RED STAG® TIMBERLAB

CLT

Cross Laminated Timber

Acoustic Floor System

Batten&Cradle™ Flooring Systems

October 2022

Laminex™
NEW ZEALAND

strandfloor®

CONTENTS

1. Background

B&C Systems International Ltd. and Red Stag TimberLab in conjunction with Laminex New Zealand™ have developed a lightweight CLT floor system that is suitable for high density residential, commercial, educational and healthcare applications when designing intertenancy floors. As per Clause G6 'Airborne and Impact sound' to the New Zealand Building Code (NZBC), the Sound Transmission Class (STC) and the Impact Insulation Class (IIC) for intertenancy floors shall be no less than 55. This acoustic flooring system has been tested and verified to achieve the fire ratings up to 60/60/60 FRR and STC 65/IIC-56. The acoustic performance exceeds the minimum requirements of Clause-G6 of the NZBC. The acoustic performance of the system has been designed with input from Norman Disney & Young & independently tested at Auckland University.

When utilising this system, acoustic performance can be achieved with no reliance on carpet or acoustic underlay, especially if hardwood flooring or tiles were used.

CLT is a high-performance mass wood product that is generated by utilising graded boards, which are glued together in a cross-layered (each layer orientated 90 degrees to each other) orientation. Red Stag TimberLab CLT is manufactured from New Zealand renewable FSC certified forestry, typically in three layers, with a common thickness of 126 mm to achieve the structural requirements for the majority of sub and mid floors.

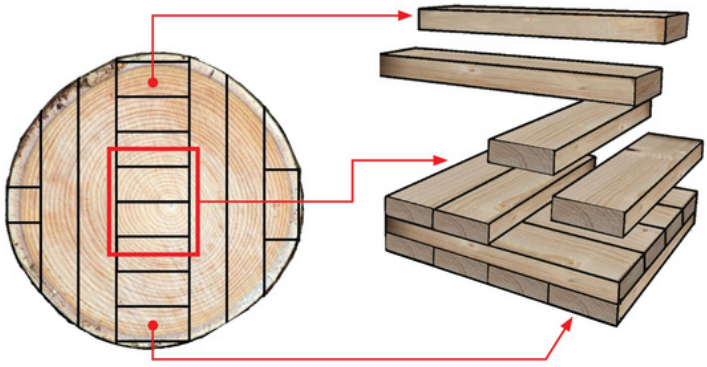
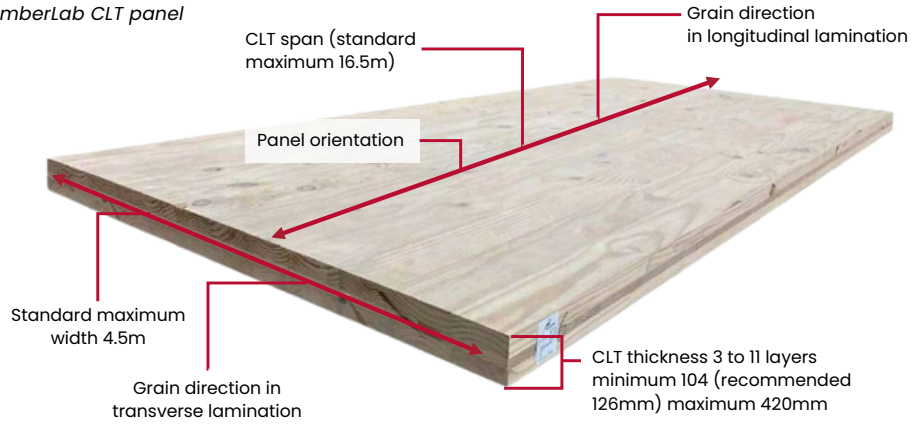


Figure 1.1: *CLT board arrangement*

The benefits of CLT include, design flexibility and versatility, reduced installation time, lightweight, sound structural properties, engineered seismic performance, along with a fire resistance level of 60/60/60. CLT is a cost-effective option when compared with concrete and steel and is a significant sequester of carbon, making it an environmentally friendly solution.

Figure 1.2: *Red Stag TimberLab CLT panel*



2. Scope

This literature has been developed to provide an acoustic and fire solution for inter-tenancy applications and/or where a higher level of acoustic performance is preferred. The solutions contained in this literature cover structural CLT (cross laminated timber) together with either Strandfloor®H3.1 Tongue and Groove, Strandfloor® Tongue and Groove or SuperPine® Tongue and Groove as the second layer.

This acoustic system can be applied for use in applications including most domestic and commercial buildings including residential apartments and offices where live loading does not exceed 4.0 kPa and/or 2.7 kN. Where live loading exceeds these parameters, Specific Engineering Design (SED) is required.

Red Stag TimberLab produces a combination of panels, beams, and columns to enable the majority of mass timber construction solutions. Typically, Red Stag TimberLab elements are produced using at least three layers. CLT elements have layers arranged at right angles to one another, and GLT has all layers running in the same direction. Hybrid options also exist for band beams, where one or both faces have multiple layers of GLT sandwiching CLT layers. Red Stag TimberLab can manufacture some of the largest CLT elements in the world, with panels up to 16.5 m x 4.5 m x 0.42 m (Length x Width x Depth). Red Stag TimberLab can manufacture GLT up to ~17.0 m x ~3.0 m x 0.43 m. More information available in the Red Stag TimberLab Design Guide.

3. Product: Strandfloor® Types

Strandfloor® Tongue & Groove

- Strandfloor® Tongue & Groove consists of 20mm nominally thick high density reconstituted wood panels, specifically marketed as flooring.
- This product has a polypropylene white tongue to one long edge, and a groove to the other.
- When correctly installed this gives the required shear strength and eliminates the need for timber nogs.
- There is a range of two panel sizes particularly designed for common joists centres.

*Panel dimensions**

	Panel sizes mm	Weight (kg) per m2	Weight (kg) per panel
Tongue & Groove	3600 x 1200 x 20 2400 x 1200 x 20	13.6 13.6	58.8 39.2

StrandfloorH3.1® Tongue & Groove

- StrandfloorH3.1® Tongue & Groove consists of 20mm nominally thick high density reconstituted wood panels, specifically marketed for uses in wet areas
- It is identical to StrandfloorH3.1® Square Edge but has the addition of a polypropylene green tongue to one long edge and a groove to the other.
- When correctly installed this gives the required shear strength and eliminates the need for timber nogs (except in wet areas – refer to section 5 installation).
- There are three panel sizes to choose from.

*Panel dimensions**

	Panel sizes mm	Weight (kg) per m2	Weight (kg) per panel
H3.1 Tongue & Groove	3600 x 1200 x 20 2400 x 1200 x 20	13.6 13.6	58.8 39.2

Strandfloor® & SuperPine® characteristic properties

Shear strength

Product	Property	Parallel	Perpendicular
Strandfloor®	Shear Strength	7.2 MPa	6.45 MPa

Product: Superpine® Type

Superpine® Tongue & Groove

*Panel dimensions**	Panel sizes mm	Weight (kg) per m2	Weight (kg) per panel
Tongue & Groove	3600 x 1200 x 20 2400 x 1200 x 20	13.8 13.8	60 40

Panel tolerances	
Length	+/- 1.5mm
Width	+/- 1.5mm
Thickness	+/- 0.2mm
Panel edge straightness	</=1mm/m on width </=2mm/m on length.
Panel squareness	The requirement is </=0.5mm/m. Diagonal of a 2400 is 2683, so the requirement is <1.25 for a 2400. Diagonal of a 3600 is 3795, so the requirement is <1.75 for a 3600.

**All dimensions provided are approximate only and subject to manufacturing tolerances.*

Accessories:

Accessories not supplied by Laminex New Zealand™.

Laminex New Zealand™ recommends the following products for use in conjunction with its flooring products.

- Backing Rod – PEF backing rod to be used with sealant in control joints.
- Sealant – Sealant used in V joint in tiled applications, ensure the sealant is compatible with the waterproofing membrane system selected.
- Level/straight edge – For checking straightness of underlying flooring.
- Waterproofing membrane – Used over the StrandfloorH3.1® Tongue and Groove panel in wet areas. Use the recommended products and applications.
- Adhesive – Adhesive used over joists prior to installation of Laminex New Zealand™ Strandfloor®
- Screws for timber
  - 8g x 45mm wood thread self embedding screws.
  - Simpson Strong Tie 50 x 10 gauge Screw (SSTWSV50SA).
  - Simpson Strong Tie 50 x 10 gauge Stainless Steel screw (SSWSC2BSA10).
- Screws for steel – 8-10g x 40-45mm wingtek min. class 3 coating.

Laminex New Zealand™ does not supply these products and does not provide a warranty for their use. Please contact the component manufacturer for information on their warranties and further information on their products.

4. Durability

Laminex New Zealand™

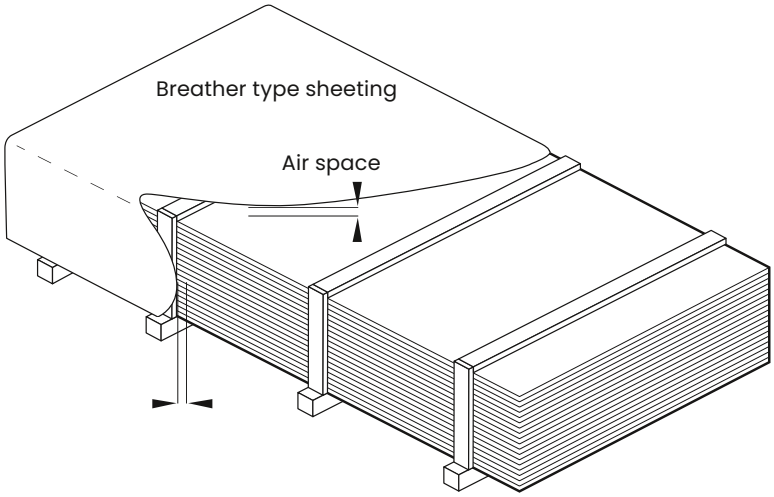
Refer to laminex.co.nz for details of Strandfloor® and SuperPine® Producer Statements.

When stored, handled, installed and maintained in accordance with this document, Strandfloor® and SuperPine® panels will meet the durability performance requirements of NZBC B2.3.1 (a) for 50 years.

The specifications, details and methods described herein shall be strictly observed to avoid building code non-compliance. Laminex New Zealand™ will not be liable to any person if the conditions as to storage, handling, installation and maintenance of Strandfloor® and SuperPine® panels as outlined within this document are not complied with.

Note: *StrandfloorH3.1® Tongue & Groove panels have been treated to resist attack by insects such as borer.*

Figure 4.1



Red Stag TimberLab

Red Stag TimberLab's durability statement covers Red Stag TimberLab CLT and GLT installed in the following locations as defined in NZS 3602:2003 Table 1A as updated by the New Zealand Building Code (NZBC) B2/AS1 amendment 10 to meet a 50 year durability performance:

- Where not exposed to weather or ground atmosphere, but with a risk of moisture penetration conducive to decay (Ref 1D14, exterior walls).
- Where not exposed to weather or ground atmosphere and in dry conditions (Ref 1E2 midfloors and ceilings, 1E5 internal walls, 1E7 interior flooring).

Please refer to the Red Stag TimberLab Durability Statement (Section 7) found in the Red Stag TimberLab Project Guide 20220809.

Durability conditions

To ensure the durability of the Strandfloor®, the following conditions are required to be complied with.

Handling and Storage

- Panels shall be stored and handled so as to minimise surface and edge damage.
- Wherever possible panels shall be stored inside under cover. Outside storage shall be for short periods only. Panels shall not be stacked on wet concrete floors.
- The panels shall be flat stacked clear of the ground, on evenly placed, full width, level bearers. Bearers shall be of uniform thickness and shall extend across the full width of the stack.
- When stored in external situations, panels shall be protected from the weather. A breather-type cover shall be used, supported clear of the top sides of the panels using battens to allow air to circulate freely around the pack.

Wet areas

StrandfloorH3.1® Tongue and Groove
Wet areas shall comply with NZBC E3 / AS1 or E3 / AS2. In "wet areas" panels shall be protected with a suitable wet area membrane or an integrally waterproof sheet material. Refer to the Strandfloor® Technical Manual, Section 9: Finishing – 9.3 Wet areas.

Strandfloor® Tongue and Groove / SuperPine® Tongue and Groove
As a general rule, Strandfloor® Tongue and Groove or SuperPine® Tongue and Groove can be used in kitchens and laundries. For more information, refer to the respective Technical Manual of each product. These can be downloaded at laminex.co.nz

Heat

- Panels shall be separated from fuel burning appliances, flues and chimneys in accordance with NZCB Section C AS/1.
- Panels shall not be subjected to temperatures exceeding 50°C for a prolonged period.

Prohibited uses

- Panels shall not be used in covered exterior situations with no weather protection e.g. open verandas.
- Once installed and in use, panels shall not be subjected to conditions that will allow the continuing moisture content to be above 16%.

5. Installation

Mass timber buildings are constructed using a natural resource, configured as an EWP. Products that exist under the umbrella of mass timber include CLT and GLT. Mass timber elements (including beams, columns, and panels) require specifically designed assembly and connection details. Whilst this guide cannot account for all the various permutations of assembly and connection detailing on a project (as they are often unique), it does provide some general advice regarding the connection and assembly of mass timber elements. More information available in the Red Stag TimberLab Project Guide.

Strandfloor® Tongue and Groove / SuperPine® Tongue and Groove second layer – Batten & Cradle™ Flooring System

- Position the acoustic cradles on the floor starting from one edge of the room. The cradles allow the placement of Batten & Cradle™ flooring structural battens.
- Acoustic cradles must be placed at 450mm centres maximum along the length of Batten, and Batten rows at 400mm centres. Minimum requirements are 7 cradles/m2 of the floor area (refer figure 5.2).
- Acoustic Cradles and structural battens are placed along the perimeter of the room with a 10mm gap from the internal lining (refer figures 5.1 and 5.5).
- Place the structural battens into the Acoustic cradle. The maximum spacing between the Batten & Cradle™ structural battens must not exceed 400mm centres. The battens can run in either direction of the room.
- Acoustic insulation 50mm thick (density 9.6kg/m3) must be placed in between the batten and cradles to create a damping effect (refer figure 5.3).
- Lay Strandfloor®, StrandfloorH3.1® Tongue & Groove / SuperPine® Tongue & Groove across the batten and fix to the battens using a 45mm x 8g self-tapping steel screws. Fixing centres are 150mm for sheet perimeter and 200mm centre of sheet (intermediate area) (refer figure 5.6).
- The long sheet edges are to be butted together to form a tight tongue and groove joint (refer figure 5.4).
- Allow a 5-8mm gap between the Strandfloor® or SuperPine® Tongue and Groove and the wall lining around the perimeter. The gap is filled sealed with acoustic sealant (refer figures 5.4 & 5.5).
- Gluing of Strandfloor® Tongue and Groove panels to structural battens is not mandatory.

StrandfloorH3.1® Tongue and Groove / Strandfloor® Tongue and Groove | Residential / Retail / Commercial (office) Spans and Loadings	
Batten row centres	400mm
Cradle centres	450mm
Standard Batten size mm	42mm x 40mm (other sizes available on request)
Uniform loads (kPa)	4.0
Concentrated loads (kN)	3.6

SuperPine® Tongue and Groove | Residential Spans and Loadings	
Batten row centres	400mm
Cradle centres	450mm
Standard Batten size mm	42mm x 40mm (other sizes available on request)
Uniform loads (kPa)	1.5
Concentrated loads (kN)	1.8

Figure 5.0: *Cross section*

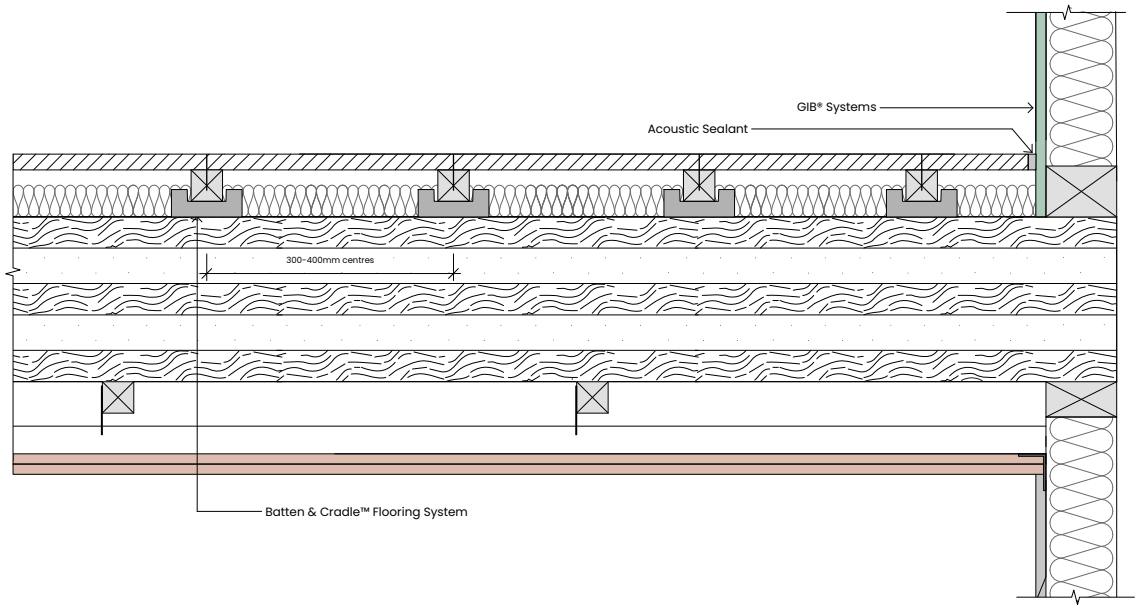


Figure 5.1: *CLT layer*

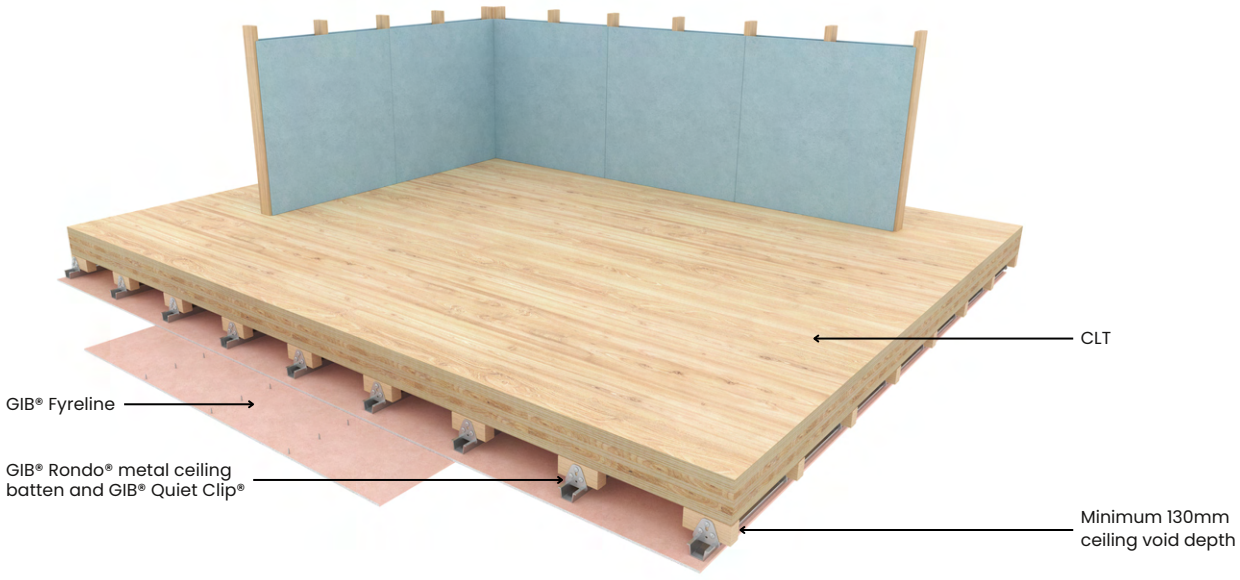


Figure 5.2: *Batten & Cradle™ Flooring System set up*

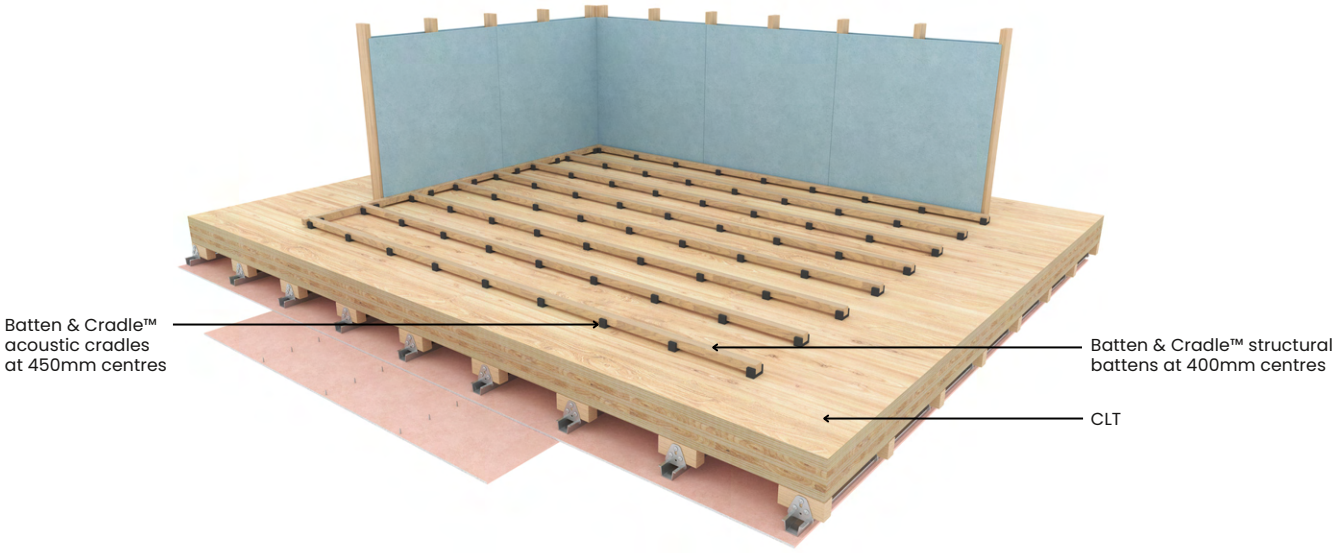


Figure 5.3: *75mm thick insulation, density of 9.6kgs/m3 minimum*

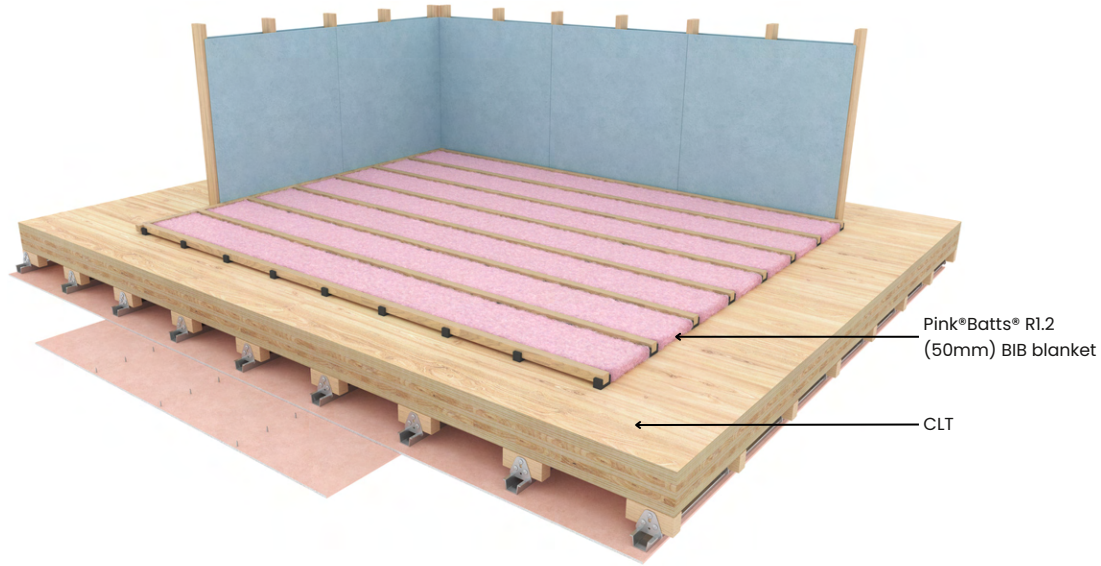


Figure 5.4: *Strandfloor® / SuperPine® installation*

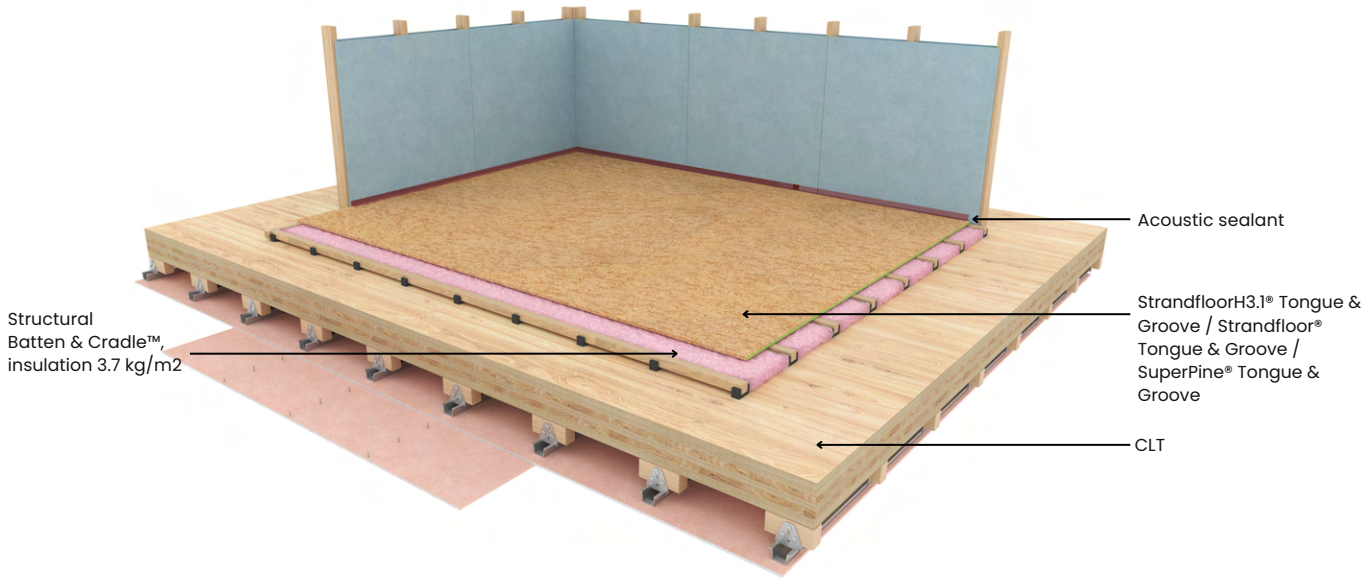
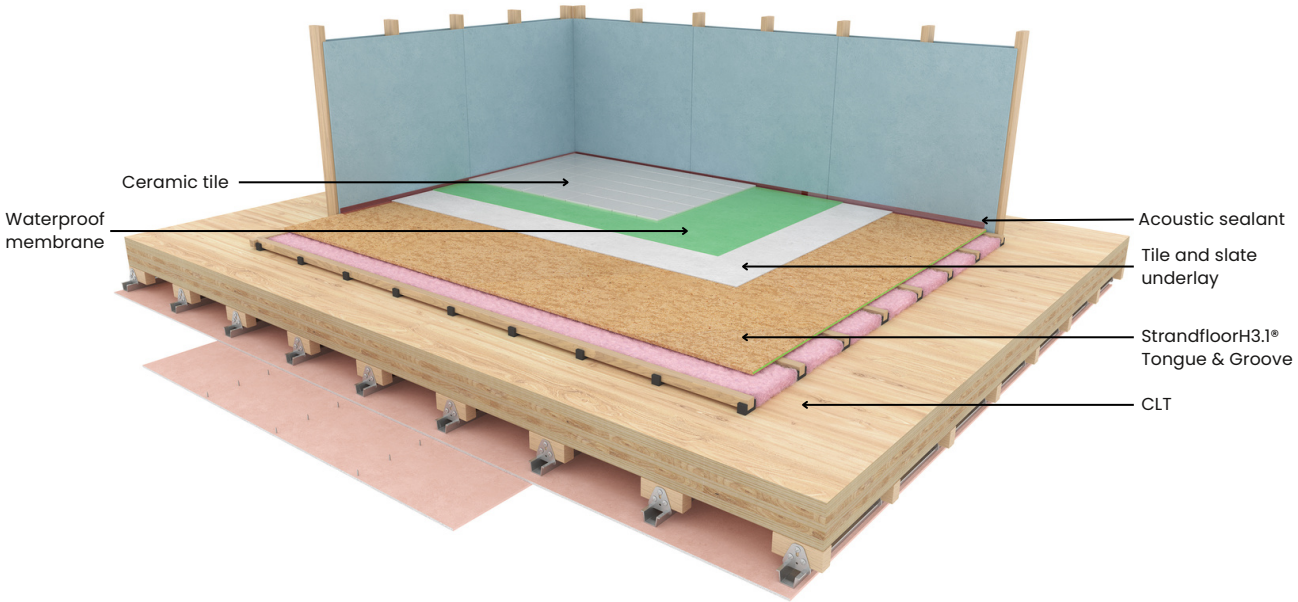


Figure 5.5: *Strandfloor® wet area*



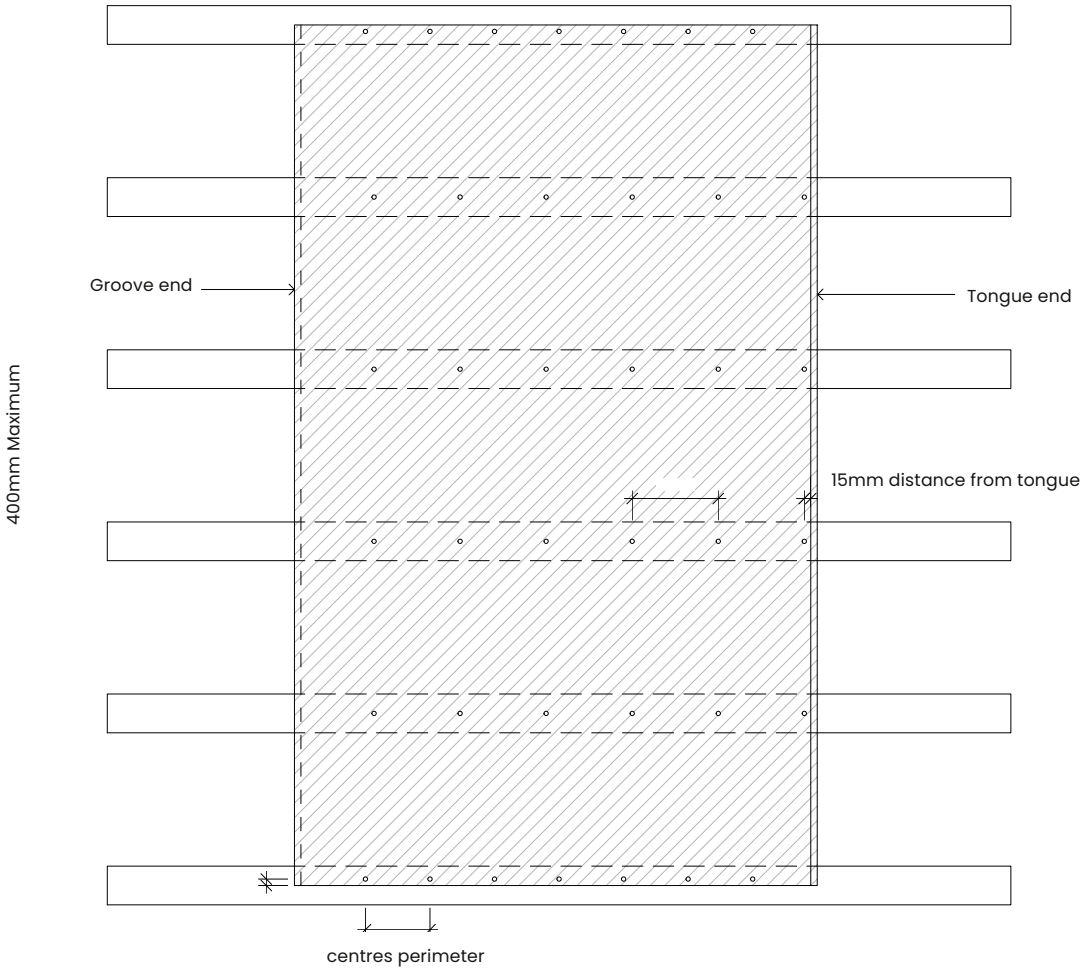
Wet areas

For installation of StrandfloorH3.1® Tongue & Groove in wet areas follow details as described in 5.1 above, and if rigid floor coverings (e.g. ceramic tile), are being installed please follow details below:

- A suitable tile & slate fibre cement sheet underlay and the application of an appropriate waterproof membrane shall be installed over the Strandfloor®H3.1 Tongue & Groove prior to installation of rigid floor coverings, such as ceramic tile (refer to figure 5.4 & 5.5).
- In wet areas, Strandfloor®H3.1 Tongue & Groove panels shall be covered with a floor covering or finish that is impervious(i.e. does not allow the passage of moisture).

While Acceptable Solution E3/AS1 provides a list of impervious surface finishes that meet the requirements of the NZBC, Laminex New Zealand™ believe that the laying of an appropriate (1) wet area membrane in accordance with the Code of Practice for Internal Wet Area Membranes prior to the installation of any decorative surface, is best practice to ensure the Strandfloor® H3.1 Tongue & Groove will remain dry for the life of the structure. Refer to NZBC / AS2.

***Figure 5.6**: Fixing detail*



Shower tray detail

Please refer to the Laminex New Zealand™ Strandfloor® Technical Manual section 9.3 for further wet area installation details.

Allproof stainless steel shower tray details

Refer figures 5.7 & 5.8

Figure 5.7: *Tile over with hob*

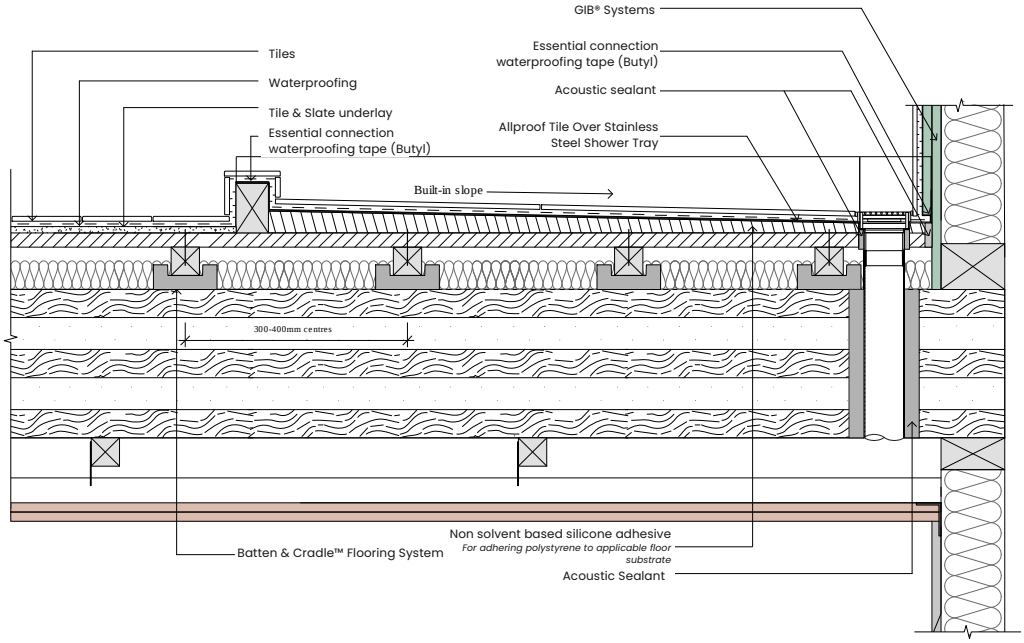
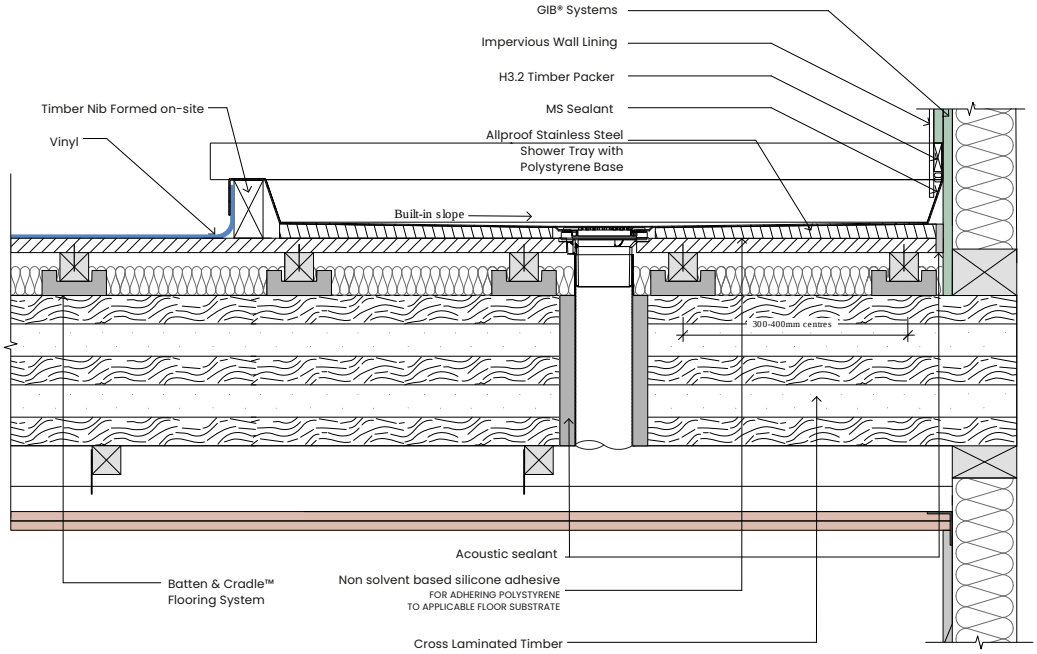


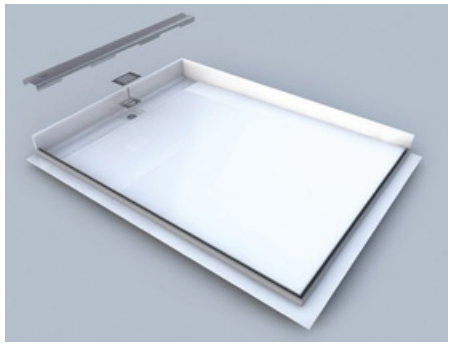
Figure 5.8: *Stainless tray*



Atlantis level entry shower tray detail

Atlantis have developed a level entry shower base system which provides a solution for a waterproof join at the shower base and Strandfloor® junction.

This allows for the installation of rigid floor covering, such as ceramic tiles and other impervious floor coverings where level entry is desired.



Atlantis Linea Quattro Tiled Channel Drain Shower System

- 100% waterproof, structurally solid preformed FRP base.
- 100mm high upstand from the floor and 65mm waterproofing flange at front of the tray for secure waterproofing connection.
- Factory-fitted glass receiver channels on base.
- Includes new aquaPLANE™ waste for optimal drainage.
- Over 60 Standard sizes available.

Contact Atlantis for details: Call 0800 428 526 or visit www.atlantis.net.nz

Figure 5.9

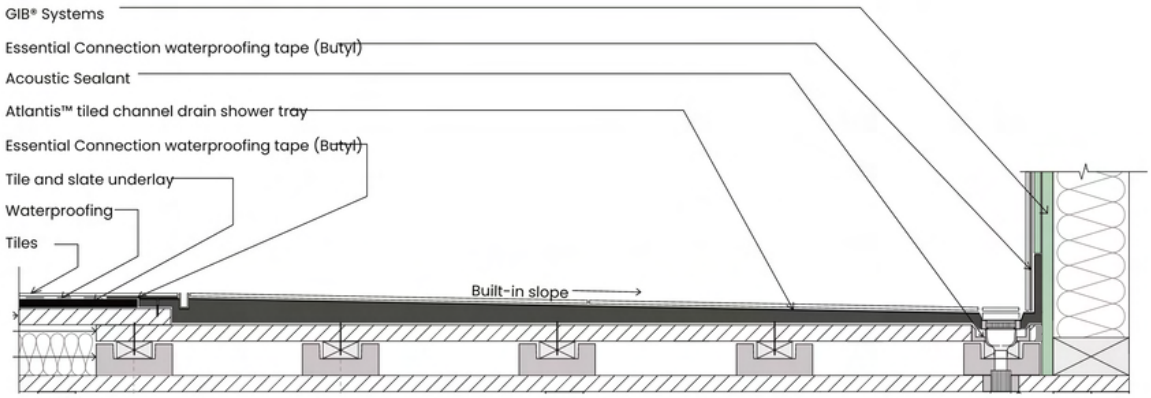
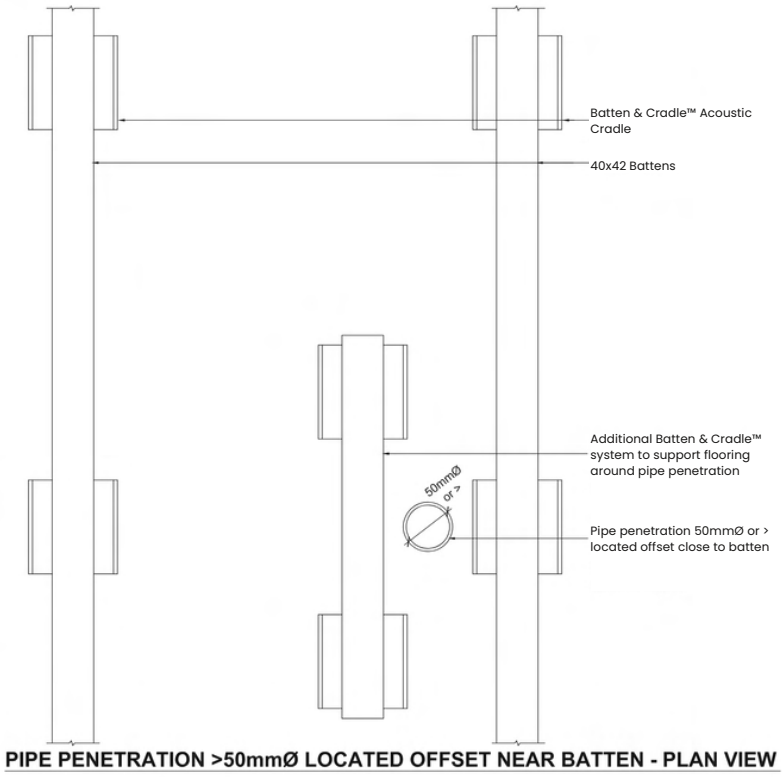


Figure 5.10: Pipe Penetration Details – Structural Support



Ceiling installation

The installation of the GIB® Quiet Clip®, GIB® Rondo® metal ceiling batten and 2 x 13mm GIB® Fyreline® is as per the information published by Winstone Wallboards Limited. Refer to GIB® Noise Control® Systems technical specification for information regarding their installation.

Floor penetrations

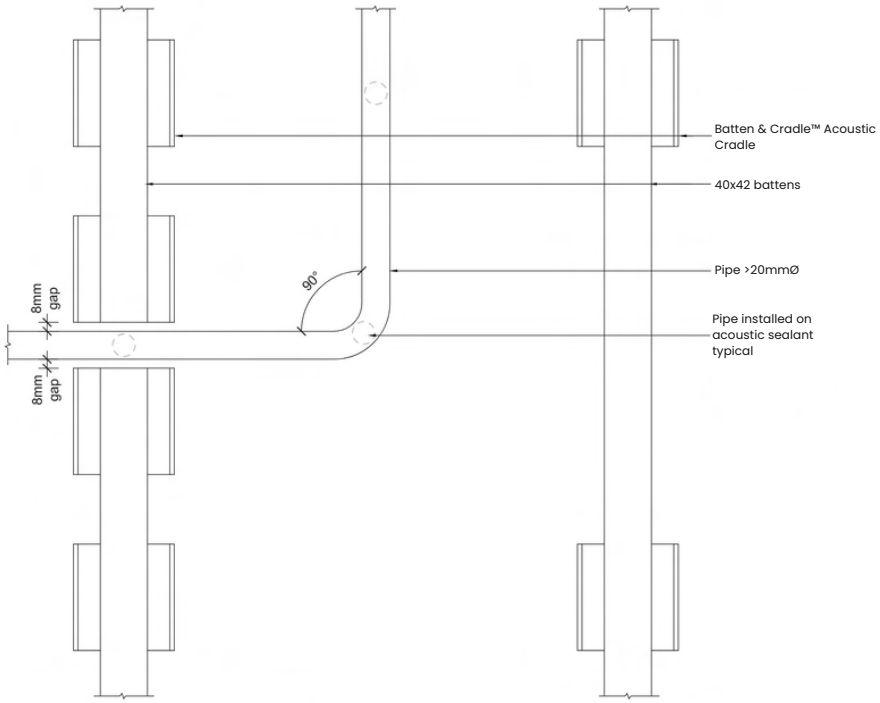
For smooth clean cut circular holes:

- For pipe penetrations through the floor cut a 10mm oversize hole through the CLT. Fit the pipe through the penetration and then seal around with an acoustic sealant.

For irregular holes:

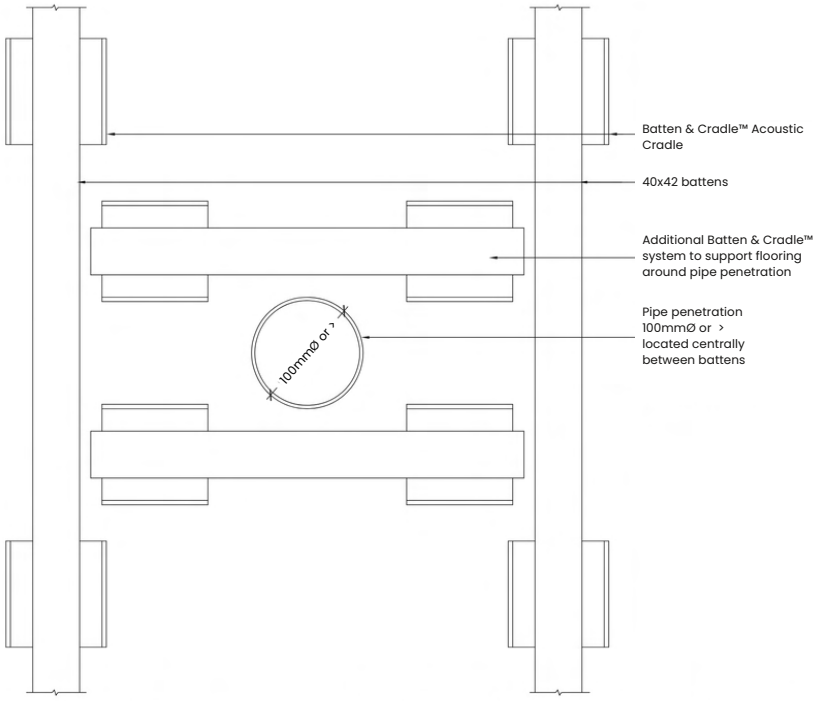
- Use of a jigsaw or reciprocating saw.
- Small rectangle or circular holes can be cut by drilling a series of small holes around the perimeter of the hole then tapping out the waste from the sheet face.

Figure 5.11



PIPE >20mmØ - PLAN VIEW

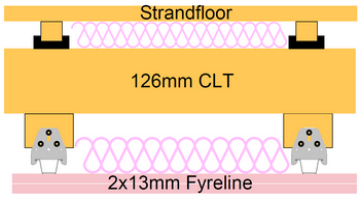
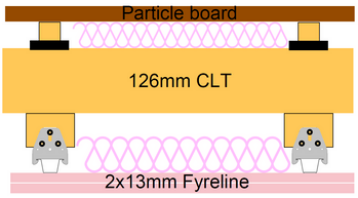
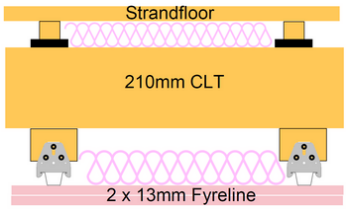
Figure 5.12



PIPE PENETRATION >100mmØ LOCATED CENTRALLY - PLAN VIEW

6. Performance Data

Laboratory measurement of the impact insulation of the floor system. Performance data tested at the University of Auckland.

Diagram	Type	Test Result		Test No.
	Airborne	STC 67	R_w 67 R_w+C_{tr} 51	T2210-4a
	Impact	IIC 56	$L_{n,w}$ 50	T2210-4i
	Airborne	STC 65	R_w 66 R_w+C_{tr} 51	T2210-5a
	Impact	IIC 55	$L_{n,w}$ 51	T2210-5i
	Airborne	STC 66	R_w 69 R_w+C_{tr} 57	T2210-12a
	Impact	IIC 60	$L_{n,w}$ 46	T2210-12i

Flooring: 1 layer of 20mm Laminex™ Superpine® MR Particleboard screw fixed at 200mm centres to 42mm (H) x 40mm (W) LVL battens. Battens spaced at 400mm centres seated in Batten & Cradle™ acoustic cradles spaced at 450mm centres.

Insulation: 50mm thick R1.2 Pink Batts fibreglass insulation.

Mid Floor: 126mm thick Red Stag TimberLab CL3/126 Cross Laminated Timber (CLT) flooring comprising 2 panels lap jointed through centre. CLT screw fixed along lap joint at 200mm centres and sealed around perimeter only.

Insulation: 90mm thick R2.2 Pink Batts fiberglass insulation

Linings: 2 layers of 13mm GIB® Fyreline plasterboard screw fixed to 35mm Rondo furring channels spaced at 600mm centres in GIB® Quiet clips spaces at 1200mm centres. GIB® Quiet clips screw fixed to custom timber mounts screw fixed to the CLT panel (total ceiling cavity depth: 130mm).

7. Health & Safety

Working conditions

- Health and Safety precautions shall be taken when working with wood panel products.
- Exposure to wood dust and/or formaldehyde may cause irritation to eyes, respiratory system and skin, and may cause sensation resulting in asthma, and by skin contact resulting in dermatitis.
- Wood dust is classified as a known carcinogen. Repeated inhalation of wood dust over many years may cause cancer. Formaldehyde is classified as a known carcinogen.
- Storage areas containing large quantities of Strandfloor® and SuperPine® shall be adequately ventilated.
- Work areas shall be well ventilated and kept clean.
- Sawing, sanding and machining equipment shall be fitted with dust extractors to ensure that dust levels are kept within standards laid down by Occupational Health and Safety New Zealand, Worksafe Australia or the specific country of use. If not, a dust mask conforming to AS/NZS 1715 and AS/NZS 1716 and eye protection conforming with AS/NZS 1337 shall be worn.
- Offcuts, shavings and dust shall be disposed of in a manner that avoids the generation of dust and in accordance with the requirements of local waste authorities.
- In end use applications all product surfaces exposed to occupied space shall be sealed.

Working outdoors

- Make sure you work in a well ventilated area.
- Position cutting station so wind will blow dust away from yourself and others in the working area.
- When sawing, sanding, rebating, drilling or machining wood panels, always:
  - Wear your P1 or P2 mask (correctly fitted in accordance with manufacturers' instructions).
  - Wear safety glasses.
  - Wear hearing protection.
  - When others are close by ask them to do the same.

If concerns still exists about exposure levels or you do not comply with the above practices, you should always consult a qualified industrial hygienist.

Formaldehyde

Control

When installed, emission levels can be controlled by room ventilation and covering of the surface. The surface shall be sealed or covered with a coating system or alternatively, with a floor covering such as foam-backed carpet, carpet with rubber underlay, sheet vinyl or ceramic tiles.
Sealing or covering of the surface shall be carried out before the building is occupied.

Safe working practices

- Never use a power saw in a poorly ventilated area.
- Always use M class extractor unit as a minimum.
- Always use an approved sharp sawblade when cutting wood panels.
- Always follow tool manufacturers' safety recommendations.
- Always wear an approved properly-fitted approved dust mask (P1 or P2).

8. Product Warranty

Batten and Cradle™ Flooring system

Refer to Batten and Cradle product warranty available at:
https://www.battenandcradle.co.nz/warranties

Red Stag TimberLab

Refer to Red Stag TimberLab product warranty available at:
https://redstag.co.nz/wp-content/uploads/2022/07/Red-Stag-CLT-Design-Guide-V1.1-20220721-Final-Compressed.pdf

GIB®

Refer to the GIB® Product and System Warranty -
https://www.gib.co.nz/about-winstone-wallboards/warranty/

Laminex New Zealand™

For product warranties, refer to:
Strandfloor® : https://www.laminex.co.nz/search?text=strandfloor+warranty
SuperPine® : https://www.laminex.co.nz/search?text=superpine+warranty

Ongoing maintenance

The occupier or owner, throughout the life of the building, shall maintain the following specific area.

Floor coverings - wet areas

- Floor coverings in wet areas, shall be maintained to ensure water cannot penetrate through to the Strandfloor® H3.1. To ensure long-term performance of the flooring, the surface protection system shall be repaired at any sign of damage.
- Floor wastes shall remain unobstructed and drain to the outside of the building.

Floor coverings - dry areas

- Other floor coverings and coatings shall be maintained to ensure the Strandfloor® T&G / SuperPine® T&G surface is protected.

9. References & Sources of Information

- Red Stag TimberLab - Red Stag CLT design guide v1.1
- Red Stag Project Guide 20220809
- New Zealand Building Code (NZBC)
- CHH Plywood technical notes - downloadable from www.ecoply.co.nz
- Futurebuild® LVL Durability Statement downloadable from www.futurebuild.co.nz
- designIT® for houses software package – downloadable from www.chhsoftware.co.nz
- NZS 3603:1993 "Timber Structures Standard"
- NZS 3604:2011 "Timber Framed Buildings"
- AS/NZS 1170:2011 "Structural design actions"
- AS/NZS 2269:2012 "Plywood Structural"
- Secura™ Interior Flooring, Installation Manual February 2013
- Laminex™ New Zealand Strandfloor® Technical Manual - refer to laminex.co.nz for latest edition
- Laminex™ New Zealand SuperPine® Technical Manual - refer to laminex.co.nz for latest edition
- GIB® Noise Control Systems, Specification and installation manual, CBI5113, September 2017
- Batten and Cradle™ flooring systems, Specifiers Guide Version 4, April 2017
- Laboratory measurement of airborne and impact insulation of an acoustic flooring system. Test ID: T1962-1
- Laboratory measurement of airborne and impact insulation of an acoustic flooring system. Test ID: T1962-2
- Laboratory measurement of airborne and impact insulation of an acoustic flooring system. Test ID: T1962-4
- Regulatory information report - penetrations through Red Stag TimberLab CLT floor and wall system
- Report no. FAS210260 Rev: R1R1.1 Issue date 5 April 2022 expiry date: 28 Feb 2027
- Norman Disney & Young Acoustics www.ndy.com/service/acoustics

10. Limitations

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We recommend that a qualified acoustic consultant is engaged on every application to specify the most suitable solution.

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