

FLOORING

STRUCTAflor[®]

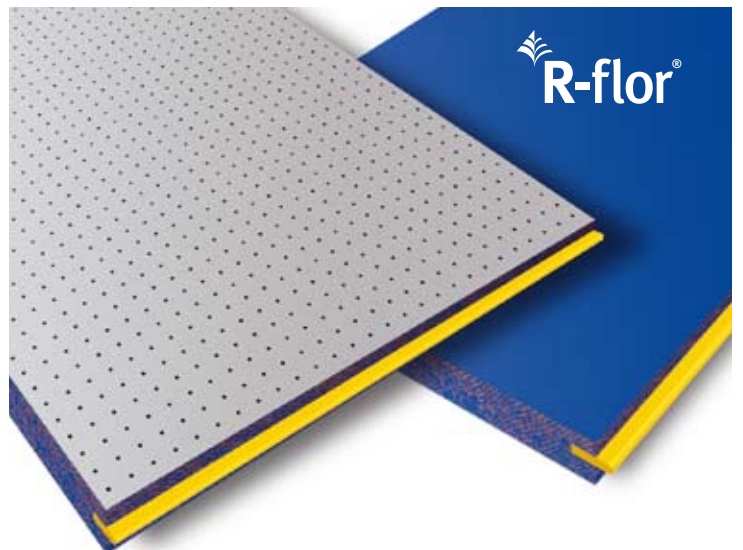


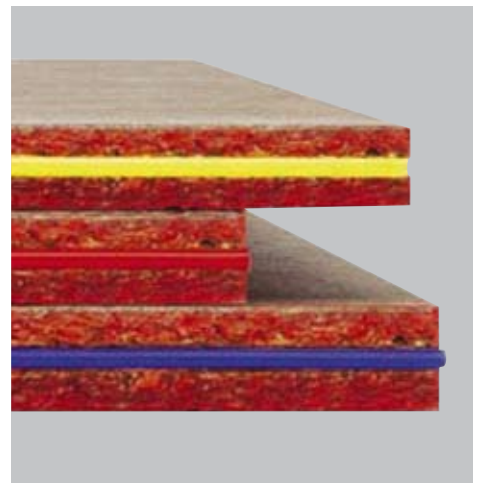
Installation and Design Manual

STRUCTAflor
TERMINATOR[®]

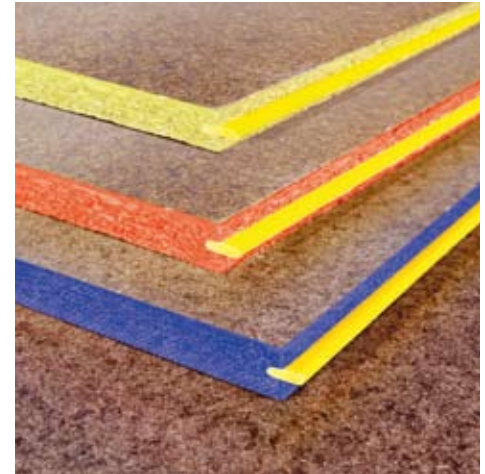


R-flor[®]





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In the building business, your reputation's only as good as the materials you use. That's why when it comes to structural particleboard flooring, you need a product you can trust and a partner you can rely on to keep pace with ever-changing lifestyle and construction requirements.

Our Leading Brands

STRUCTAflor® Particleboard Flooring, Terminator® Termite Protected Particleboard Flooring and R-flor® Radiant Barrier Flooring offer a practical, flexible and cost effective choice when building your new home or extension. With an extensive range of options, they are ideal for: sub-floors, suspended floors in multi-storey construction, additions and extensions and commercial flooring; as well as a host of building applications.

With over 25 years of reliable performance, STRUCTAflor is still the leading product in its class. The proven performance of STRUCTAflor, STRUCTAflor Terminator and R-flor makes them the clear choice in flooring for more builders. And just as they were the first product of their kind on the market, they continue to lead the way in innovation and development of flooring solutions.

25 Years of Trust

After 25 years of dedicated production and innovation, Carter Holt Harvey STRUCTAflor and STRUCTAflor Terminator remain the number one choice of the majority of Australian builders.

Market Leader

When it comes to flooring, Carter Holt Harvey are both experts and innovators. Carter Holt Harvey pioneered the market with **STRUCTAflor, STRUCTAflor Terminator** termite-protected particleboard flooring and **R-flor** Radiant Barrier particleboard flooring.

Practical and Versatile

The simplicity of lightweight floor framing systems means that carpenters can construct a common residential sub-floor in as little as eight to ten hours; with reported savings of up to tens of thousands of dollars per house, largely by saving on excavation, retaining walls and sub-soil drainage that would be required for slab on ground when the site is sloping.

With scarcity of conventional flat building sites, the standard answer of a concrete slab on ground just won't work when the building block becomes steep.

Limitations on cut and fill have been put in place by some local councils concerned at the scarring of the landscape, loss of trees and vegetation and problems with overland storm water flow.

More and more builders are coming to recognise the advantages of **STRUCTAflor, STRUCTAflor Terminator** and **R-flor** which do not stop at sloping sites, but are equally of benefit on flat sites. Homeowners enjoy the advantage of having useful underfloor space that can be used for storage.

NOTE:
Particleboard flooring is not to be used in weather exposed applications or with under-carpet heating.

Leading Brands

STRUCTAflor YELLOWtongue is still by far the number one product in its class, YELLOWtongue's proven reliability and durability makes it the clear choice in flooring for more builders.

STRUCTAflor, STRUCTAflor Terminator and R-flor are available in a range of products and easily recognised by their well known YELLOWtongue, REDtongue and BLUEtongue particleboard flooring tongue joining strips.



The following information provides a guide to the applications, properties and features of the full product range. It also details the appropriate installation systems for STRUCTAflor and STRUCTAflor Terminator.

The Facts That Matter

- Proven performance**
 - Tried and proven building material
 - Strong and reliable
 - Has stood the test of time
 - Contractor familiarity
 - Efficient site construction
- Easy to install**
 - Easily installed in new or existing homes
 - Provides an ideal working platform during construction
- Provides design flexibility**
 - Can easily accommodate future alterations or additions
- Great for all floor coverings**
 - STRUCTAflor provides the ideal surface for all floor coverings including vinyl, ceramic, quarry, slate, parquet and carpet
 - Ideal as a timber subfloor base under decorative timber flooring or over a concrete slab
- Ideal for sloping sites**
 - Less site disruption
 - Reduced site preparation costs compared to having to create a level area for a concrete slab – cut and fill earthworks and soil retaining structures
- Suspended (ground) floors keep you high and dry**
 - Being off the ground, suspended flooring systems are less affected by water seepage
 - Ideal for flood prone areas
- Underfloor subfloor space**
 - Ideal storage area and ideal hiding spot for unsightly water storage tanks
 - Timber subfloors provide access to the underfloor – which makes for easier inspection, maintenance and modifications



STRUCTAflor Range

STRUCTAflor, STRUCTAflor Terminator and R-flor are structural grade particleboard sheet flooring products, manufactured in Australia to comply with the requirements for Particleboard Flooring, Class 1, in AS/NZS 1860.1, Particleboard Flooring. STRUCTAflor TERMINATOR and R-flor are termite protected sheet flooring that provides added protection against termite attack.

Product Description

Designed to provide a total flooring concept, STRUCTAflor, STRUCTAflor Terminator and R-flor are particularly suited to platform construction where the floor is laid prior to the erection of walls. They are made from precision milled wood flakes and bonded with moisture resistant synthetic resin. For additional protection during construction and exposure to weather, the upper surface is resin enriched and all edges of the tongue and grooved sheets are coated.

STRUCTAflor, STRUCTAflor Terminator and R-flor are sanded on the underside for thickness control and accurate edge profiling. Factory grooved long edges are fitted one side with a distinctive, colour-coded rigid Polypropylene (PP) tongue to ensure a neat, tight fit for adjoining panels.

STRUCTAflor, STRUCTAflor Terminator and R-flor are available in YELLOWtongue, REDtongue and BLUEtongue tongue colours. The tongue and grooved sheets are supplied in easy-to-handle 600mm or 900mm widths. Large 3600mm x 1800mm sheets of square edge STRUCTAflor and STRUCTAflor Terminator product are also available. This comprehensive product range allows the selection of flooring to meet specific needs. The products provide total compatibility and cover large areas fast.

YELLOWtongue®

An interior all-purpose flooring for use primarily in residential buildings and designed for both platform and fitted flooring construction methods. YELLOWtongue will support imposed loads for general areas in houses as required by AS/NZS 1170.1-2002. Permanent, imposed and other actions. At 19mm thick, the maximum joist centres for YELLOWtongue STRUCTAflor, STRUCTAflor Terminator, and R-flor is 450mm for general residential applications.

REDtongue®

REDtongue is a thicker all-purpose flooring for larger joist spacings or higher load capacity. At 22mm thick the maximum joist centres for REDtongue STRUCTAflor, STRUCTAflor Terminator, and R-flor is 600mm for general residential applications.

BLUEtongue® – Heavy Duty

A 25mm thick particleboard flooring specifically for residential, commercial, industrial and institutional buildings. Subject to span and deflection limits, STRUCTAflor may be used over various floor joist spacings to support a wide range of concentrated and uniformly distributed loads.

Floor loads will depend on the nature of occupancy and floor use. Refer AS/NZS 1170.1. When used over floor joists at 450mm maximum centres, 25mm thick BLUEtongue will support live loads in excess of 10kPa uniformly distributed and 4.0kN concentrated.

In some circumstances, alternative fixing methods to those in this publication may be necessary.



STRUCTAflor

STRUCTAflor GP – General Purpose particleboard sheet flooring, manufactured in Australia to comply with the requirements for Particleboard Flooring, Class 1, in AS/NZS 1860.1, Particleboard flooring.

STRUCTAflor®



Made in Australia



With over 25 years of dedicated production and innovation, STRUCTAflor remains the number one choice of the majority of Australian builders – making it the most trusted brand in particleboard flooring.

With its unique hard wearing resin enriched surface, yellow edge coating on the PP tongued variants – It is ‘the’ quality floor for every Australian Home.

STRUCTAflor is available in YELLOWtongue, REDtongue, BLUEtongue and Square Edge variants.

R-flor Radiant Barrier Flooring

R-flor radiant barrier flooring is a particleboard flooring with a foil laminated on the underside of the flooring board. It has a low emittance (high reflectance) metallised foil surface which significantly reduces the radiative heat transfer across a suspended timber floor. The subfloor air space delivers an improvement in the “Total R-Value” of the flooring system.

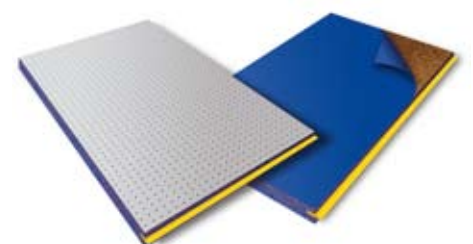
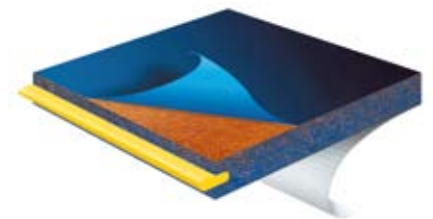
R-flor incorporates a termiticide for added protection against termites and is easily identified by its blue edge coat.

STRUCTAflor Terminator

A termite protected sheet flooring that provides added protection against termite attack. It should be used in conjunction with the normal precautions against termite attack which include adequate sub-floor ventilation and the provision of physical or chemical barriers to AS 3660.1 Termite Management – New Building Work.

STRUCTAflor Terminator is also safe to use and environmentally friendly and is easily identified by its red edge coat.

R-flor®



TERMINATOR®

Size Coverage	STRUCTAflor		Terminator		R-flor	
	900 x 3600mm 3.24m ²	600 x 3600mm 2.16m ²	900 x 3600mm 3.24m ²	600 x 3600mm 2.16m ²	900 x 3600mm 3.24m ²	900 x 3600mm 3.24m ² (BARE)
YELLOWtongue 19mm Domestic Flooring 450mm Joist Spacing	✓	✓	✓		✓	*
REDtongue 22mm Domestic Flooring 600mm Joist Spacing	✓	✓	✓		✓	*
BLUEtongue 25mm Heavy Duty Commercial Flooring		✓		✓	* †	* †

Square edge flooring also available * Made to order. † 600mm x 3600mm sheet size. BARE = without protective surface film.

Product Details

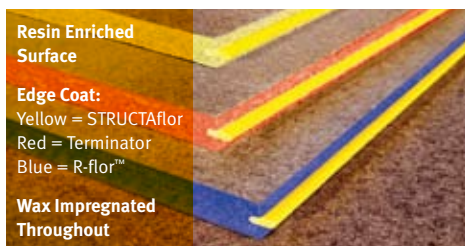
Thickness: 19mm, 22mm and 25mm nominal.

Surface Qualities: Upper surface is unsanded to retain a resin film, retard moisture and provide a working surface during installation. Sanded on “down” or underside for thickness control and precise edge profiling.

Availability: Product is also available (on request) with a finely sanded light wood tone coloured upper surface.

Edge Coating: Factory applied to all edges of tongue and grooved sheets to minimise moisture ingress.

- **YELLOW** coating for **STRUCTAflor** General Purpose YELLOWtongue, REDtongue and BLUEtongue Heavy Duty.
- **RED** coating for **STRUCTAflor Terminator** YELLOWtongue, REDtongue and BLUEtongue Heavy Duty.
- **BLUE** coating for **R-flor** YELLOWtongue, REDtongue (and BLUEtongue Heavy Duty).



AS 1860.2 Particleboard Flooring – Installation recommends that panels be factory sealed against water penetration. Where panels are not factory sealed, and where panels are cut to size on site, the edges should be sealed with adhesive used to bond the panels to the joists.

Edge Profiles: Square cut all edges, or tongue and grooved long edges with square cut ends.

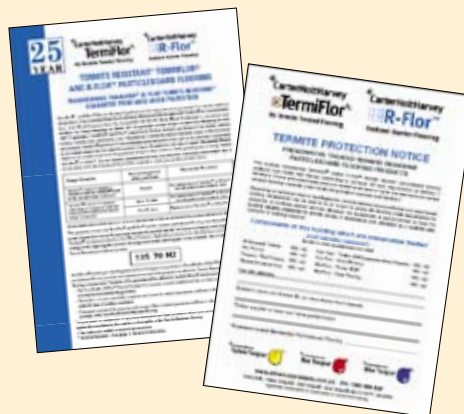
Tongue System: Factory fitted, rigid PP tongues ensure a tight fit and precise alignment of unsupported edges.

Resin: Natural tannin resin blended with synthetic resins.

Identification: Stamps on the underside of boards indicate required joist spacings.

The Facts That Matter

- ✓ **Resin Enriched Surface**
 - ✓ Added weather protection during construction – For up to 3 months
 - ✓ Hardwearing working surface during installation
- ✓ **Edge Coat**
 - ✓ Minimises moisture ingress
 - ✓ Easy product identification
 - Yellow - STRUCTAflor
 - Red - Terminator
 - Blue - R-flor
- ✓ **Wax Impregnated throughout**
 - ✓ In-built moisture protection for cut sheets
- ✓ **Hybrid Resin System**
 - ✓ Incorporates natural Tannin Resins
- ✓ **Meets or Exceeds AS/NZS 1860.1**
- ✓ **STRUCTAflor & STRUCTAflor Terminator Range**
 - ✓ **YELLOWtongue** – 19mm Domestic Flooring – 450mm joist spacing
 - ✓ **REDtongue** – 22mm Domestic Flooring – 600mm joist spacing
 - ✓ **BLUEtongue** – 25mm Heavy Duty Commercial Flooring
- ✓ **900mm wide sheet**
 - ✓ 3.24m² coverage (per sheet)
- ✓ **600mm wide sheet**
 - ✓ YELLOWtongue sheet weighs < 30kg (approx)
- ✓ **Environmentally Friendly**
 - Grown from managed and renewable plantation pine
- ✓ **Built on 25 years of Trust**
- ✓ **Structural H2 termite protection**
- ✓ **25 year Chemical Supplier guarantee on H2 termite protected flooring**



TERMINATOR

25 YEAR
CHEMICAL SUPPLIER
GUARANTEE

*The guarantee is provided by the chemical supplier for the benefit of the property owner. It is a limited and conditional guarantee covering the provision of replacement product used in Australia. The full terms and conditions are available at www.chhwoodproducts.com.au/guarantees.

Usage Situation	period after purchase	Guaranteed Provision
STRUCTAflor Terminator or R-flor installed in conjunction with full FrameSure® Blue/Red® termite resistant timber construction	25 years	Full replacement of STRUCTAflor Terminator or R-flor including labour and material costs
STRUCTAflor Terminator or R-flor™ installed other than in conjunction with full FrameSure® Blue/Red® termite resistant timber construction	Up to 10 years	Full replacement of STRUCTAflor Terminator or R-flor including labour and material costs
	10 to 25 years	Replacement of STRUCTAflor Terminator or R-flor only

or equivalent product conforming to H2-F, H2 or H2-S treatment level or better as applicable for the use on the site as defined by AS 1604. Specification for preservative treatment.



Features & Benefits of Particleboard & Timber Flooring

Economical & Versatile

STRUCTAflor, STRUCTAflor Terminator and R-flor particleboard flooring provide significant cost savings through their economy and lighter construction, providing reduced foundation costs and reduced construction times since only dry trades are used.

Timber sub-floor systems provide significant advantages, such as:

- No need for bulk site excavation, earth retaining walls and special drainage
- Easier construction for split level designs
- Simple, economical installation of central heating, plumbing and electrical wiring
- Greater adaptability to later extensions or alterations
- Underfloor storage space
- Keeping building occupants high and dry
- Insulation against winter cold and summer heat
- Flexibility to choose from a variety of floor coverings

Comfort

Particleboard floors are comfortable to walk on and promote a healthy environment which is high and off the ground. Like natural timber, it is a useful thermal insulator and gives the feeling of warmth and comfort. Particleboard flooring provides a cushioning effect when you walk on it and offers greater comfort for those standing for longer periods of time.

Energy Efficient

Particleboard flooring is thermally efficient and reduces heat conductivity providing insulation that helps lock out winter's cold and summer's heat.

Homes with suspended timber floors **can meet** energy standards – this can be achieved where necessary, with the minimum of fuss. Improvements in thermal comfort and energy efficiency can be achieved with the use of R-flor Radiant Barrier Particleboard Flooring:

Environmentally Friendly

Particleboard flooring is made from a natural wood resource grown and harvested from sustainably managed renewable plantation pine.

Plantation pine is truly a renewable building material.

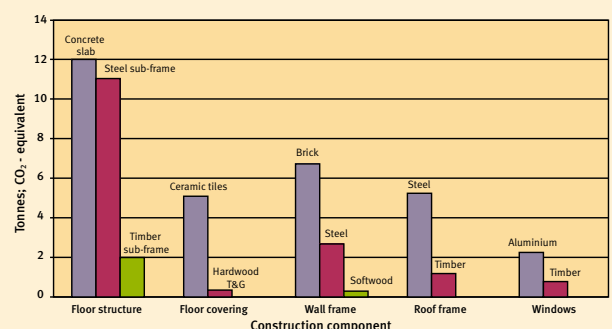
- No rainforest timbers or endangered species are used
- Trees grow on solar energy
- All plantation pine trees are replaced after harvesting

Trees absorb greenhouse gases during growth while releasing oxygen into the atmosphere and storing carbon as wood fibre. They require relatively little fossil fuel energy to produce, transport and use.

Plantation pine easily outperforms concrete, ceramic tiles, brick, steel and aluminium on a carbon footprint basis, therefore it makes sense to use materials derived from plantation pine. A carbon footprint is a measure commonly used when assessing the total carbon emissions contributing to global warming associated with a given material including manufacture, transport and installation.

Using wood products instead of non-renewable alternatives has been shown to result in over 24 tonne reduction in the carbon footprint of a house construction. This is equivalent to 16 years of carbon emissions resulting from heating and cooling a home.

Graph 1. Greenhouse gases emitted in the manufacture of building materials



Source: Forests, Wood and Australia's Carbon Balance (2006) & Department of the Environment, Water, Heritage and the Arts <http://www.environment.gov.au/settlements/gwci/heat.html>

- Increases overall R-Value of floor system
- Improves thermal comfort
- Reduces energy use
- Is greenhouse and environmentally friendly
- Provides fast and easy installation

Noise Control

Particleboard flooring assemblies can be easily installed to reduce sound transmission through floors, so that floor and walls are isolated from surface vibrations associated with airborne sound and impact eg: footsteps.

Product Quality & Performance

Our manufacturing process creates the best resin-enriched surface. Our production process means that STRUCTAflor, STRUCTAflor Terminator and R-flor's resin-enriched surface ensures outstanding weather durability.

These products meet or exceed the requirements of AS/NZS 1860.1. Monitoring and testing delivers a quality product that won't let you down.

Peace of Mind

Having stood the test of time, our flooring range offers a peace of mind that comes from knowing that the flooring is safe and reliable not to mention environmentally friendly. Furthermore, STRUCTAflor Terminator offers additional protection against termites. It's no surprise that STRUCTAflor and STRUCTAflor Terminator brands are trusted brands in particleboard flooring.

Continual Improvement

The best just gets better. Continual improvements to resins and board design minimise water penetration. Combined with the resin-enriched surface it gives STRUCTAflor unequalled protection. Advances in resin technology have seen the development and use of natural tannin resin in the manufacture of particleboard flooring.

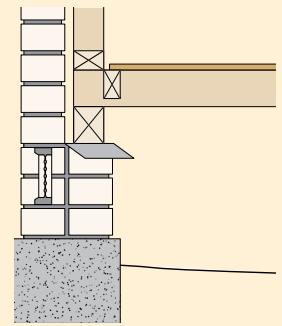
Product Installation

Installation Methods

These instructions are taken from AS 1860.2 – Particleboard Flooring Installation, Australian Wood Products Association (AWPA) Particleboard Structural Flooring Design Manual, Building Code of Australia (BCA) and relevant timber framing and building standards.

Fitted Construction

This applies to STRUCTAflor and STRUCTAflor Terminator installation after the walls have been erected. Floor joists and trimmers must be installed so that all sheet edges at the room perimeter are supported.



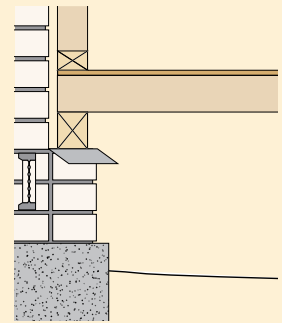
Fitted construction

Platform Construction

The product is particularly suited to platform construction. The method provides a working platform for wall and roof frame erection and contributes to time and cost savings.

In platform construction, sheet edges at the building perimeter are aligned with the outside edges of external wall frames. Wall plates are laid over product and fixed through the sheets to the joists.

The fixing of trimmers between joists is eliminated except for Square Edge products. Where square edges butt together within a room, they must be supported on joists or trimmers.

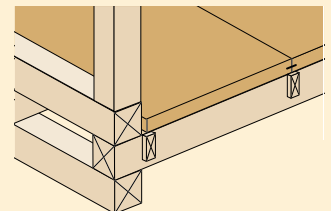


Platform construction

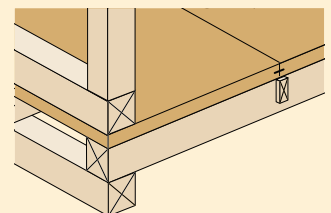
Installation methods depend on the edge profile and the construction method – either “fitted” or “platform”.

Irrespective of the construction method, always ensure that:

- Joists are spaced to suit the thickness and design use, e.g:
 - Maximum 450mm centres for 19mm YELLOWtongue
 - Maximum 600mm centres for 22mm Red BLUEtongue
 - 450mm or maximum 600mm for 25mm BLUEtongue
 - Individual sheet lengths or widths cover at least two floor joist spacings
 - The sheet surface carrying identification thickness and span information is placed face down.
- Apply a construction grade adhesive to the upper surface of framing members prior to sheet placement (see “Adhesive Application” and “Sub-floor Insulation – Notes”).



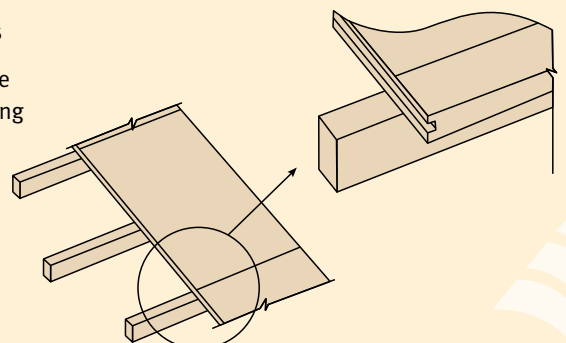
Fitted construction



Platform construction

Structural Platform Systems

Platform flooring has the advantage of providing a working surface during construction as well as the ideal substrate for overlay flooring such as carpet, tiles, parquet, or other timber overlays. Square edges of STRUCTAflor to be fully supported.



Overlay Timber Flooring

This flooring is installed after lock-up stage and gives the advantages of a structural platform floor during construction. As an overlay it provides the warmth and beauty of a natural timber floor that can be installed after the completion of the house or extension.

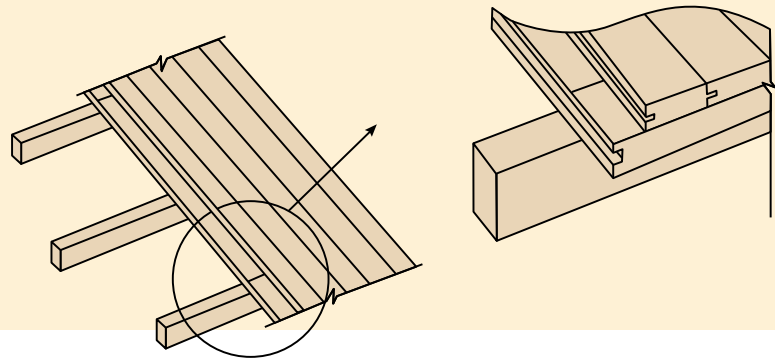


Figure 1. Structural/Platform flooring

Installation Details

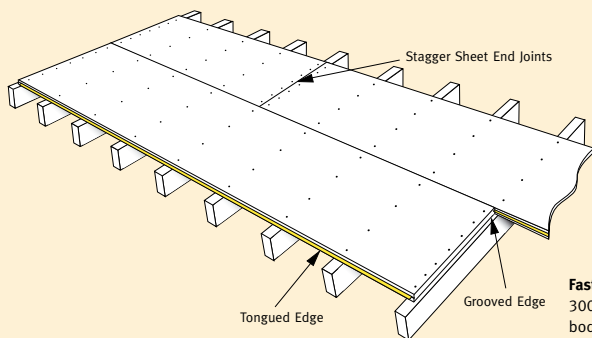
Sheet Layout

Particleboard Flooring sheets are laid with their long side across floor joists and ends butted over a joist. Sheet end joints should be staggered (as illustrated in Figure 2) because any slight rounding of sheet corners may present a hole in the floor if four corners come together.

Select a starting point for laying and set a string line to ensure the first sheet is square with the joists. Position the first sheet with its tongued edge to the string line and note the printed information on the sheets regarding top surface.

Each sheet must be supported by at least three joists. If this is not possible (cutting in around the room perimeter) then nogging should be fixed under the edges of these smaller pieces.

Standard Fixing – for tongued and grooved panels



Fastener Spacing
 300mm maximum centres – body of sheet
 150mm maximum centres – sheet edges
 25mm from T&G edges
 10mm (minimum) from square edges (butt joint)

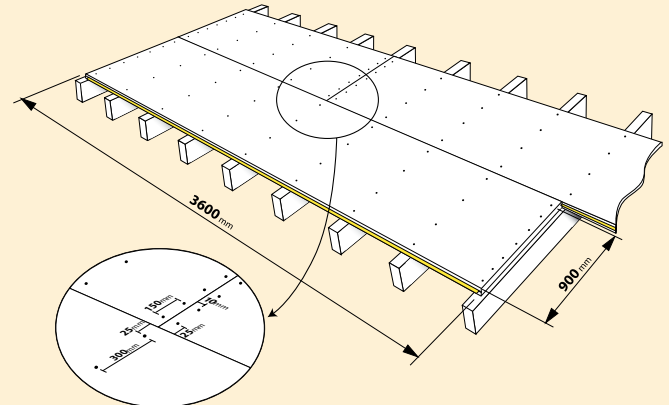
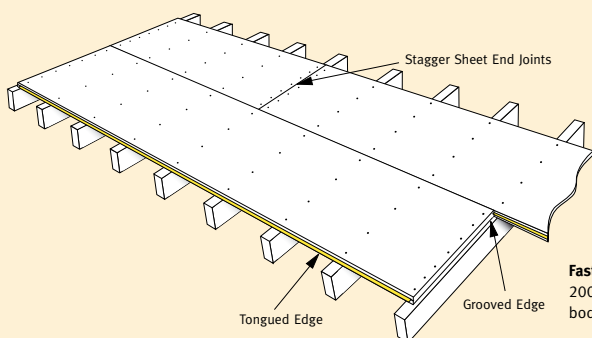


Figure 2. Sheet layout illustrating standard fixing

Close fixing – for tongued and grooved panels (see Safe Load Tables – Addition Requirements for relevance)



Fastener Spacing
 200mm maximum centres – body of sheet
 100mm maximum centres – sheet edges
 25mm from T&G edges
 10mm from square edges

Figure 3. Close spacing illustration

Fixing – for square-edged panels (standard fixing)

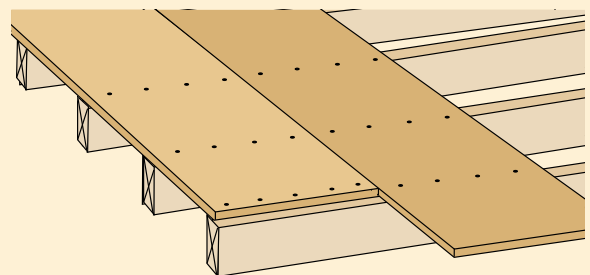


Figure 3. Nail Spacing Square Edge

Platform Installation

YELLOWtongue, REDtongue and BLUEtongue

Set a string line to the floor extremity and at right angles to the joists.

Position the first sheet with the tongued edge to the string line. Set one end flush or trim back to outside edge of perimeter joist. The opposite end should be located centrally over a joist.

Fix sheet to joists with fasteners from **table 2** and at the nominated spacings. Refer “Fasteners” on **page 10**.

Continue positioning and fixing first row of sheets. Butt ends firmly together and locate centrally over joists. Seal any cut ends with construction grade adhesive before positioning sheet. Trim end of last sheet flush with outside edge of perimeter joist.

Fix second and subsequent rows as described and by mating tongued edges into grooves. Stagger end joints (stretcher bond pattern) and locate centrally over joists. Trim ends flush with joists at floor perimeter.

Notes:

1. For ease of mating tongue and grooved edges, fasten grooved edges only slightly. Complete the fastening after laying the next row.
2. Tongues may be removed from the first row of sheets to “make good” off-cuts.

Fitted Floor Installation

When fitting up to installed wall frames, use either tongue and grooved or square edge sheets.

Arrange sheets as in “Platform Installation” e.g: T&G edges at right angles to floor joists, long edges of STRUCTAflor Square Edge resting on joists.

Ensure floor joists and trimmers are installed at the room perimeter to support sheet edges and ends. Provide 10mm clearance between edges and wall frames. Cover with skirting fixed through wall linings to the wall frame.

Fix sheets in rows and stagger end joints using a stretcher bond pattern. All edges of STRUCTAflor Square Edge must be supported on joists or trimmers. Position ends of tongue and grooved sheets over joists.

STRUCTAflor Square Edge

STRUCTAflor square edge requires frame support and the fixing of trimmers between joists is sometimes necessary. Trimmers are not required at the floor perimeter where external wall frames will be fixed over the STRUCTAflor.

To minimise trimmer installation, fix STRUCTAflor Square Edge with the long edges resting on joists. At the floor perimeter, set the long edges of the first row to a string line and flush with the outside of the perimeter joist. The opposite edges should be centred on joists.

Fasten sheets individually and butt subsequent sheets firmly up to the fixed sheets. Stagger end joints and seal any cut ends with construction grade adhesive.

Double Layers

Allowable loads for double layers can be obtained by adding together the Allowable Loads for each individual layer from the floor load tables. Refer to page 28.

The additional fixing and support details are required for Concentrated Loads higher than 6kN or Uniformly Distributed Loads higher than 20kPa – refer to section on Load tables. In this case the bottom sheet only requires screw fixing and full support on all edges.

When installing double layers, install the first layer as per the installation requirements on page 8. The second layer is to be laid so that the long joints are staggered between the two layers and the end joints meet on a different floor joist. A bead of adhesive is to be applied on the first layer at the joist position and fasten through both layers into floor joists.

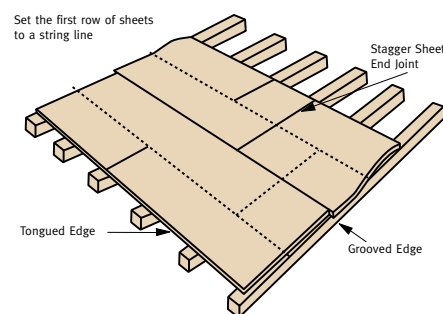


Figure 4. Double Layer Layout

Fastener length for the second layer should provide at least 30mm penetration into joists.

Table 1. Sheet Quantity Estimator*

How many sheets do you need?										
Width	Thickness x Length	Area	Size of Floor (m ²)							
			10	25	50	75	100	150	200	250
900mm	19mm x 3600mm	3.24m ²	4	8	16	24	31	47	62	78
600mm	19mm x 3600mm	2.16m ²	5	12	24	35	47	70	93	116

*Approximate only – Allow an additional 10% for wastage and off-cuts. Single layer only.

Fasteners

Select an appropriate fastener from Table 2. The fastener type, length and gauge is based on the particleboard thickness, joist material and available fastening equipment.

Fastener Spacing

For all flooring system’s sheet edges, space fasteners at 150mm centres. Keep fasteners at least 10mm from square edges and 25mm from tongue and grooved edges.

In the body of the sheets, space fasteners at 300mm centres. Drive nails flush with the STRUCTAflor/Terminator surface. Immediately prior to sanding, punch nails 2mm below the surface.

Fixing to Steel Joists

Note: AS 1860.2 stipulates that nail fixing to steel joists is not permitted due to concerns with squeaking. AS 1860.2 recommends 9g or 10g screws.

Fixing to Timber I-beam joists

AS1860.2 recommends that particleboard flooring is fixed to I-beams joists using a screw (not nails) with gauge of 9 or 10.

For CHH I-beams - (Hy)JOIST nails can be used.

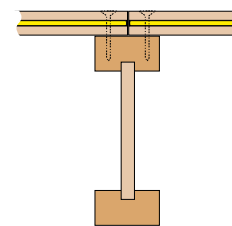


Figure 5. Fixing to EWP I-Beam



Table 2. Fasteners

Fastening method	Joist material	Fastener type	CHH Flooring	Minimum fastener
Manual Nailing	Hardwood or Cypress Pine	Bullet head or flathead nails	19mm, 22mm	50mm x 2.8mm
Manual Nailing	Hardwood or Cypress Pine	Bullet head or flathead nails	25mm	65mm x 3.75mm
Manual Nailing	Softwood	Bullet head or flathead nails	19mm, 22mm	65mm x 2.8mm
Manual Nailing	Softwood	Bullet head or flathead nails	25mm	75mm x 3.75mm
Machine Driven	Hardwood or Cypress Pine	D head, round head or finished head	19mm, 22mm	50mm x 2.5mm
Machine Driven	Hardwood or Cypress Pine	D head, round head or finished head	25mm	65mm x 2.5m*
Machine Driven	Softwood	D head, round head or finished head	19mm, 22mm	65mm x 2.5m*
Machine Driven	Softwood	D head, round head or finished head	25mm	75mm x 2.5mm*
Machine Driven	Steel	Hard steel twist, conical point	19mm, 22mm	32mm x 2.5mm*
Machine Driven	Steel	Hard steel twist, conical point	25mm	40mm x 2.6mm*
Pneumatic Nailing	All timbers	Tee or finishing head nails	19mm, 22mm	50mm x 2.5mm
Pneumatic Nailing	All timbers	Tee or finishing head nails	25mm	75mm x 3.15mm
Screw Fixing	All timbers	Type 17 countersunk, self-drilling wood screws	19mm, 22mm	10g x 50mm
Screw Fixing	All timbers	Type 17 countersunk, self-drilling wood screws	25mm	14g x 65mm
Screw Fixing	Steel	Countersunk self-embedding head, self-drilling screws, preferably with self breaking cutter nibs	19mm, 22mm	9g x 45mm or 10g x 45mm

* Available in D or round head only.

Notes:

1. Use galvanised nails designated for wet areas.
2. Skew bullet or jolt head nails for improved holding.
3. Steel screws should be suitably coated to resist corrosion. To determine if there are alternative methods please contact the Carter Holt Harvey Customer Service Centre on 1300 658 828.

Table 3. Fastener Quantities per Sheet – Standard Fixing

Sheet Size (mm)	Edge Profile	No of Fasteners per sheet	
		Joists at 450mm centres	Joists at 600mm centres
3600 x 600	Tongue and grooved	31	25
3600 x 900	Tongue and grooved	42	34
3600 x 1200	Square	75	61

Table 4. Fastener Quantities per Sheet – Close Fixing

Sheet Size (mm)	Edge Profile	No of Fasteners per sheet	
		Joists at 450mm centres	Joists at 600mm centres
3600 x 600	Tongue and grooved	42	34
3600 x 900	Tongue and grooved	62	50
3600 x 1800	Square	115	93

Note:

1 kg equals approximately 390 nails - 50mm x 2.8mm, 170 nails - 65mm x 3.75mm, 305 nails - 65mm x 2.8mm or 150 nails - 75mm x 3.75mm

Adhesives

Requirement & Application

Construction grade adhesive specifically formulated for particleboard flooring is to be used with nail or screw fixings. Apply the adhesive as follows:

Load cartridge into caulking gun or foam canister into dispensing tool. For cartridge system, cut nozzle to allow a 5mm bead diameter and for foam system regulate flow to achieve the required adhesive bead diameter.

Clean any dirt, grease or water from surfaces to be bonded.

Exude a continuous, 5mm diameter bead of adhesive to each joist to be covered by flooring. Apply two beads to joists where sheets butt together.

Adhesive fixing provides a stiffer floor. An extra bead applied along the tongue before sheets are pressed together will help to achieve a squeak free floor system. Any excess glue squeezed out should be cleaned off.

Position sheets within approximately ten minutes of applying the adhesive. Do not allow the adhesive to skin over before applying sheets.

Nail or screw flooring sheets within 15 minutes of positioning sheet.

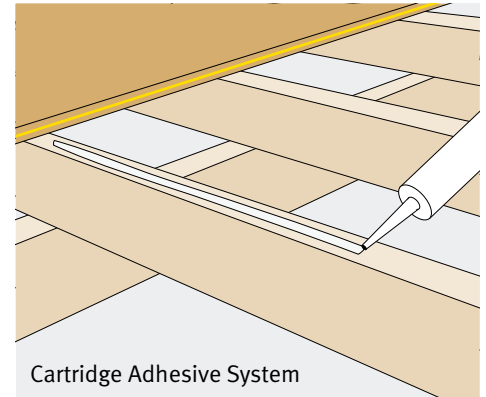
Remove excess adhesive from sheet surface before it dries. Use a scraper and rag dampened with mineral turps (or appropriate solvent).

To seal cut edges of the sheets, apply a bead of adhesive to the edge. Butt the edge firmly up to the adjoining sheet and remove excess adhesive. Alternatively, the adhesive may be spread over the cut edge with a spatula.

The use of construction grade adhesive in conjunction with nails or screws is mandatory.

Notes: AS 1860.2 Particleboard Flooring – Installation

1. Advises that adhesive applied along the tongue helps to keep tongues tight in their grooves and minimises squeaking in installed floors.
2. Recommends that panels be factory sealed against water penetration. Where panels are not factory sealed, and where panels are cut to size on site, the edges should be sealed with adhesive used to bond the panels to the joists.
3. The installation of draped Foil type Insulation that provide a disconnect between the joists and flooring is not recommended as it may impede the proper gluing of the flooring to the joists as set out in AS 1860.2 – seek advice and assurance from insulation supplier prior to installation of sub-floor insulation products as to their suitability.



Cartridge Adhesive System



Application & Construction Requirements

Construction Requirements

a) General. CHH particleboard flooring should be installed in accordance with government building regulations and AS 1860.2.

It may be used over conventional joists in single storey or two storey construction in accordance with AS 1684 Residential Timber Framed Construction. In commercial or domestic applications involving increased floor loadings, reference should be made to AS 1170 Structural design actions. The supporting frame should comply with the requirements of the Building Code of Australia and/or be certified by a professional engineer, as may be required by the building authority.

b) Wet Area Rooms. CHH particleboard flooring are accepted by building authorities for use beneath impervious floor surfacings in wet area rooms such as bathrooms, laundries and toilets. The waterproofing of the floor surface should comply with AS 3740, Waterproofing of Wet Areas in Residential Buildings.

Carter Holt Harvey recommends that wet rooms (bathrooms, laundries and toilets flooring) be entirely waterproofed.

Note:

AS 1684.2 states that "where platform floor construction is used, the flooring shall be protected from wetting by rain and wet trades." Furthermore, during construction, all flooring should be flood-coated with a water repellent sealer.

The above requirement in the main contradicts the established practice of avoiding the application of a surface sealants or plastic sheeting over exposed platforms as they will trap moisture and retard drying out in the likely event that the floor gets wet. Where a sealant is applied, ensure that the flooring panels are dry prior to application.

Framing

CHH particleboard flooring may be used over timber or metal floor joist systems. For best results with timber frames, deep floor joists (150mm or more) such as those used in upper story construction, should be seasoned and gauged.

Securely fix floor joists to bearers. The top surface of joists must be level to allow the flooring sheets to lie flat and level. Kiln dried or stabilised timbers are recommended for use. Green (unseasoned) timber (joists and bearers) may shrink unevenly as they dry which may lead to distortion of the particleboard flooring sheets as well as causing protrusion of nail heads after joists and bearers have stabilised in moisture.

Floor joist spacings must not exceed the span capacity of the particular particleboard flooring product. Refer to "Applications" or "Product Details".

Ventilation/Vapour Barriers

Ventilators to external and internal subfloor walls should satisfy the requirements of the Building Code of Australia, be evenly spaced and allow a clear cross-flow of air beneath the floor. Particular attention should be given to the ventilation of corners.

Increased levels of ventilation are advised for subfloor spaces which are subjected to occasional dampness.

The particle flooring subfloor members should not be subjected to prolonged dampness. The moisture content of particleboard flooring should be maintained below 13% moisture content.

To assist drainage and ventilation, the ground should be graded to fall and weep holes provided in the external walls. In some circumstances 0.2mm (minimum) plastic sheet ground covers may be used to retard the rise of moisture vapour.

The underside of STRUCTAflor facing the ground must not be coated with sealant.

Ground Clearance

The BCA (and AS 3660.1: Termite Management) requires a minimum ground clearance of 150mm to underside of bearer where termite inspection is not required. Where termite inspection is required, 400mm minimum height from ground surface is required. On sloping sites, 400mm clearance may be reduced to 150mm within 2m of external walls

Where termite barriers are not installed or don't require inspection, a minimum 400mm ground clearance is advised as good practice.

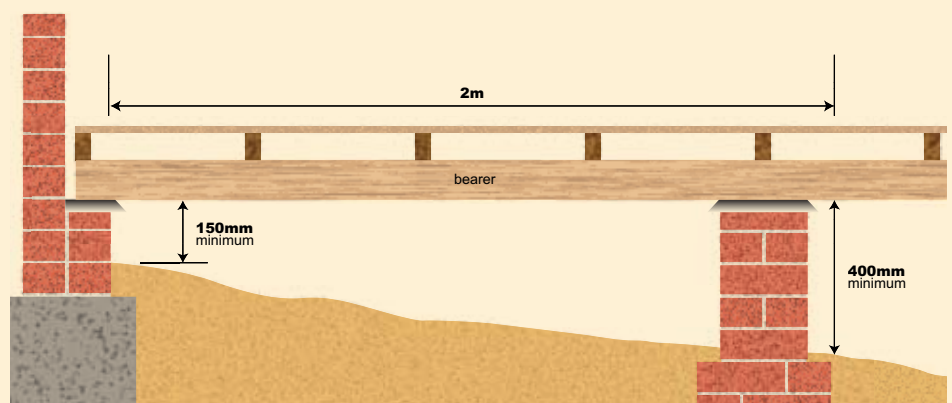


Figure 6. BCA Minimum underfloor clearance requirements

Platform Exposure

The product may be exposed to the weather for up to three months. However, it is always advisable to enclose the building as soon as possible after laying the floor. During exposure, prevailing weather conditions can influence the surface condition of the board and may cause minor swelling. Following the enclosure of the building, this can be removed by sanding – see Figure 7.

Remove any water that ponds on the platform by sweeping or by drilling holes (no larger than 2mm in diameter and no closer than 1 metre apart) in positions which will eventually be covered by wall plates, cupboards or skirting.

Excessive and differential drying of particleboard flooring sheets after it has been wet may result in cupping and shrinkage of the product which could, in extreme circumstances, cause pull-out or pull-through of nail heads. If this occurs, screwing the flooring sheet to the joists will be required to prevent the floor from movement and possible squeaking. In severe cases, shading may be required, or alternatively, light wetting of the flooring surface may be required to recondition sheets back to uniform moisture contents.

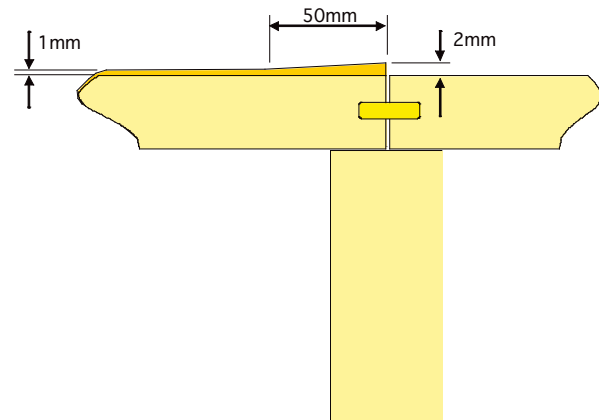


Figure 7. AS 1860.2 Sanding Provision

Do not apply plastic sheeting or surface sealants over the exposed platform as they will trap moisture and retard drying out. Furthermore, this can result in dimensional change.

The hygroscopic movement of the particleboard flooring (or any flooring) should be taken into account in the design.

General damage to the flooring surface can occur through various means. Avoid the build up of plaster, concrete, paint etc on the floor and do not use the floor:

- For stacking heavy materials like bricks, tiles, sand, cement or
- As a mixing table for the mixing of cement, mortar, etc.

Minor swelling that may result due to prolonged exposure to weathering (resulting from the hygro-expansivity of particleboard) can be removed by sanding following the enclosure of the building. The depth of material removed shall not exceed the following:

- 1mm - Over the general panel area
- 2mm - Within 50mm of any supported edge



Bush Fire Areas

The method of determining the Bushfire Attack Level (BAL) for a site has been revised and now comprises six categories, namely BAL—LOW, BAL—12.5, BAL—19, BAL—29, BAL—40 and BAL—FZ. These categories are based on heat flux exposure thresholds.

The methods for determining the Bushfire Attack Level now include both a step-by-step procedure, including tables that list climate, slope of ground and vegetation variations in States and Territories and a detailed calculated procedure.

Please refer to AS 3959 “Construction of Building in Bushfire-Prone areas” and CHH’s “Guide to building in bushfire affected areas”.

Expansion Joints

Particleboard flooring will expand and contract as sheets respond to changes in atmospheric moisture. Allowance for this movement must be made throughout the floor area by providing gaps and special joints as appropriate to accommodate sheet expansion.

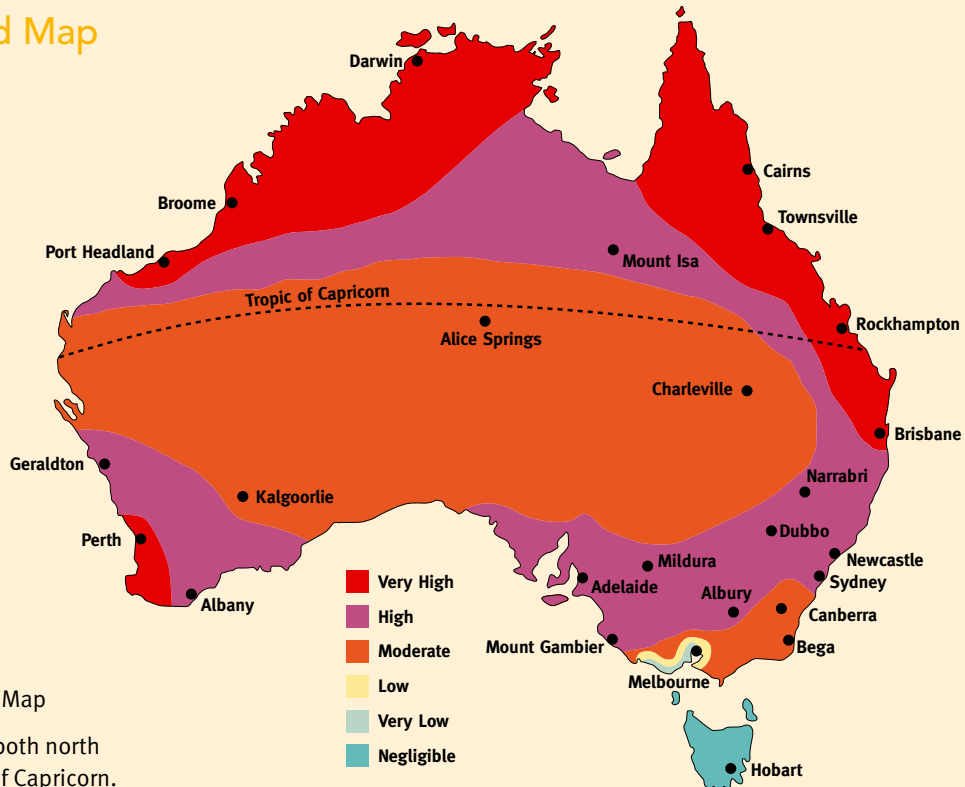
For small areas, the gaps left between panels when laid by hand should accommodate normal hygroscopic movement. For large floor areas the hygroscopic movement of the particleboard flooring should be taken into account in the design. Refer to AS 1684.

The Building code of Australia references AS 1648 standard as the Acceptable Construction Manual for timber framed construction. AS 1648 stipulates the following provisions for expansion joints for all flooring material to be:

“For continuous floor widths over 6m, measured at right angles to flooring, intermediate expansion joints shall be provided in addition to the perimeter gaps. This joint shall be either a single 10mm wide gap (under a wall or across a hallway), or smaller gaps with closer spacing to give an equivalent space”

Termite Risk Management

Termite Hazard Map



Two destructive termite species found in Australia



Resistance to Termites

Termites (also known as white ants), feed on any cellulose based material, such as timber. In areas defined as termite-prone (check with your local authority), physical barriers such as ant caps or chemical treatments need to be applied in accordance with AS 3660.1.

STRUCTAflor Terminator and R-flor are resistant to both the subterranean termite (including *Mastotermes darwiniensis*) and the timber beetle.

STRUCTAflor Terminator and R-flor termite resistant particleboard flooring conforms to H2 level treatment requirements as defined in AS 1604.2. Timber and wood based products treated to H2 level or higher are deemed to be termite resistant building materials under the Building Code of Australia and AS 3660.1.

Depending on individual state or local legislation, termite resistant structural timber and wood building components may be used in full or part to satisfy the Building Code requirements for protection of building against termites. However the householder is recommended to have this building regularly inspected for termite activity in accordance with AS 3660.2 by a qualified pest controller or building inspector.

STRUCTAflor Terminator and R-flor flooring are protected, by a synthetic pyrethroid insecticide from the most common species of subterranean termites in Australia including *Coptotermes* spp, *Schedorhinotermes*, *Nasutitermes* and *Mastotermes darwiniensis* and hence is suitable for use both south and north of the Tropic of Capricorn.

STRUCTAflor Terminator and R-flor termite resistant particleboard flooring are protected from termite attack by incorporation of an Australian Pesticides and Veterinary Medicines Authority approved wood preservative in accordance with AS 1604.2 (and also approved by Forest NSW and the Queensland Department of Primary Industries), the Timber Marketing Act (NSW) 1977 (if applicable), the Timber Utilisation and Marketing Act (Qld) 1987 (if applicable) and is compliant with AS 3660.1.

STRUCTAflor Terminator and R-flor particleboard flooring are regularly tested by an independent, accredited third party laboratory.

Energy Efficiency

Homes with suspended particleboard floors can easily meet home energy efficiency and thermal comfort regulations across Australia with a minimum of fuss and expense.

Energy Efficiency Regulations Overview

Across Australia, energy efficiency regulations vary between the different states and territories. Generally speaking there are two ways to meet the regulations, either with an elemental approach or with a modelling approach.

Note that in both approaches the floors on mezzanine, first and higher floors do not have any energy efficiency requirements to meet.

Elemental approach

The elemental approach sets out, among other things, specific minimum insulation levels for the various elements of a house - walls, ceilings and so on and includes minimum requirements for the ground floor. This approach is called acceptable construction in the Volume 2 of the Building Code of Australia (BCA), deemed-to-satisfy in Volume 1 of the BCA, and Rapid or DIY method under the NSW BASIX system.

For most states and territories all the energy efficiency requirements for the ground floor element are in the latest edition of the BCA. However some states may have exemptions from or additional requirements to the BCA. Some states may also have requirements which refer to previous editions of the BCA.

Modelling approach

The modelling approach requires a home to meet minimum energy efficiency levels for the energy needed to heat and cool the whole house. These minimum levels are set by the state and territory governments and are minimum 5 star, 6 star rating and so on or, in the NSW BASIX system, minimum heating and cooling loads which vary depending on the homes location. The minimum energy efficiency of the whole house as designed is required to be modelled using computer software such as FirstRate, AccuRate or BERS Professional by a trained energy assessor. This modelling approach allows considerable flexibility in how a home achieves the minimum energy efficiency rating. It may mean, for example, that no additional insulation is required on the ground floor because of increased wall and ceiling insulation (it is also usually easier and cheaper

to install more insulation in these areas) or changes to glazing type, coverage or frames.

An average home using STRUCTAflor, Terminator or R-flor particleboard flooring on the ground floor can generally achieve the required energy efficiency star ratings (or equivalent) for the building fabric by one or more of the following:

- Increasing insulation in the wall, ceiling or internal walls
- Correct building orientation to take advantage of sunlight, shade or breezes
- Providing summer shading and ventilation
- Providing outdoor living areas in warm climates
- Correct glazing sizing, location frame type

In cooler or temperate climate zones additional measures may be needed such as:

- Draught proofing
- Enclosing the subfloor perimeter with a wall
- Blocking the wall cavity if building a block or brick veneer home
- Installing additional insulation under the floor.

For both approaches the insulation properties of the particleboard flooring or the insulation properties of particleboard flooring when used as part of a particular floor system will need to be known. Guidance of both is provided below.

Particleboard Flooring R-Values

Insulation value is commonly called an "R-value" and is a measure of thermal transmittance. There are two ways in which R-values are listed:

- Product or material R-value is the R-value of the product or material on its own.
- System R-value includes the combined insulation value of flooring material, air spaces, any additional insulation and other variables working in conjunction.

STRUCTAflor, Terminator and R-flor all have a material R-value. The R-values for suspended particleboard ground flooring vary and R-values for a common selection of systems are included in Table 5.

For assistance in calculating the R-value of other suspended particleboard flooring systems visit the Carter Holt Harvey website on www.chhwoodproducts.com.au and download the free R-values Calculator under R-flor. The R-values Calculator can also provide information on total system R-values as well as what is considered additional insulation under some energy efficiency regulations.

R-Values - Downwards or Upwards?

Heat always travels from warmer to cooler areas. Insulation works by reducing the amount of heat escaping from your home when it's cold outside and entering your home when it's hot outside. In winter it is usually colder underneath the floor so insulation is needed to stop heat escaping downwards into the subfloor. At hot times of the year, insulation may be needed to stop heat travelling upwards through the floor.

The direction in which insulation needs to inhibit this heat transfer, depends upon if the climate zone your home. R-values can be measured depending on the direction of heat flow (upward or downward) that one wants to reduce. In cooler climates higher down R-values and lower up R-values are appropriate. In hot, humid climates where houses are naturally ventilated, lower down R-values and higher up R-values are appropriate for floors.

Specific floor system R-values can vary depending on:

- **Sub-floor perimeter enclosure** - if the area under the ground floor (the sub-floor) is enclosed the air movement is greatly reduced, substantially increasing the R-value of the floor system. Note that minimum sub-floor ventilation rates, which vary depending on the building location and its humidity zone, must be adhered to.
- **Building location and sub-floor ventilation** - a building located in a lower relative humidity zone requires less subfloor ventilation if the sub-floor perimeter is enclosed. Less ventilation (and air flow) increases the R-value of the floor system.
- **Building exposure** - a floor system of a building in a suburban area will have a higher R-value than a floor system installed in an exposed rural or seaside location.
- **Sub-floor perimeter material** - if a sub-floor is enclosed with materials with a higher material R-value then the ground floor system will have a higher R-value.
- **Height above ground level** - floor systems close to the ground have a greater thermal connection with the earth so will have a higher R-value than one that is further off the ground.

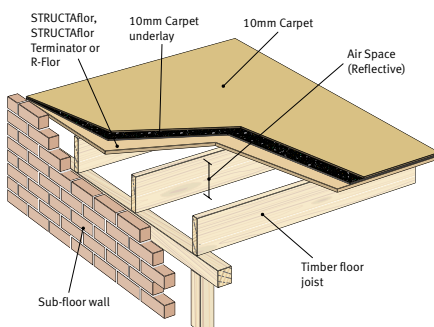
- **Wall cavity barrier** - where a sub-floor perimeter is enclosed and brick or block veneer is the method of construction, installing a barrier below floor level to prevent convection between the airspace under the floor and any wall cavities will substantially increase the R-value of a floor system. Note that in warm, humid climates a wall cavity barrier will reduce the ability of the home to cool off so in some climate zones this is not an elemental requirement.
- **Floor joist depth** - a floor joist of greater depth will slightly increase the R-value of a ground floor system as more insulating air is trapped underneath.
- **Soil type** – clay soils are less thermally conductive than sandy soils so a suspended ground floor built over clay soil will have a higher R-value.
- **Flooring material** - a flooring material which conducts less heat (such as particleboard or carpet) will increase the R-value of a floor system.

Additional Insulation

If additional insulation is required for the ground floor it may be added on top of or underneath the floor or even on the inside of the sub-floor perimeter walls. The following options are available:

On top of the floor

Carpet and underlay laid on top of the particleboard flooring can add a significant insulation effect. An increase in R-value of approximately R0.5 (downwards and upwards) can be expected.



Carpet and underlay can increase R-value (down and up) by R0.5.

Laying tiles directly onto particleboard flooring will result in only a slight increase in system R-value. The effect on R-values of timber finishes such as floating timber floors or tongue and groove timber varies depending on the type of wood and the substrate materials. Consult with the manufacturer of these products on their specific material R-values.

Be aware that the insulation on top of a floor may not be recognised by some building authorities or energy rating software as additional insulation. Check with your local building authority or energy rating professional about the acceptability of this in your area.

Under the floor

The addition of insulation under the floor can result in either small or large increases in R-value to a ground floor system.

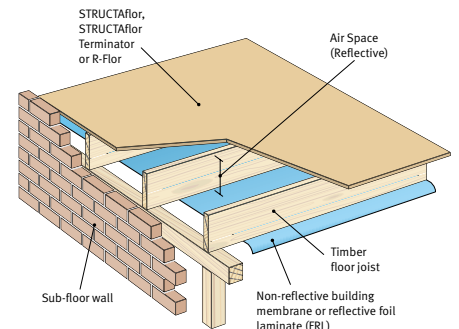
Installing R-flor significantly reduces the radiative heat transfer from the warm living space through the floor into the cool sub-floor space to deliver an improvement in the R-value (downwards) of the flooring system. R-flor can add up to R0.6 downwards insulation value to a ground floor system.

STRUCTAflor, STRUCTAflor Terminator and R-flor can be used in conjunction with other insulation products below the floor.

It is important that the R-flor reflective coating requires an air gap underneath to work effectively. Bulk insulation pressed up against the coating, will negate R-flors additional insulation value.

R-flor has a high reflectance metallised foil coating underneath which significantly reduces radiative heat transfer between the living space and the sub-floor area, substantially increasing R-value (down) of a ground floor system.

Fixing a non-reflective building membrane between or under floor joist is considered to add an R-value of 0.2 (downwards and upwards) in the BCA. Fixing reflective foil laminates (RFLs) between or under floor joists will achieve a higher R-value however, the specific R-value needs to be determined for each product and the airspace above the RFL. Typically a double-sided RFL attached beneath the floor joists with 90mm airspace can add an R-value of at least 1.97 downwards and 0.55 upwards.



Fixing reflective foil laminate (RFL) underneath floor joists where the sub-floor perimeter is enclosed substantially increasing R-value (down) of a ground floor system.

The installation of a membrane or RFL draped over the floor joists is not recommended as it may impede the proper gluing of the flooring to the floor joists as set out in Australian Standard AS1860.2. This Standard states that the use of construction grade adhesive in conjunction with nails or screws is mandatory. The installation of a draped membrane or RFL may interfere with the function of the adhesive between the flooring and floor joist.

Placing bulk insulation such as expanded polystyrene or fibre batts will add significant R-value when installed under a floor system. Bulk insulation is available from anywhere between R1.5 to R3 and is usually installed between the floor joists. Depending on the available access bulk insulation can either be placed between the floor joists and held there by friction or placed on top of wire or netting or on stirrups placed over the floor joists.



Photo courtesy of Practicle MMC.

Use of expanded polystyrene between floor joists can add significant downward R-value to a suspended particleboard floor. Friction fitting or laying on top of floor bearer may be possible with some systems.

When using bulk insulation and recalculating total floor system R-value care must be taken as it is not a straight forward matter of adding the material R-value. The bulk insulation displaces air which itself has some insulation

effect. For example installing fibre batts with an R-value of 1.5 between the floor joists will increase the R-value by R0.74 (upwards) and R1.21 (downwards) not R1.5.

Bulk fibre insulation installed on top of wire netting between floor joists adds significant downwards R-value. Note the airspace above the insulation which is needed to maximise benefit of reflective foil coating under R-floor.

Inside the sub-floor perimeter wall

In cold climates installing additional insulation inside the sub-floor wall enclosing the perimeter will improve the insulation performance of the floor system. Again, take care that the minimum sub-floor ventilation requirements for the buildings humidity zone are adhered to ensure adequate air movement under the floor.

Further information

Research funded by the Forest Wood Products Australia (FWPA) has identified a number of options for insulating under floors in the report “Insulation Solutions to Enhance the Thermal Resistance of Suspended Timber Floor Systems in Australia”. This report can be found at www.timber.org.au in the Design and Construction section under Thermal Performance.

Due to the magnitude of solutions and products available only a few systems are noted above. Advice on the most suitable product for your climate and conditions including information on correct installation of additional insulation under the floor is to be sought from the insulation supplier/ manufacturer.

HINTS

Apply a quality duct tape to joins as soon as practical after installation.

- During platform exposure apply appropriate drainage to facilitate evacuation of moisture.
- Do not drill drainage holes in the particleboard flooring in areas that drain into insulation underneath the floor.
- Ensure that the floor and sub-floor space is kept as dry as possible to prevent mould and fungal growth.
- If using draped RFL over the floor joists (not recommended) ensure that the RFL is perforated where the trough is formed with a minimum 6 mm diameter holes at spacings of 300mm to allow water to pass through.
- Precautions need to be taken so the insulation does not get wet during construction which may cause mould or fungal growth to develop under the flooring.

- If underfloor insulation does get wet, ensure adequate sub-floor air ventilation and circulation is present to dry it out.
- Care must also be taken not to over insulate the floor. In hot climates or in other climates at warmer times of the year too much under floor insulation may prevent the building cooling off, resulting in increased use of air-conditioning to ventilate or cool the inside of the home.
- Placing additional insulation underneath floors where the sub-floor perimeter is not enclosed may require additional support to keep insulation in place. Lining underneath the floor joists with particleboard or plywood may be needed to deliver additional R-value required and secure the insulation.

For assistance in calculating the R-value of other suspended particleboard flooring systems visit the Carter Holt Harvey website on www.chhwoodproducts.com.au and download the free R-values Calculator under R-floor. The R-values Calculator can also provide information on what is considered additional insulation under energy efficiency regulations if using the elemental approach and energy rating software if using a modelling approach.

The R-values calculator was developed in conjunction with leading academic and experts in the field of insulation from the University of Adelaide.

Use of Red Tongue (22mm thick) and Blue Tongue (25mm thick) will generally deliver an increase in total system R-values in the order of 0.02-0.05 compared to Yellow Tongue.

Table 5: R-values for selected suspended ground floor systems using STRUCTAflor, Terminator and R-floor Yellow Tongue - enclosed perimeters

Flooring product details		STRUCTAflor and STRUCTAflor Terminator Yellow Tongue (19mm)		R-floor Yellow Tongue (19mm)	
Height of floor above the ground (metres)		0.6	1.2	0.6	1.2
Additional insulation type	Direction of heat flow	R-Value			
No additional insulation	Downwards	1.06	0.91	1.67	1.52
	Upwards	0.93	0.79	1.06	0.91
With carpet and underlay	Downwards	1.54	1.39	2.15	1.99
	Upwards	1.42	1.27	1.54	1.39
No carpet and non-reflective membrane between or under joists	Downwards	1.26	1.11	1.87	1.72
	Upwards	1.13	0.99	1.26	1.11
No carpet and RFL under joists	Downwards	2.95	2.80	3.42	3.27
	Upwards	1.52	1.38	1.61	1.46
No carpet & R1.5 bulk insulation between joists*	Downwards	2.54	2.39	2.94	2.81
	Upwards	2.40	2.25	2.79	2.65

Notes

1. R-values for typical suburban location in humidity zone 3, standard brick veneer with a wall cavity barrier, sub-floor enclosed with single skin masonry (110mm), floor joist depth 90mm over a clay soil.
2. Bulk insulation is assumed to sit flush with the bottom of the floor joist, leaving an airgap between the top of the bulk insulation and the bottom of the particleboard flooring.
3. R-values calculated in accordance with the relevant provisions of Australian Standard AS/NZ4859.1 – Materials for the thermal insulation of buildings. General criteria and technical provisions and the International Standards Organisation standard ISO13370 – Thermal performance of buildings – Heat transfer via the ground – Calculation methods is used as the methodology for determining the R-value of suspended timber floors.
4. Assumption of carpet: 10mm carpet, 10mm underlay both with conductivity of 0.05 W/m2K.
5. Additional R-value for adding a non-reflective membrane between or under joists is considered to add an R-value of 0.2 to the total R-value of the base floor construction as advised in BCA 2010 Volume Two.

* 90mm joists, fibreglass insulation



Wet Area Installation

CHH particleboard flooring provides an economical flooring option for the application of impervious waterproofing systems in wet areas such as bathrooms, laundries and toilets. The waterproofing of floors and floor/wall joints in these areas is essential to prevent water damage to the substructure and adjoining rooms or spaces.

Waterproofing systems for wet area floors must comply with regulatory requirements. Systems which comply with AS 3740, have a State or National Certificate of Accreditation are generally suitable for use over particleboard flooring.

Australian Standard AS 3740, defines “waterproof” and “water resistant” and specifies which treatment is required for wall and floor areas in bathrooms, toilets and laundries under various arrangements.

When treated in accordance with AS 3740, with sealants and membranes meeting AS 4858, CHH particleboard flooring Wet Area Membranes are suitable for use in all wet areas.

Construction

“Platform” or “fitted” flooring construction methods may be used and flooring should be installed as detailed under “Product Installation” page 7.

Sub-floor bearers and joists should be securely restrained and timber members should be seasoned and gauged, particularly where their depth exceeds 150mm. Ensure that the flooring sheet is adhesive bonded and securely nailed or screwed to the floor joists.

Note: Movement of the sub-floor members due to shrinkage, attention to fixing detail or from subsequent floor loads can be detrimental to the performance of floor surfacings, e.g: waterproofing systems and ceramic tiles. Close attention should be given to the fixing detail in the design and construction of the floor.

Preparation

Following wall and roof installation, prepare the product surface to receive the waterproofing system and floor surfacing. Remove any mortar deposits or other accumulated surface debris and drive fasteners 2mm to 3mm below the board surface. Sand where necessary. The floor should be dry, clean and free of any surface contamination.

Neatly cut any holes in the floor to receive service pipes, drains or waste outlets. The holes should not be roughly punched through the floor. Installed pipes may be secured to the structural subfloor members with brackets.

They should not penetrate through the members unless allowance has been made for the penetrations in the structural design. Before installing waterproofing systems or shower bases/trays, seal all cut edges of the product, including holes for service pipes, with epoxy resin. Construction grade adhesive may also be used.

Sub-floor space

Depending on your local building authority requirements, you will most likely have a requirement for installing a water tank – the subfloor space is an ideal location for hiding water tanks, and there are a number of options which are ideally suited to underfloors.

Perimeter Flashing

Perimeter flashing should be applied to all internal angles formed between the floor and walls. Use PVC angles or waterproof flashings.

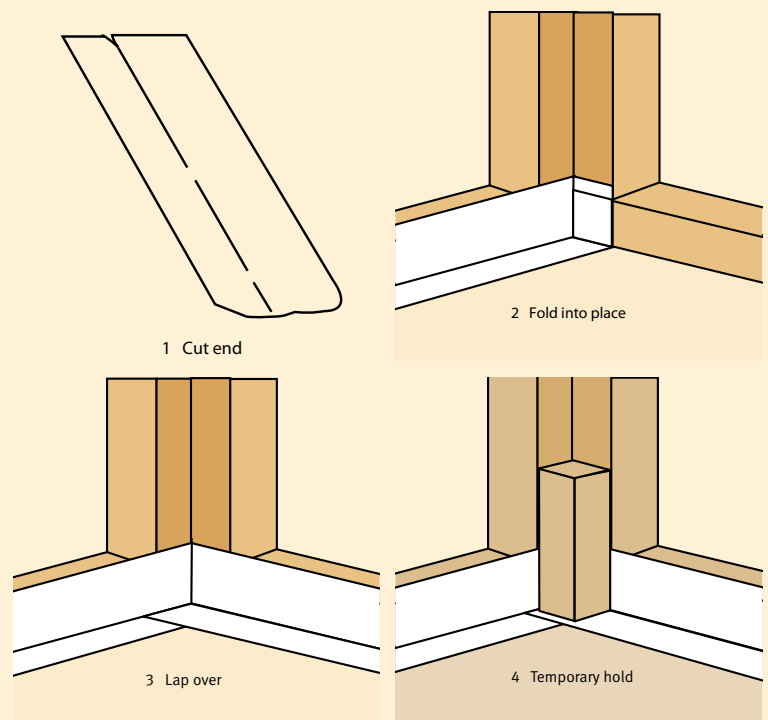
Flashing materials must be waterproof, sufficiently flexible to accommodate movement at floor/wall joints and suitable for bonding with waterproof adhesive. They should also be tough enough to resist damage during the installation of other waterproofing materials and floor surfacings.

Cut and fold the flashing to suit the wall length as illustrated.

Bond the flashing to the floor using a waterproof adhesive and apply the adhesive in a continuous bed, 65mm wide by 3mm deep, using a 3mm notched spreader.

Bed the flashing into the adhesive and ensure corner joints are thoroughly sealed.

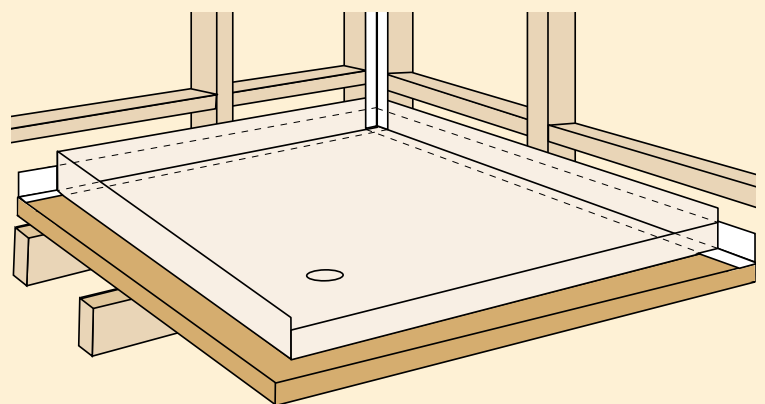
Do not continuously bond the flashing to the bottom wall plate. The flashing is required to provide a bond break in the event of wall/floor joint movement. Spot bonding to the bottom plate at 600mm centres is sufficient.



Vertical Corners

Flash vertical corners before fixing wall sheetings. Vertical flashings should extend down into external shower trays or over the recessed edge of precast shower bases or baths.

The vertical flashing should extend over the perimeter floor/wall flashing where internal shower trays are used and at joints around fixed vessels. Ensure that the surface and vertical joints of shower recess wall linings are sealed with a waterproof sealer and that the ceramic tile adhesive is compatible with the sealer.

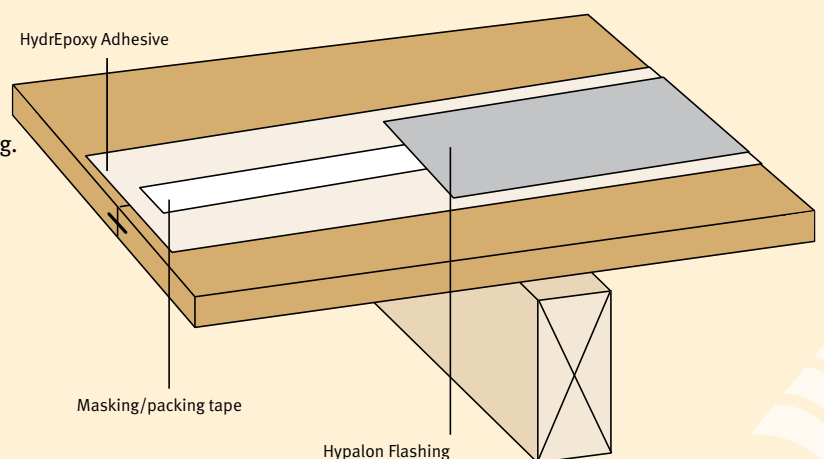


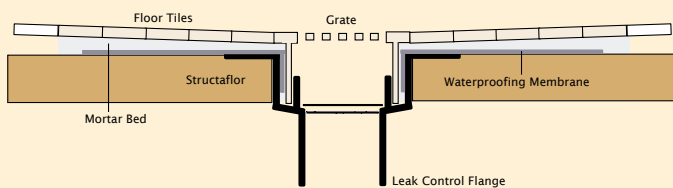
Joins

Apply flashing over all joints. They should be bedded into a 140mm wide by 3mm deep bed of epoxy adhesive applied by notched spreader.

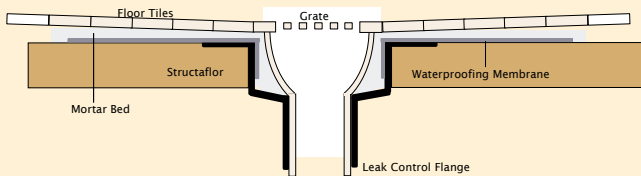
Place a 25mm wide strip of masking or packing tape centrally over the joint and the adhesive prior to positioning the flashing. Ensure the top surface of the tape is kept clean of adhesive. Use a weighted roller to press the flashing into the adhesive.

Proprietary liquid internal shower tray membranes should be isolated from sheet joints with a bond breaker or separating tape. The tape width will depend on the flexibility of the membrane. Apply the separator and reinforce the membrane in accordance with the membrane manufacturer's recommendations.





Floor Waste Outlet



Shower Floor Waste Outlet

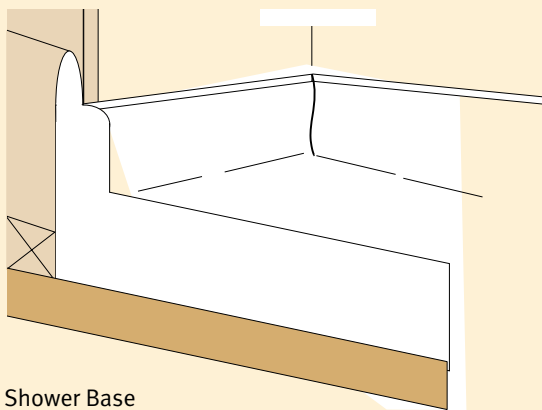
Floor/Shower Wastes

Seal edges of holes which are cut through the product for waste outlets with epoxy or construction grade adhesive.

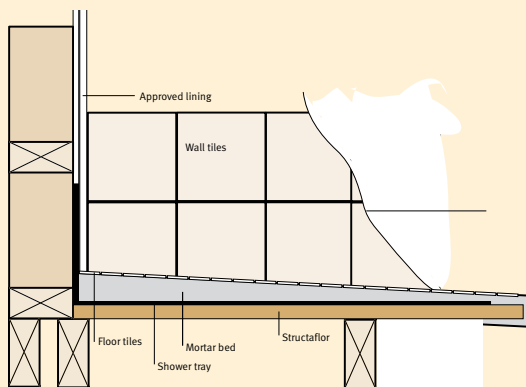
Preformed shower bases should be fitted with shower outlets which are part of the base design. With prefabricated external shower trays, waste outlet fittings must form a waterproof seal with the tray.

Sheet membrane or liquid in-situ trays are normally applied to the product surface. For best results, the waste pipe should be fitted with a leak control system.

The flange on the system is bonded to the product with waterproof adhesive and covered by the waterproof membrane which is dressed down into the leak control system.



Precast Shower Base



Shower Tray

Shower Areas

Precast shower bases:

Fit precast moulded bases including porcelain enamelled steel, acrylic, polyester and ceramic types, into the walls. Wall linings and flashings should extend into the top recessed edge of the base and be sealed with silicone or other waterproof sealer.

Ensure the tray base and sides are adequately supported and restrained against movement or distortion. Always install shower bases in accordance with the manufacturer's instructions.

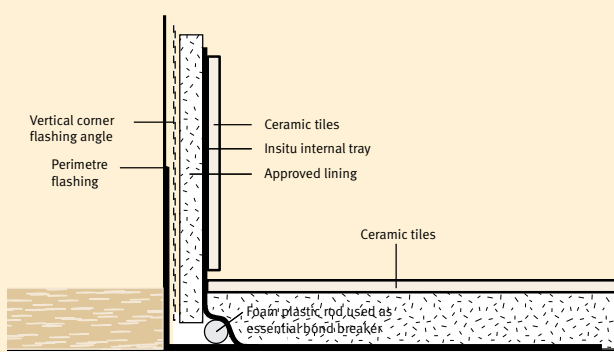
Seal the surface of the product with an epoxy sealer before fixing bases which create a cavity between the base and floor. Also use the sealer when laying a mortar bed to support the shower base. The sealer should be tacky when the mortar is applied.

Prefabricated shower trays:

Fix the approved external prefabricated shower tray to the product to form the shower recess base. Bed the tray in epoxy adhesive applied by notched spreader. The adhesive should cover the entire recess area and extend to the floor/wall joint flashings.

Typical trays are manufactured from copper, stainless steel or fibreglass. Check with your local building authority regarding tray approval. Follow the tray manufacturer's installation instructions.

Brick hobs should be set inside the tray. Alternatively set split bricks on either side of the tray upturn. Ensure the hob junctions with the floor and walls are thoroughly flashed and sealed.



In Situ Internal Tray

In-situ Internal Trays:

The trays consist of proprietary liquid membranes which are applied to the floor and wall lining surfaces. They may require reinforcement and all floor/wall joints should be formed over an essential bond breaker such as plastic foam rod. Flexibility should also be provided over the STRUCTAflor sheet joins by means of separating tape or flashing.

The liquid membranes may be used over entire room areas, including shower recesses. They can be dressed down into floor waste outlets which should be fitted with a leak control system (refer "Floor/Shower Wastes"). Always install the liquid membrane in accordance with the manufacturer's instructions.

Some membranes require professional installation.

Note: In-situ membrane materials should be approved by regulatory authorities and be installed in accordance with AS 3740.

Sheet Membrane Trays:

External in-situ sheet membranes should be bonded to the floor with waterproof adhesive applied by notched spreader. Use a weighted roller to bed the membrane into the adhesive. At corners, fold the membrane and bond with adhesive to form the tray upstand. The upstands should only be spot bonded to the wall frame.

Fix corner flashing to angles formed between the floor, walls and shower hob or riser. Care must be taken to ensure good bonding and sealing of the flashing at any joints in the membrane.

Wet Area Surfacing

In shower areas, ceramic tiles are usually laid in a mortar bed applied over the shower tray. Where the ceramic tile application extends over the wet area room, the product should be waterproofed with an in-situ sheet membrane or proprietary liquid membrane as in the shower area.

Alternatively, the floor surface outside the shower area should be sealed with an epoxy sealer. Apply a second coat of sealer and place the mortar, usually 3 parts sand to 1 part cement, while the epoxy sealer remains tacky.

In accordance with Australian Standard AS 3958.1, Guide to the Installation of Ceramic Tiles, mortar beds should be reinforced with galvanised 50mm x 50mm welded wire mesh, 2.5mm diameter. A minimum mortar bed thickness of 40mm is recommended.

Some floor surfaces which are outside the shower area may not be required to slope to a floor waste outlet. Please check with your local building authority.

Where 6mm fibre cement is applied over the product as a base for ceramic tiles or resilient sheet or tile floor coverings, fix sheet strictly in accordance with the manufacturer's instructions.

Decorative & Surface Finishing

CHH particleboard flooring is an ideal base for underlayments, floor coverings and finishes. Surface treatments include carpet, vinyl sheet or tile, cork, linoleum, quarry or ceramic tile and clear or tinted paint coatings.

Surface Finishing

Apply the covering or finish in accordance with the manufacturer's instructions. The installation should also meet the requirements of the relevant Australian Standards:

AS/NZS 2455.1, Textile Floor Coverings - Installation practice general.

AS/NZS 2311, Guide to The Painting of Buildings.

AS 3958.1, Ceramic Tiles - Guide to the Installation of Ceramic Tiles.

AS 3958.2, Ceramic Tiles - Guide to the Selection of a Ceramic Tiling System.

Preparation

Preparation of particleboard flooring to receive floor surfacings will depend on the type of covering or finish and the effect of weather exposure on the floor.

Preparatory work should be undertaken only when the building is closed and weather tight. STRUCTAflor which has been wetted must be allowed to dry to a moisture content below 10%.

Check that the STRUCTAflor is fixed tightly to joists, as per "Installation Details" page 7.

Drive fasteners below the floor surface to facilitate sanding and minimise "nail popping" in the event of substructure shrinkage.

Sanding

Sand the surface of the product to level sheet joints and fixing points, even out irregularities and remove any loose weathered particles. For general purpose sanding use 40-60 grit closed coat paper. Refer to sanding provisions detailed under Platform Exposure above.

Heavier sanding, with maximum 40 grit paper, may be required on floors which have been exposed to severe wetting. Avoid excessive sanding and limit to a 1mm maximum cut over general floor areas, 2mm maximum cut over supported sheet joints, in accordance with AS 1860.2.

For clear and tinted paint finishing, the product should be fine sanded with 100 grit closed coat paper.

After sanding remove all dust, preferably by vacuum cleaning. The prepared surface should be dry, clean and free of any surface contamination, e.g: paint, oil, etc.

Carpet

Lay carpet and soft underlays directly over the prepared STRUCTAflor surface. Most underlays can be spot fixed with staples, panel pins or adhesive. Crumb, foam and synthetic underlays are usually loose laid and perimeter stapled. Joints should be taped firmly together.

Carpet may be fixed to the product using perimeter stapling or tacking, tackless systems such as Robert's Smoothedge or adhesive installation methods. The surface of STRUCTAflor may require priming before applying adhesive. Follow textile manufacturer's instructions.

Quarry & Ceramic Tiles

Carter Holt Harvey recommend the use of a fibre cement underlay in all ceramic tile applications.

Underlay/Mortar Beds:

For monocottura, quarry, slate, marble, or soft biscuit type tiles, apply an underlay or mortar bed over the STRUCTAflor. Mortar beds are primarily used in wet areas where a fall to floor waste pipes is required. Refer "Wet Area Installation".

Typical underlays for general living areas, kitchens, hallways and entrance foyers include fibre cement sheet or flexible levelling compounds. The flexible compounds have adhesive qualities and are applied in liquid form over primed surfaces. Fix 6mm fibre cement sheet with screws or nails. Sheet underlay should be arranged so that the joints do not coincide with joints in the flooring.

It is important that the tile supplier's recommendations be followed in relation to the selection and application of primers, underlay, adhesives and ceramic floor tiles.

Note:

Select only ceramic tiles which are suitable for flooring. The selected tile and tiling system must be capable of withstanding imposed floor loads, deflection and potential dimensional movement of the substructure.

Tiling:

Carefully bed the tiles into adhesive applied over the underlay or directly into adhesive type underlay compounds. Ensure that there are no voids between the tiles. The adhesive bed thickness will depend on the rib or recess depth on the back of the tiles.

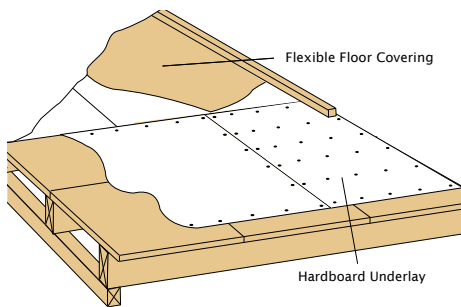
Space tiles evenly apart to accommodate grouting. Joint widths can range from 1.6mm to 12mm depending on the tile type. Apply grout when the adhesive has cured. Additives can be mixed with cement-based grout to increase joint strength and flexibility. Use a compressible grout where tiles are fixed over fibre cement underlay.

Expansion joints:

Expansion joints should be provided between tiles at approximately 5m intervals and at the perimeter of large floors. Extend the joints through to the STRUCTAflor where fibre cement sheet is used as an underlay. Fill with proprietary materials such as polyethylene foam beading covered with silicone or other suitable sealant.

Resilient Sheet and Tile

Resilient sheet and tile floor coverings, including flexible and semi-rigid PVC, cork, rubber, linoleum and cushioned vinyl require a hard underlay, e.g: Hardboard Underlay, to meet Australian Standard and floor covering manufacturer's installation requirements. Hardboard Underlay can be fixed to the flooring sheets with a construction grade adhesive, in combination with staples or ring grooved buttress type underlay nails. Ensure underlay joins do not coincide with flooring joins.



Flexible Floor Coverings

In some circumstances, users may elect to lay resilient floor coverings directly over the flooring. Before electing to do this, agreement should be obtained from the floor covering manufacturer. Sheet materials, suitable for loose lay or perimeter fixing, are preferred in these applications. Where adhesive is used, it should be a permanently flexible type and compatible with the particular floor covering.

STRUCTAflor may require sealing before applying adhesive.

Note:

Resilient floor coverings, laid directly on STRUCTAflor, can be adversely affected by substructure or floor movement. STRUCTAflor sheet joins may also become visible and show through the covering. The use of an underlay will minimise these risks. Nail and staple heads as well as underlay joins may still be visible when very thin, soft and flexible resilient floor coverings are laid over underlay sheeting.

Clear or Tinted Finishes

Polyurethane gloss floor finishes can be applied to prepared surfaces to give an attractive cork-like appearance.

Prepare the product as detailed under "Sanding". Apply a minimum three coats of polyurethane in accordance with the manufacturer's instruction.

Lightly sand between coats and vacuum clean.

Note: STRUCTAflor sheets may vary in colour and appearance. The variation will show through clear and tinted finishes.

Following colour selection and mixing, apply one coat and allow to dry. Lightly sand with 100 grit paper. Apply subsequent coats at intervals not greater than 24 hours. The second coat may be clear or tinted.

Apply a minimum of three coats. The final coat should be clear with no stain added.

Maintenance:

Sweep regularly and occasionally clean with a damp cloth. Scatter rugs or mats, placed in high traffic areas, will increase the life of the coatings. Use felt pads beneath furniture to minimise surface abrasion and scratching.

Timber T&G Strip Flooring over existing STRUCTAflor and Joist System

Assessing the Existing Floor

Timber T&G flooring may be laid over existing particleboard sheet floors. Where the existing floor is structurally sound, either overlay flooring (generally 11 mm to 14 mm thick) or structural flooring (generally 19 mm to 22 mm thick) can be laid. Floors may be fixed into the joists or with shorter fixings at reduced centres into the existing floor only.

In instances where there is doubt over the structural adequacy of the existing floor, defective boards or sheets should be replaced to make the existing floor structurally sound, or structural flooring fixed through to the joists can be used. To provide a level surface, top (face) nails in existing flooring should be re-punched and the existing floor rough sanded.

Adhesives require a clean, structurally sound floor that is free from moisture,

loose particles and contaminants. It is also particularly important that if a new floor is laid at 90° to an existing floor, the existing floor must be structurally sound and level.

In some instances sheet sub-floors (substrates) can sag between joists and if not leveled, the sagging will show through to the new floor. It is also necessary to check that the existing floor moisture content is appropriate to accept the new floor.

The cause of any excess moisture (wetting during construction, leaks, inadequate sub-floor ventilation, etc) needs to be addressed prior to installation. Prior to laying, the existing floor should be of similar moisture content (within a few per cent) to the new floor.

Squeaking present in an existing T&G floor may be reduced by providing a bead of polyurethane flooring adhesive to fill any gaps between the underside of flooring and tops of joists (caused by cupping, shrinkage etc).

Further reductions may be achieved by fixing a seasoned batten (approximate dimensions 35 x 45mm), to the underside of flooring (mid-span between joists) fixed with a full length bead of polyurethane flooring adhesive and screwed at approximately 300mm centres.

Installation of flooring should not be done until other construction activities (particularly wet trades) are complete and after the building is roofed and enclosed, with the temperature and humidity as close as possible to the expected in-service conditions.

Detailed installation information on timber flooring can be found on:

www.timber.org.au

www.timberqueensland.com.au

www.atfa.com.au

Concrete Surfacing

Concrete floors in domestic, commercial and industrial buildings can be upgraded with particleboard flooring to change the surface characteristics and adapt the floor for special purposes, e.g: work areas, goods storage, display, sport or recreation, children’s play areas, etc or as a base for decorative timber flooring. Particleboard flooring provides a uniform, comfortable “walk on” surface and the feeling of warmth associated with wood.

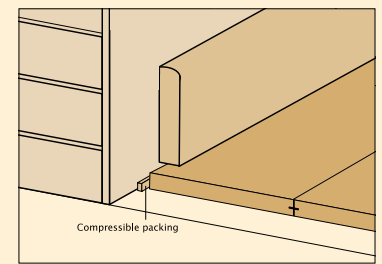
STRUCTAflor provides the ideal base surface for base under decorative timber flooring or over a concrete slab

Concrete Surfaces:

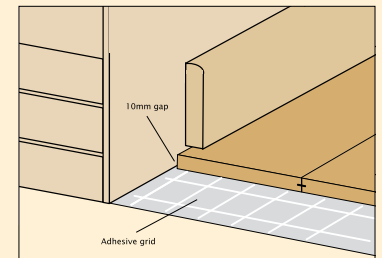
The concrete should be dry, reasonably flat and clean of dirt, oil, grease or fatty substances. A moisture impervious membrane should be located beneath slabs on the ground.

Prior to installation it is necessary to ensure that the concrete is sufficiently level to accept the system. Where the slab is greater than 3mm out of level over any 1500mm length, a concrete topping (leveling compound), grinding or packing should be used. Slabs on ground should be constructed with a continuous under slab vapour barrier (e.g: 0.2mm thick polyethylene). Timber floors should not be installed until the concrete slab has a moisture content less than 5% (generally achieved after slabs have cured for approximately 4-6 months). In old slabs, moisture contents should be below this level and if not, care should be exercised.

Various methods are available to test the moisture content of concrete, including resistance metres, capacitance metres and hygrometres.



Particleboard flooring on Concrete Loose Laid



Particleboard flooring on Concrete Adhesive Bonded

Fixing:

Use tongue and grooved STRUCTAflor, arranged in rows in a brickwork pattern. Provide 10mm clearance at the room perimeter. The sheets may be loose laid or adhesive bonded with construction grade adhesive. Pack the room perimeter clearance around loose laid sheets with pieces of compressible material, e.g: Cane-ite, polystyrene, etc. Use adhesive to bond the tongue and grooved joints between loose laid sheets.

When using adhesive, fix one sheet of STRUCTAflor at a time. Apply adhesive to the concrete in continuous, 6mm diameter beads in a grid pattern. Use the “contact bond” method of fixing in accordance with the adhesive manufacturer’s instructions.

Carefully position each sheet before making final contact bond.

Trowelable type flooring adhesives can also be used for fixing particle flooring (T&G or square-edge) to provide a base for fixing decorative timber strip flooring using secret nail or face nail fixing techniques. Depending on the condition of the concrete surface, a vapour moisture barrier and/or a floor levelling compound may be required. Use adhesive and ancillary products in accordance with the manufacturer’s instructions.

Uneven Surfaces:

These should be brought to a reasonable level or covered with resilient material before laying particleboard flooring. The preparatory method will depend on the extent of surface irregularity.

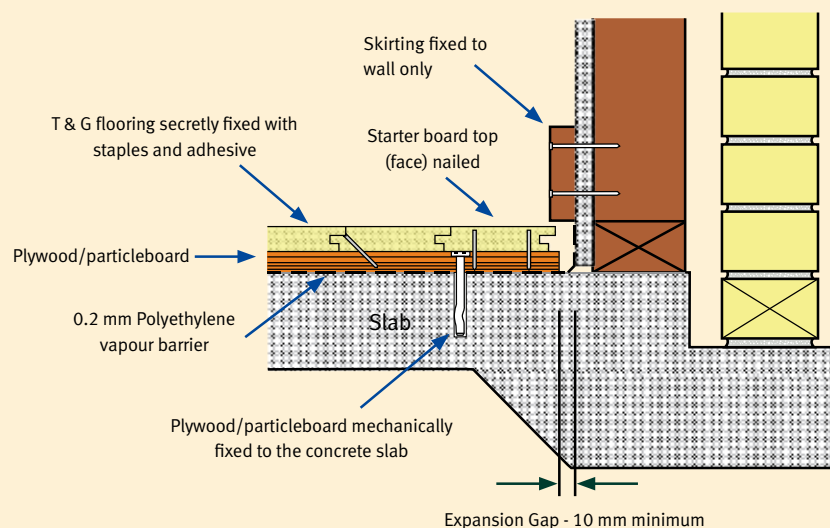
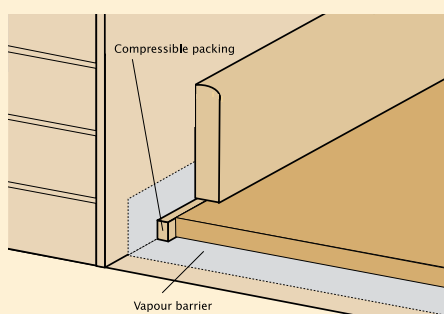
Fill small depressions with a proprietary levelling compound. Ensure the compound is dry before laying the product.

A screed of consolidated dry sand, over an impervious vapour barrier, is a European system for overcoming severe irregularities.

Resilient materials include Cane-ite® insulating board, polystyrene, resin bonded fibreglass or mineral wool insulation (see also “Raft and Floating Floors”).

Vapour Barriers:

An impervious moisture barrier, e.g: 0.2mm polyethylene, should be laid over any concrete surfaces subject to dampness. Lap and tape all joints and fold the barrier up walls. Loose lay the STRUCTAflor as outlined under “Fixing”.



Typical Timber T&G Strip Flooring over Particleboard on Concrete

Other Applications

Alternative Applications

CHH particleboard flooring is suitable for alternative flooring applications to restore old floors, upgrade concrete floors, reduce sound transmission or accommodate sub floor services for computers, telephones, plumbing, etc.

Raft and Floating Floors

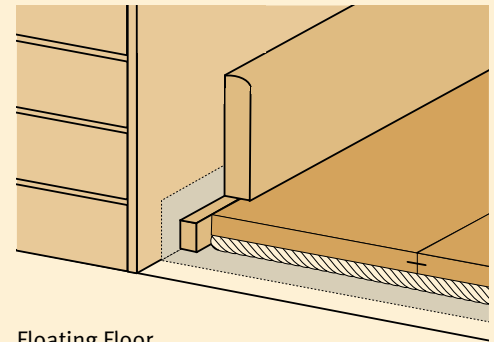
To reduce sound transmission through existing floors, particleboard flooring may be used as a raft or floating floor over a layer of resilient material, e.g: Cane-ite insulating board, expanded polystyrene, resin bonded fibreglass, etc. The purpose of the assembly is to isolate the existing floor and walls from surface vibrations associated with airborne sound and impact e.g: footsteps.

Raft or floating floors are not fixed to the sub floor. They are held in position by their own weight and by skirting fixed to perimeter walls.

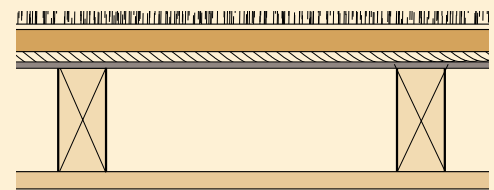
Best results are obtained where the floor systems are applied over concrete to reduce impact noise transmission to the room below. Another recognised control against impact noise is to cushion the impact with a soft floor surfacing e.g: carpet over felt or other resilient underlay.

Raft or floating floors may also be applied over existing timber floors.

The effectiveness of raft and floating floor systems is limited by their retention of resilience under load. Also by the extent to which pipes, services, etc, form bridges to conduct vibrations between the floor and the structure.



Floating Floor



Floating Floor (Over Timber)

Acoustic Flooring

Insulated floors can greatly reduce the transmission of sound between adjacent apartments and provide the desired peace without compromising the life style. Sound pressure level is measured in decibel (dB). A 3 dB change is barely noticeable for the ordinary person. Most people perceive an increase of 10 dB as twice as loud and accordingly a decrease of 10 dB as half as loud. For instance, the typical open plan office is usually around 45-50 dB(A), speech at 1 m is 55-60 dB(A), a truck at 3 m is 85 dB(A), and the threshold of pain is 120-130 dB(A). Further typical examples are given in Table 6.

Table 6: Typical examples of perceived sound

Sound Levels and Human Response		
Perception Example	Sound Level [dB]	Effect
Rocket launching pad	180	Irreversible hearing loss
Auto horn (at 1m distance)	120	Maximum vocal effort
Rock concert	110	Extremely loud
Firecrackers	100	Very loud
Heavy truck (at 17m distance)	90	Very annoying
Alarm clock	80	Annoying
Loud busy street	70	Telephone use difficult
Average office	60	Intrusive
Normal conversation	50	Quiet
Quiet office	40	
Library	30	Very quiet
Quiet room	20	
Very faint normal breathing	10	Just audible
Threshold of hearing	0	Threshold of hearing

Source: The Noise Pollution Clearing House.

Sound transmission can be divided into two types of sound sources: impact sound sources and airborne sound sources. Impact sound sources transmit sound energy through direct contact with the structure (e.g. footfall on floor), whereas airborne sound source are sound sources which transmit sound energy to a building element, like a floor, through the air.

Airborne sound

Airborne sound comes from common sound sources such as voices, TVs and radios. It typically is measured using the Weighted Sound Reduction Index (R_w) and is in general applied to both wall and floor elements. The higher the number (e.g. R_w 50) the better the performance. R_w can be used on its own or modified using the spectrum adaption term, C_{tr} , to take greater account of low frequency noises like bass or sub woofer. C_{tr} is usually a negative number with a typical range of -1 to -15, and so, even though it is added to the R_w value, the net result is a lower number than the R_w value on its own. It is therefore significantly harder to achieve $R_w + C_{tr}$ 50 than R_w 50 on its own.

The higher the R_w or $R_w + C_{tr}$ value, the more noise is absorbed and the better the system is at isolating airborne noise and the quieter the building. An increase of one R_w unit is approximately equal to a reduction of one dB in noise level. An R_w rating of 45 means that the element reduces the sound passing through it by 45 dB.

Impact sound

Impact sound comes from common sound sources such as heavy footsteps (particularly on bare timber or tile floors), banging doors, scraping furniture, vibration from loud music, and plumbing noise. It occurs when part of the building is directly or indirectly impacted. Effectively, energy passes through the building structure and creates noise in nearby rooms. It typically is measured using the Weighted Normalised Impact Sound Pressure Level ($L_{n,w}$). The lower the number (e.g. $L_{n,w}$ 62) the better the performance. $L_{n,w}$ can be used on its own or modified using the spectrum adaption term, C_i , to take greater account of low frequency impact noises like footsteps. C_i is usually a positive number, and so when added to the $L_{n,w}$ value, the net result is a higher number than the $L_{n,w}$ value on its own. It is therefore significantly harder to achieve $L_{n,w} + C_i$ 62 than $L_{n,w}$ 62 on its own.

BCA Sound-Design Requirements

Sound Performance Regulation in Dwellings

The Building Code of Australia (BCA) only regulates sound performance for residential units that are connected to each other. In single family dwellings there are no regulated sound performance. The difference in sound performance of some typical residential dwellings can be seen when comparing Figure 9, Figure 10 and Figure 11 on page 26.

Sound Performance Regulation in Multi Residential Buildings

Part F5 of the Building Code of Australia (BCA) is concerned with protecting residence in multi residential building, like an apartment block, from unwanted noise. BCA Performance Requirements focus on the sound insulation of wall and floor elements where separating:

- adjoining units; and
- common spaces from adjoining units

It prescribes a R_w or $R_w + C_{tr}$ value of not less than 50 and for floors an additional impact requirement of $L_{n,w} + C_i$ or $L_{n,w}$ having a value of not greater than 62. Data of systems which pass these criteria can be found in various guides of manufacturers. Typical floor details for multi residential buildings are given in Figure 12 to Figure 15 (Sound rating values in bold indicate BCA compliance).

Improve and Upgrade Sound Performance

Many building occupants demand a high sound performance as sound disruptions impact on the day-to-day living quality. Therefore, quiet buildings command premium prices, so it often pays to upgrade sound performance.

Sound performance of floors can often be improved by simple attention to some key details or additions:

- add extra mass
- add insulation in floor cavity
- attach ceiling lining via sound isolation clips and furring channels
- install floating floor

Extra mass

The addition of mass is a simple yet important means of improving sound performance in timber-framed construction. In its simplest form, this involves adding extra layers of material such as particleboard to the floor system. To further improve the sound reduction an extra layers of materials such as plasterboard can be added to the ceiling.

Floor cavity insulation

A layer of insulation in the ceiling cavity is a fast and relatively easy way to increase acoustic performance without increasing overall building height or interfere with other systems in the building. There are many different types and grades of insulation batts available in the market place. Sound insulation specific batts are best and in addition, high density materials tend to outperform low density materials. This is the case up to a density of 60 kg/m², above this the density has a minor effect. It is recommended that a minimum density of 10 kg/m² be used.

Sound isolation clips and furring channels

Using sound isolation clips to attach the ceiling lining via furring channels to the floor joists of floor trusses can improve the sound performance significantly. Commonly used sound isolation clips are rubber grommet based clips, isolation hanger plates or spring based resilient mounts. The ceiling lining in turn is fixed to furring channels which simply clip into the sound isolation clips.

Floating floor

Incorporating a soft layer of material which attenuates sound is a simple yet important means of improving sound performance in timber-framed construction. A range of products based on various materials with a wide range of thicknesses, starting from about 2 mm, is available.

Particleboard Floor System Sound Performance

The following illustrations are a selection of commonly used floor systems with indicative sound performance values included. A range of values are given as the performance of floor systems is dependent on the actual material used, such as insulation or ceiling linings used and depth of joist. For more accurate information refer to the manufactures of these products.

Floor System A

Insulation	$R_w + C_{tr}$	$L_{n,w} + C_l$		Flooring: min. 19mm STRUCTAflor Joists: min. 140mm deep timber joists Mounts: none Ceiling: 1x 10mm standard plasterboard
		Carpet	Bare/Tiles	
No insulation	30-37	60-65	-	
75mm glasswool; R1.5	34-40	60-65	85-90	

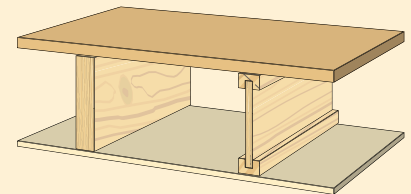


Figure 9: Floor System A

Floor System B

Insulation	$R_w + C_{tr}$	$L_{n,w} + C_l$		Flooring: min. 19mm STRUCTAflor Joists: min. 140mm deep timber joists Mounts: A-clips + furring channels Ceiling: 1x 10mm standard plasterboard
		Carpet	Bare/Tiles	
No insulation	32-41	60-65	-	
75mm glasswool; R1.5	35-46	60-65	85-90	

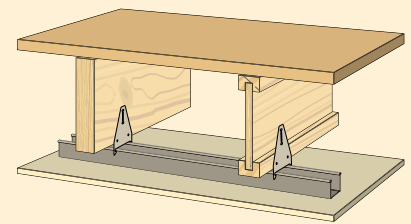


Figure 10: Floor System B

Floor System C

Insulation	$R_w + C_{tr}$	$L_{n,w} + C_l$		Flooring: min. 19mm STRUCTAflor Joists: min. 140mm deep timber joists Mounts: Sound isolation mounts + furring channels Ceiling: 1x 10mm standard plasterboard
		Carpet	Bare/Tiles	
No insulation	38-40	55-60	75-80	
75mm glasswool; R1.5	40-45	50-55	65-70	

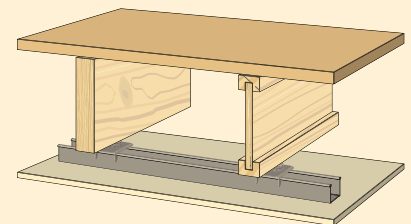


Figure 11: Floor System C

Floor System D

Insulation	$R_w + C_{tr}$	$L_{n,w} + C_l$		Flooring: min. 19mm STRUCTAflor Joists: min. 140mm deep timber joists Mounts: A-clips + furring channels Ceiling: 2x 13mm fire plasterboard
		Carpet	Bare/Tiles	
No insulation	39-46	50-55	80-85	
75mm glasswool; R1.5	42-50	50-55	75-80	

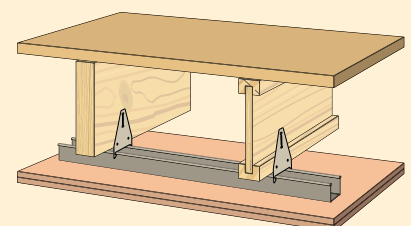


Figure 12: Floor System D

Floor System E

Insulation	$R_w + C_{tr}$	$L_{n,w} + C_1$		Flooring: min. 19mm STRUCTAflor Joists: min. 140mm deep timber joists Mounts: Sound isolation mounts + furring channels Ceiling: 2x 13mm fire plasterboard
		Carpet	Bare/Tiles	
No insulation	44-46	50-55	70-75	
75mm glasswool; R1.5	48-50	45-50	60-65	

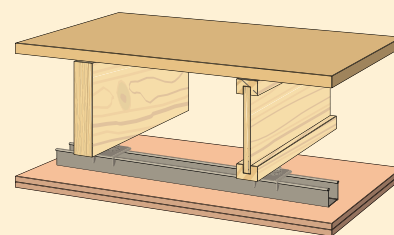


Figure 13: Floor System E

Floor System F

Insulation	$R_w + C_{tr}$	$L_{n,w} + C_1$		Flooring: min. 19mm STRUCTAflor Joists: min. 140mm deep timber joists Mounts: suspended ceiling + furring channels Ceiling: 2x 13mm fire plasterboard
		Carpet	Bare/Tiles	
No insulation	42-44	60-65	80-85	
75mm glasswool; R1.5	48-42	55-60	75-80	

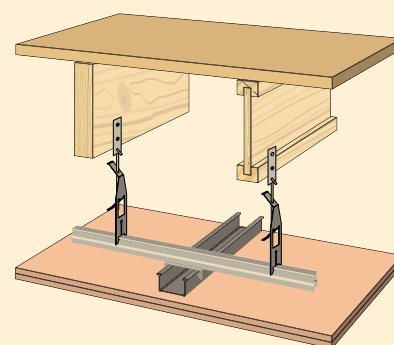


Figure 14: Floor System F

Floor System G

Insulation	$R_w + C_{tr}$	$L_{n,w} + C_1$		Flooring: min. 19mm STRUCTAflor Joists: min. 140mm deep timber joists Mounts: suspended ceiling + sound + isolation mounts + furring channels Ceiling: 2x 13mm fire plasterboard
		Carpet	Bare/Tiles	
No insulation	45	50-55	70-75	
75mm glasswool; R1.5	51-55	45-50	60-62	

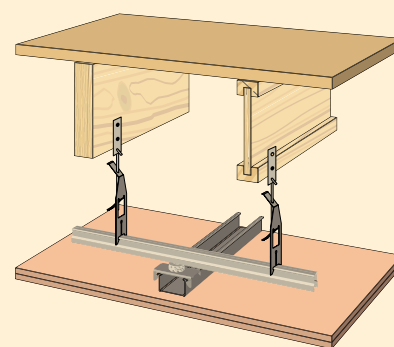


Figure 15: Floor System G

Flooring Maintenance & Repairs

Timber Floor Restoration

Particleboard can be laid over severely worn or cupped timber floors which are structurally adequate.

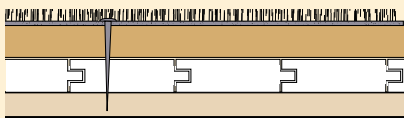
Preparation:

Before installing, check the subfloor conditions. Where dampness exists, the source of moisture must be corrected and the subfloor and timbers allowed to dry. In some circumstances it may be necessary to provide additional subfloor ventilation.

Replace any damaged or decayed timber and re-nail loose floorboards. Punch protruding nails below the floorboard surface.

Fixing:

Use particleboard tongue and grooved, laid in rows in a stretcher bond pattern with the long edges at right angles to the floor joists. Fix directly into joists. Allow 10mm minimum clearance at the room perimeter.



Timber Floor Restoration

Flooring Load Tables

The span capacity of particleboard flooring given in this guide is for the load condition of a single family home.

Particleboard flooring can also be used for a number of different loads and spans to meet other load conditions such as those required for commercial buildings. For further information on the capacity of particleboard floors refer to the Particleboard Flooring Design Manual produced by the Engineered Wood Product Association of Australasia. This can be found at www.ewp.asn.au

Product Material and Properties

Table 7 describes typical dimensions and package size available in the CHH STRUCTAflor range.

Table 7: Dimensions and Packaging

Thickness	Edge type	Length +/- 2mm	Width +/- 2mm	Sheets per pack	Contents m ²	Approx Mass per pack (kg)
19mm	YELLOWtongue	3600	900	30	97.2	1350
		3600	600	30	64.8	900
22mm	REDtongue	3600	900	30	97.2	1500
		3600	600	30	64.8	1000
19mm	Square	3600	1800	15	97.2	1350
22mm		3600	1800	15	97.2	1500
25mm	BLUETongue	3600	600	15	54.0	1134

Particleboard Flooring Properties

Table 8 contains typical properties for Australian produced particleboard flooring in internal application where they are not subject to prolong wetting or high level of relative humidity. The equilibrium moisture content of the board should be maintained below 13%.

Table 8: Typical Property Values for Class 1 Particleboard Flooring

Property	Units	Thickness - mm		
		19	22	25
Density	kg/m ³	680	700	700
Blending Strength (MOR)	MPa	24	21	24
Bending Stiffness (MOE)	MPa	3500	3250	3750
Internal Bond Strength	MPa	0.70	0.75	0.80
Surface Water Absorption	g/m ²	50	50	50
Thickness Swell (24 hr)	%	3	3	2
Glue Bond Durability	MPa	5.5	5.5	6
Glue Bond Quality	MPa	12	12	12
Thickness Stability	%	11	11	11
Formaldehyde Potential (Desiccator Method)	mg/L	1.3	1.3	1.3

Source: Facts About Particleboard and MDF EWPA 2010 – www.ewp.asn.au

Fire Hazard Properties

For certain building types and locations within the building, the Building Code of Australia stipulates minimum fire properties of materials used in construction. These fire hazard properties are generally used for commercial buildings and are required for not single family houses (Class 1).

Commercial Building

Particleboard used as a flooring substrate - BCA Specification C1.10 - Early Fire Hazard Properties.

This fire hazard property is used where particleboard is not the final floor covering such as under a carpet or tiled floor. In this case the Early Fire Hazard properties are required for most single family homes.

Table 9 below shows the properties of typical particleboard flooring.

	Index	Range
Ignitability	12 - 13	0 - 20
Spread of flame	6 - 7	0 - 10
Heat Involved	7 - 8	0 - 10
Smoke Developed	2 - 3	0 - 10

Source: Facts About Particleboard and MDF, EWPA 2010

Particleboard used as a Floor Covering – BCA Specification C1.10a

Where particleboard is used as the actual floor covering (exposed) in commercial buildings, Specification C1.10a of the BCA fire hazard properties places limits on the floor covering performance in various locations within a building or whether sprinklers are used. Table 17 below contains the test result for typical STRUCTAflor, minimum 19mm thick.

Mean Distance of Flame Travel	326.7 mm
Average Critical Radiant Flux	7.0 kW/m ²
Average Smoke Obscuration	48 % min

Source: CSIRO Manufacturing & Infrastructure Technology. Report No. FNR8861C

Thermal Insulation

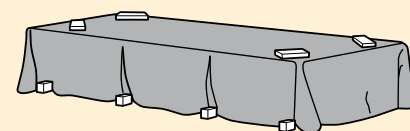
The thermal conductivity of STRUCTAflor and STRUCTAflor Terminator is 0.12 W/mK. Thermal resistance (R-values) calculated in accordance with the relevant provisions of Australian Standard AS/NZ4859.1 for the nominated thicknesses are:

Product	R-value (Thermal resistance m ² K/W)		
	YELLOWtongue 19mm	YELLOWtongue 19mm	YELLOWtongue 19mm
CHH Flooring	R0.16	R0.18	R0.21
R-flor	Refer to Table 5 or the R-flor calculator for the R-value of R-flor as part of a flooring system		

Storage & Handling

STRUCTAflor is designed to withstand full weather exposure for up to 3 months. Because of this there is a tendency to leave packs unprotected on site before installation. Packs of STRUCTAflor must be protected from the weather until it is installed as moisture penetration of the product before installation may lead to gaps occurring at the flooring joints when the product dries out.

When storing outside, ensure packs are kept clear of the ground. Cover with waterproof sheeting laid on timber battens so that air circulates freely between the waterproof cover and the product.



Health and Safety

The normal health and safety precautions should be taken when working with wood panel products. Machine tools should be fitted with dust extractors and work areas kept clean. If dust levels exceed Worksafe Australia standards the wearing of a dust mask (AS/NZS 1715 and AS/NZS 171) and safety glasses (AS/NZS 1337) is recommended.

Storage and work areas should be adequately ventilated.

Shelving

The use of particleboard flooring as shelving has become widespread from the early days of the industry in Australia. Particleboard flooring panels are well suited to industrial shelving systems because of their predictable and non-directional mechanical and physical properties, flat wear resistant surfaces, and most importantly, their economy.

Shelving Design

For information on shelving design, a design manual can be found on: www.ewp.asn.au

Safe Load Tables for shelving are based on Uniformly Distributed Loading (UDL). True Concentrated Loads, operating at centre span, are not considered to be applicable. Loads applied to shelving via four support legs would approximate the UDL condition for design purposes; patch loads can also be considered to approximate Uniformly Distributed Loading.

Safe Load Tables are all based on simply supported shelving. Occasionally screws or clips are used to locate shelving and prevent movement, but this does not represent fixed ends in an engineering sense. Three support cases are included:

- Single span (2 parallel supports)
- Multiple spans (3 or more parallel supports)
- Four edge support

Shelving Load Tables

Load/Deflection Tables give safe loads and maximum deflections resulting from those loads. They are initial deflections and do not include any allowance for creep.

Creep in particleboard would be expected to double initial deflections under temperate conditions of temperature and relative humidity. Temperate conditions include atmospheric conditions in the southern region of Australia and also air conditioned interiors.

In tropical areas, with shelving exposed to the interior effects of weather cycles of temperature and relative humidity, the creep factor is three times initial deflection. If shelving is exposed to severe tropical weather conditions in protected exterior exposure, a creep factor of four should be used.

STRUCTAflor can be used as shelving in all areas of Australia, including tropical areas.

Table 11. Safe Uniformly Distributed Loads (P) – (kPa) for Shelving Supported on Two Parallel Supports and Resulting Deflection (Δ) - (mm)

Board Type	Thick (mm)	Span (mm)											
		450		600		750		900		1000		1200	
		P	Δ	P	Δ	P	Δ	P	Δ	P	Δ	P	Δ
PB Flooring	19	8.1	2.5	4.6	4.5	2.9	7.0	2.0	10.0	1.6	12.4	1.1	17.9
	22	10.3	2.2	6.1	3.9	3.9	6.0	2.7	8.7	2.2	10.7	1.5	15.4
	25	14.0	1.9	7.9	3.4	5.0	5.3	3.5	7.6	2.8	9.4	2.0	13.5

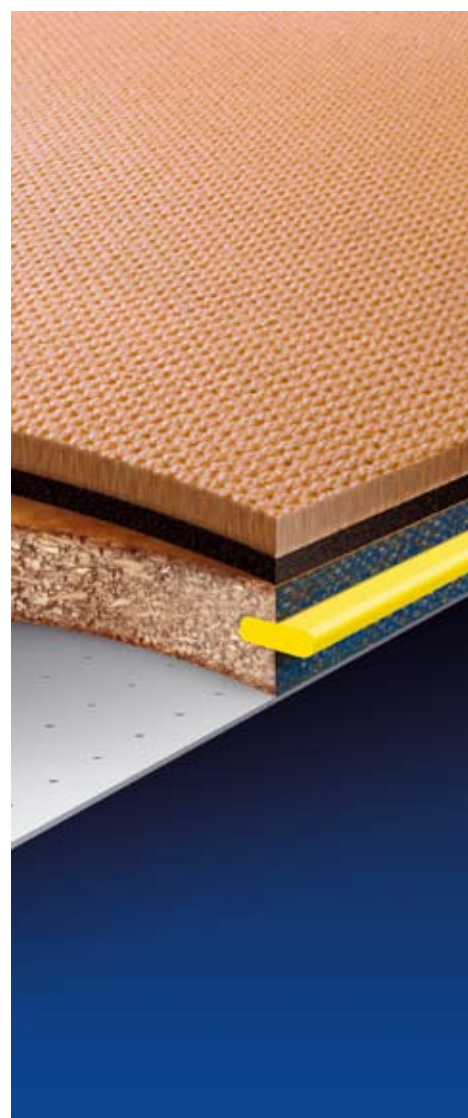
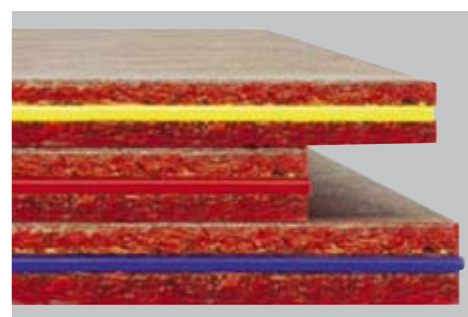
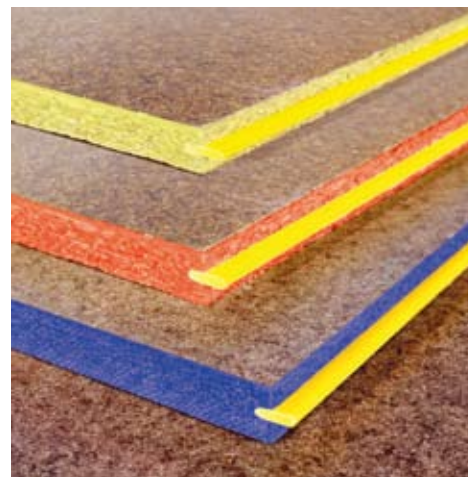
Table 12. Safe Uniformly Distributed Loads (P) – (kPa) for Shelving Supported on Three or More Parallel Supports and Resulting Deflection (Δ) - (mm)

Board Type	Thick (mm)	Span (mm)											
		450		600		750		900		1000		1200	
		P	Δ	P	Δ	P	Δ	P	Δ	P	Δ	P	Δ
PB Flooring	19	8.1	1.1	4.6	1.9	2.9	3.0	2.0	4.3	1.6	5.3	1.1	7.6
	22	10.3	0.9	6.1	1.6	3.9	2.6	2.7	3.7	2.2	4.6	1.5	6.6
	25	14.0	0.8	7.9	1.4	5.0	2.3	3.5	3.3	2.8	4.0	2.0	5.8

Table 13. Safe Uniformly Distributed Loads (P) – (kPa) for Shelving Supported on all Four Edges and Resulting Deflection (Δ) - (mm)

Length		a		1.25a		1.5a		1.75a		2a	
Thick	Width (mm) (a)	P	Δ	P	Δ	P	Δ	P	Δ	P	Δ
19mm	450	21.0	1.8	15.4	2.0	12.1	2.1	10.7	2.1	10.1	2.2
	600	11.8	3.2	8.6	3.6	6.8	3.7	6.1	3.8	5.7	4.0
	750	7.6	5.1	5.5	5.6	4.4	5.8	3.9	5.9	3.6	6.2
	900	5.3	7.3	3.8	8.0	3.0	8.2	2.7	8.4	2.5	8.9
	1000	4.3	9.1	3.1	9.9	2.5	10.0	2.2	10.4	2.1	11.0
	1200	3.0	13.0	2.2	14.3	1.7	14.6	1.5	15.0	1.4	15.8
22mm	450	28.2	1.6	20.6	1.7	16.2	1.8	14.4	1.8	13.5	1.9
	600	15.8	2.8	11.6	3.1	9.1	3.2	8.1	3.2	7.6	3.4
	750	10.1	4.4	7.4	4.8	5.9	4.9	5.2	5.0	4.9	5.3
	900	7.0	6.3	5.1	6.9	4.1	7.1	3.6	7.3	3.4	7.7
	1000	5.7	7.8	4.2	8.6	3.3	8.8	2.9	9.0	2.7	9.5
	1200	4.0	11.2	2.9	12.3	2.3	12.6	2.0	12.9	1.9	13.7
25mm	450	36.0	1.4	26.6	1.5	21.0	1.6	18.6	1.6	17.5	1.7
	600	20.5	2.5	15.0	2.7	11.8	2.8	10.2	2.8	9.8	3.0
	750	13.1	3.9	9.6	4.2	7.6	4.3	6.7	4.4	6.3	4.7
	900	9.1	5.6	6.7	6.1	5.3	6.3	4.7	6.4	4.4	6.8
	1000	7.4	6.9	5.4	7.5	4.2	7.7	3.8	7.9	3.5	8.3
	1200	5.1	9.9	3.7	10.8	3.0	11.2	2.6	11.4	2.5	12.0

NOTES



Further Information

For further information please telephone 1300 658 828 (toll free) for a copy of the STRUCTAflor Material Safety Data Sheet.

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