

At the request of Resene Constructions Systems (Resene), Marshall Day Acoustics (MDA) has undertaken a review of laboratory tests for various floor and ceiling construction systems utilising Integra lightweight concrete panels.

With the appropriate selection of floor coverings and acoustic underlays it is possible to achieve or exceed the New Zealand Building Code (NZBC) G6 sound insulation criteria of STC 55 and IIC 55 using Integra flooring panels. This requires a ceiling consisting of either one or two layers of 13 mm high-density plasterboard (such as Gib Noiseline) fixed to furring channels suspended from GIB Rondo STWC/ST001 or equivalent resilient clips.

We note that due to noise flanking through the building structure, we recommend floors are discontinuous beneath inter-tenancy walls. Where floors are not discontinuous beneath inter-tenancy walls, Batten & Cradle or a similar floor isolation system approved by MDA must be used to control noise flanking.

We have provided a summary comparison of the sound insulation performance of the basic Integra constructions considered against the equivalent construction using flooring particle board.

TABLE OF CONTENTS

1.0 INTRODUCTION

Marshall Day Acoustics (MDA) has been engaged by Resene Construction Systems (Resene) to provide advice regarding the upgrade or modification of several floor constructions utilising 75mm Integra floor panels. The aim is to achieve the New Zealand Building Code (NZBC) G6 performance criteria of STC 55 and IIC 55 required for inter-tenancy floor systems.

Our opinion is based on theoretical models for the sound transmission properties of double panel floors (Insul v9.0.4).

A glossary of acoustical terms used in this report is provided in Appendix A.

2.0 FLOOR SYSTEMS

Resene provided MDA with a series of laboratory test reports prepared by the University of Auckland's Auckland Uniservices Ltd (Uniservices). These were:

- T1608-1a, 28th October 2016;
- T1608-1i, 28th October 2016;
- T1608-2i, 28th October 2016;
- T1608-3i, 28th October 2016;
- T1608-4i, 28th October 2016; and
- T1608-6i, 28th October 2016

Construction systems used in these reports, and any proposed modifications are described below.

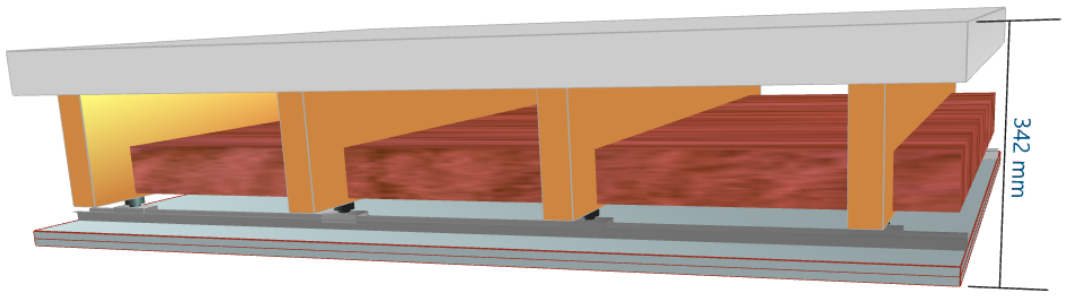
2.1 Integra Floor, 2x 13mm Gib Noiseline Ceiling

This floor/ceiling system is described in the Uniservices test report T1608-3i. The construction can be summarised as:

- Integra T&G floor panel, 75mm;
- Floor framing 190x45mm timber joists at 450mm centres;
- Pink Batts[1] to cavity; and
- 2 x 13mm Gib Noiseline on 28mm furring channel in ST001 resilient clips.

This construction is shown in Figure 1.

Figure 1: Integra Floor, 2x 13mm Gib Noiseline Ceiling.



[1] The Pink Batts silencer (mid floor) specified in the test report can be replaced with any fibrous thermal insulation with an value of at least R1.8.

Under laboratory test conditions this construction achieves a **measured impact sound insulation performance of IIC 47**. The NZBC G6 requirement is IIC55 for a design and FIIC 50 in a building. Laboratory tests are expected to achieve the design specification as flanking paths and construction defects are tightly controlled. This result indicates that either the design requires further modification, or a suitable floor covering is required to increase the impact sound insulation.

Using Insul 9.0.4 the **predicted airborne sound insulation achieved is STC 56**. This achieves the required NZBC G6 specification of STC 55.

2.1.1 Improvements to impact sound insulation performance

Continuous intertenancy floors

Where the floor system is continuous beneath inter-tenancy walls, we recommend that a floating floor system such as Batten & Cradle, or an equivalent approved by MDA be used. The subfloor resting on top of the battens may be flooring grade particle board, OSB, plywood, compressed fibre cement sheet or Secura. Any floor covering including carpet, floating or glue down timber (solid or engineered), vinyl or tiles may be used without further treatment. Cavity insulation and edge details?

Discontinuous intertenancy floors

Where the floor system is discontinuous beneath intertenancy walls, Batten & Cradle systems may still be used as described above. In addition, medium to heavy carpet on good quality underlay will also prove a satisfactory improvement in impact sound insulation. Hard floor finishes will require a compatible underlay system that achieves a cumulative performance of ΔL_w 10 or better. This is not an onerous requirement, but as underlay performance varies with manufacturer, differing styles of floor finish (tile, timber, vinyl etc) and installation (glued or floating), it is important to make a selection based on the specific proposed floor finish/underlay combination.

Uniservices test report T1608-4i demonstrates that with 15mm Oak timber flooring loose laid above 6mm cork glued to the Integra panels a measured impact sound insulation performance of IIC 55 can be achieved.

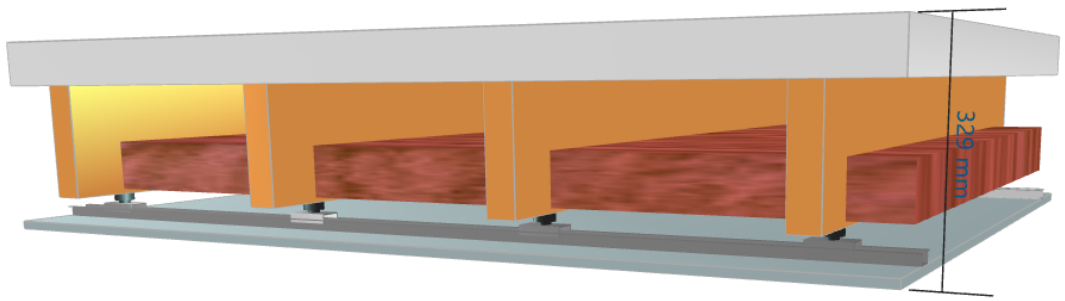
2.2 Integra Floor, 1x 13mm Gib Noiseline Ceiling

This floor/ceiling system is described in the Uniservices test report T1608-2i. The construction can be summarised as:

- Integra T&G floor panel, 75mm;
- Floor framing 190x45mm timber joists at 450mm centres;
- Pink Batts to cavity; and
- 1 x 13mm Gib Noiseline on 28mm furring channel in ST001 resilient clips.

This construction is shown in Figure 2.

Figure 2: Integra Floor, 1x 13mm Gib Noiseline Ceiling.



Under the laboratory test conditions this construction achieves a **measured impact sound insulation performance of IIC 46**. The NZBC G6 requirement is IIC 55 for a design and FIIC 50 in a building. Laboratory tests are expected to achieve the design specification as flanking paths and construction defects are tightly controlled. This result indicates that either the design requires further modification, or a suitable floor covering is required to increase the impact sound insulation.

Using Insul 9.0.4 the **predicted airborne sound insulation achieved is STC 54**. This does not achieve the required NZBC G6 specification of STC 55. The design can be modified to give the construction in Section 2.1 above, by the addition of a second layer of Gib to the ceiling. Alternatively, additional flooring panels such as particle board, plywood, Secura or fibre cement can be added above the Integra panel to achieve compliance.

2.2.1 Improvements to impact sound insulation performance

Continuous intertenancy floors

Where the floor system is continuous beneath inter-tenancy walls, we recommend that only a floating floor system such as Batten & Cradle, or an equivalent approved by MDA be used. The subfloor resting on the battens may be flooring grade particle board, OSB, plywood, compressed fibre cement sheet or Secura. Any floor covering including carpet, floating or glue down timber (solid or engineered), vinyl or tiles may be used without further treatment.

Discontinuous intertenancy floors

Where the floor system is discontinuous beneath intertenancy walls, Batten and Cradle systems may still be used as described above. In addition, medium to heavy carpet on good quality underlay will also prove satisfactory. Hard floor finishes will require a compatible underlay system that will achieve a ΔL_w 10 or better[2]. This is not an onerous requirement, but as different underlays perform differently with differing styles of floor finish (tile, timber, vinyl etc) and installation (glued or floating), it is important to make a selection based on the specific proposed floor finish.

3.0 COMPARISON WITH FLOORING PARTICLE BOARD

The unmodified construction systems tested by Uniservices and described above in Sections 2.1, 2.2 and 2.3 have been compared against the equivalent construction using flooring particle board[3] substituted for Integra panel. The results are summarised in Table 1.

Table 1: Comparison of Integra and Flooring particle board for selected constructions.

Construction	Integra		Flooring Particle Board	
	STC	IIC	STC	IIC
2 x 13mm Gib Noiseline on 28mm furring channel in ST001 resilient clips.	56	47	61	56
1 x 13mm Gib Noiseline on 28mm furring channel in ST001 resilient clips.	54	46	56	52

[2] Where additional flooring panels have been utilised, some reduction in ΔL_w can be achieved. However, the specific floor panel selected must be known to determine this reduction.

[3] Assumes minimum 18 mm thick panels of minimum density 660 kg/m^3.

APPENDIX A GLOSSARY OF TERMINOLOGY

Sound Insulation	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.
Transmission Loss (TL)	The attenuation of sound pressure brought about by a building construction. Transmission loss is specified at each octave or one third octave frequency band.
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.
STC	Sound Transmission Class A single number system for quantifying the transmission loss through a building element. STC is based upon typical speech and domestic noises, and thus is most applicable to these areas. STC of a building element is measured in approved testing laboratories under ideal conditions.
FSTC	The 'field' or in situ measurement of Sound Transmission Class. Building tolerances and flanking noise have an effect on the performance of a partition when it is actually installed, which result in FSTC values lower than the laboratory derived STC values, typically 5 dB less.
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.