Installation and Design Manual
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, TERMITflor 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, TERMITflor 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, STRUCTAflor and TERMITflor remain the number one choice of the majority of Australian builders.

Market Leader
STRUCTAflor, TERMITflor, Termite protected particleboard flooring and R-flor Radiant Barrier particleboard flooring has pioneered the market through high quality products and expert innovation.

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, TERMITflor 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.

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
- 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
- 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

Key Points

Storage
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.

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 the 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. The depth of material removed shall not exceed the following:-

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

Remove any water that ponds on the platform by sweeping or by drilling holes no larger than 8mm in diameter and no closer than 1 meter apart.

Installation
Adhesives - Elastic Polyurethane Timber Flooring adhesive specifically formulated for particleboard flooring is to be used with Screw/Nail fixing. Screws fixing being the preferred method.

Flexible adhesive allows for movement in building structure and minimises risk of Squeaky Floor.
STRUCTAflor, TERMIflor 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, TermiFlor, R-flor and R-flor are termite protected sheet flooring that provides added protection against termite attack.

**Product Description**

Designated to provide a total flooring concept, STRUCTAflor, TERMIflor 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, TERMIflor 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 neat, tight fit for adjoining panels.

STRUCTAflor, TERMIflor and R-flor are available in YELLOWtongue, REDtongue and BLUEtongue colours. The tongue and grooved sheets are supplied in easy-to-handle 600mm or 800mm widths. Large 3600mm x 1800mm sheets of square edge STRUCTAflor and TERMIflor 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 joint centres for YELLOWtongue STRUCTAflor, TERMIflor, 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 joint centres for REDtongue STRUCTAflor, TERMIflor, 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.

**Product Details**

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

Surface Qualities: Upper surface is unsealed 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 reduce moisture ingress.

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

The Facts That Matter

- Resin Enriched Surface
- Added weather protection during construction – Up to for 3 months
- Hardwearing working surface during installation
- Edge Coat – Minimises moisture ingress
- Easy product identification
- RED – TERMIflor
- 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

**Productivity and Efficiency**

- STRUCTAflor & TERMIflor Range – YELLOWtongue – 19mm Domestic Flooring – 450mm joist spacing
- REDtongue – 25mm Domestic Flooring – 600mm joist spacing
- BLUEtongue – 55mm Domestic Heavy Duty Commercial Flooring

**Durability**

- 900mm wide sheet – 3.24m2 coverage per sheet
- 600mm wide sheet – YELLOWtongue sheet weighs < 33kg (approx)

**Resilience**

- Australian Plantation Pine – Grown from managed and renewable sources

**Convenience**

- Sawn to size on site
- Quick to lay and install

**Compatibility**

- 450mm joist centres, 25mm thick BLUEtongue will support
- Wide range of flooring options

**Environment**

- 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.
Product Installation

Installation Methods

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

Fitted Construction

This applies to STRUCTAflor and TERMflor 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.

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.

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 REDtongue
  – 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”).

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, parquetry, 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.

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

(Fixed Spacing – Additional Requirements for relevance)

Close fixing - for tongues and grooved panels

(See Safe Load Tables - Additional Requirements for relevance)

Fixing - for square edged panels

(Standard Fixing)
YELLOWtongue, REDtongue and BLUetongue

Set a string line to the floor extremity and at all right angles to the joists.
Position the first sheet with the tongueed 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 at 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 tongueed edges into grooves. Stagger end and joins and seal any cut ends with construction grade adhesive.

Double Layers
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 joins are staggered between the two layers and the end joins meet on a different floor joist. A bead of adhesive is to be applied on the first layer at the joint position and fasten through both layers into floor joists.

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/screws flush with the Structaflor/TERMIflor surface. Immediately prior to sanding, punch nails/screws 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 joints
AS1860.2 states that when particleboard flooring is fixed to I-beam joints, screws (not nails) should be used. I-beam flanges may only be 35mm thick and nails will penetrate through and may not have sufficient holding strength.

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 and join using a straighter 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 and joins and seal any cut ends with construction grade adhesive.

Table 1. Sheet Quantity Estimator

<table>
<thead>
<tr>
<th>Width</th>
<th>Thickness x Length</th>
<th>Area</th>
<th>Size of Floor (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>900mm</td>
<td>19mm x 3600mm</td>
<td>3.24m²</td>
<td>10 25 50 75 100 150 200 250</td>
</tr>
<tr>
<td>600mm</td>
<td>19mm x 3600mm</td>
<td>2.16m²</td>
<td>5 12 24 36 47 70 93 116</td>
</tr>
</tbody>
</table>

Figure 4. Double Layer Layout

Figure 5. Fixing to EWP I-Beam

Notes:
1. For ease of mating tongue and grooved edges, staggering the long edges at 450mm centres and at 600mm centres. Drive nails/screws flush with the Structaflor/TERMIflor surface. Immediately prior to sanding, punch nails/screws 2mm below the surface.
2. Tongues may be removed from the first row of sheets to “make good” off-cuts.

Table 2. Fasteners

<table>
<thead>
<tr>
<th>Fastening method</th>
<th>Joint material</th>
<th>Fastener type</th>
<th>Flooring</th>
<th>Minimum fastener</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Nailing</td>
<td>Hardwood or Cypress Pine</td>
<td>Bullet head or flathead nails</td>
<td>10mm, 22mm</td>
<td>50mm x 2.8mm</td>
</tr>
<tr>
<td>Manual Nailing</td>
<td>Hardwood or Cypress Pine</td>
<td>Bullet head or flathead nails</td>
<td>25mm</td>
<td>65mm x 3.75mm</td>
</tr>
<tr>
<td>Manual Nailing</td>
<td>Softwood</td>
<td>Bullet head or flathead nails</td>
<td>10mm, 22mm</td>
<td>65mm x 2.8mm</td>
</tr>
<tr>
<td>Manual Nailing</td>
<td>Softwood</td>
<td>Bullet head or flathead nails</td>
<td>25mm</td>
<td>75mm x 3.75mm</td>
</tr>
<tr>
<td>Machine Driven</td>
<td>Hardwood or Cypress Pine</td>
<td>D head, round head or finished head</td>
<td>10mm, 22mm</td>
<td>50mm x 2.5mm</td>
</tr>
<tr>
<td>Machine Driven</td>
<td>Hardwood or Cypress Pine</td>
<td>D head, round head or finished head</td>
<td>25mm</td>
<td>65mm x 2.5mm</td>
</tr>
<tr>
<td>Machine Driven</td>
<td>Softwood</td>
<td>D head, round head or finished head</td>
<td>10mm, 22mm</td>
<td>65mm x 2.5mm</td>
</tr>
<tr>
<td>Machine Driven</td>
<td>Softwood</td>
<td>D head, round head or finished head</td>
<td>25mm</td>
<td>75mm x 2.5mm</td>
</tr>
<tr>
<td>Machine Driven</td>
<td>Steel</td>
<td>Hard steel twist, concial point</td>
<td>10mm, 22mm</td>
<td>32mm x 2.5mm*</td>
</tr>
<tr>
<td>Machine Driven</td>
<td>Steel</td>
<td>Hard steel twist, concial point</td>
<td>25mm</td>
<td>40mm x 2.6mm*</td>
</tr>
<tr>
<td>Pneumatic Nailing</td>
<td>All timbers</td>
<td>Two or finishing head nails</td>
<td>10mm, 22mm</td>
<td>50mm x 2.5mm</td>
</tr>
<tr>
<td>Pneumatic Nailing</td>
<td>All timbers</td>
<td>Two or finishing head nails</td>
<td>25mm</td>
<td>75mm x 3.15mm</td>
</tr>
<tr>
<td>Screw Fixing</td>
<td>Preferred Method</td>
<td>All timbers</td>
<td>Type 17 countersunk, self-drilling wood screws</td>
<td>12mm, 22mm</td>
</tr>
<tr>
<td>Screw Fixing</td>
<td>Preferred Method</td>
<td>All timbers</td>
<td>Type 17 countersunk, self-drilling wood screws</td>
<td>25mm</td>
</tr>
<tr>
<td>Screw Fixing</td>
<td>Steel</td>
<td>Countersunk self-embedding head, self-drilling screw, preferably with self breaking cutter nibs</td>
<td>10mm, 22mm</td>
<td>9g x 46mm or 10g x 45mm</td>
</tr>
</tbody>
</table>

* Available in D ro round head only.

Notes:
1. Use galvanised nails designated for wet areas.
2. Skew bullet or joint head nails for improved holding.
3. Steel screws should be suitably coated to resist corrosion. To determine if there are alternative methods please contact your Sales Manager.

Table 3. Fastener Quantities per Sheet – Standard Fixing

<table>
<thead>
<tr>
<th>Sheet Size (mm)</th>
<th>Edge Profile</th>
<th>No of Fasteners per sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>3600 x 600</td>
<td>Tongue and grooved</td>
<td>31</td>
</tr>
<tr>
<td>3600 x 900</td>
<td>Tongue and grooved</td>
<td>42</td>
</tr>
<tr>
<td>3600 x 1200</td>
<td>Square</td>
<td>75</td>
</tr>
</tbody>
</table>

Table 4. Fastener Quantities per Sheet – Close Fixing

<table>
<thead>
<tr>
<th>Sheet Size (mm)</th>
<th>Edge Profile</th>
<th>No of Fasteners per sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>3600 x 600</td>
<td>Tongue and grooved</td>
<td>42</td>
</tr>
<tr>
<td>3600 x 900</td>
<td>Tongue and grooved</td>
<td>62</td>
</tr>
<tr>
<td>3600 x 1200</td>
<td>Square</td>
<td>115</td>
</tr>
</tbody>
</table>

Note: 1 kg equals approximately 390 nails – 50mm x 2.8mm, 170 nails – 65mm x 3.75mm, 306 nails – 65mm x 2.8mm, 150 nails – 70mm x 3.75mm.
Adhesives

Requirement & Application
Elastic adhesive specifically formulated for particleboard flooring is to be used with nail or screw fixings. Apply the adhesive as follows:

1. 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.
2. Clean any dirt, grease or water from surfaces to be bonded.
3. Apply two beads to joists where sheets butt together.
4. Clean any dirt, grease or water from surfaces to be bonded.
5. Exude a continuous, 5mm diameter bead of adhesive to each joist to be covered by flooring.
6. 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.
7. Apply two beads to joists where sheets butt together.
8. Clean any dirt, grease or water from surfaces to be bonded.
9. Apply two beads to joists where sheets butt together.
10. Clean any dirt, grease or water from surfaces to be bonded.

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

1. 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.
2. Clean any dirt, grease or water from surfaces to be bonded.
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7. Apply two beads to joists where sheets butt together.
8. Clean any dirt, grease or water from surfaces to be bonded.
9. Apply two beads to joists where sheets butt together.
10. Clean any dirt, grease or water from surfaces to be bonded.

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 beam 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 elastic 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 provides a disconnect between the joints 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.

Application & Construction Requirements

Construction Requirements

a) General. 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 1864 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. Particleboard flooring is 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.

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

Notes: AS 1864.2 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.

Framing

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.

Framing

Securely fix floor joists to beams. The top surface of joists must be level to allow the flooring sheets to lie flat and level. Klin 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.

Notes:

AS 1864.2 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.
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 2.

Remove any water that ponds on the platform by sweeping or by drilling holes (no larger than 8mm 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 sheeting 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.

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 can be removed by sanding following the enclosure of the building. The depth of material removed shall not exceed the following:
(i) 1mm – Over the general panel area
(ii) 2mm – Within 50mm of any supported edge

Termite Risk Management

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 calculation procedure.

Please refer to AS 3959 “Construction of Building in Bushfire-Prone areas” and “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.

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Termite Risk Management

Termite Hazard Map

Two destructive termite species found in Australia

Coptotermes acinaciformis

Mustotermes darwiniensis

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.

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

TERMIFlor and R-flor termite resistant particleboard flooring conforms to H2 level treatment requirements as defined in AS 1654.2. 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.

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

TERMIFlor 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.

TERMIFlor and R-flor particleboard flooring are regularly tested by an independent, accredited third party laboratory.
Energy Efficiency

Homes with suspended particleboard floors can be designed to meet home energy efficiency and thermal comfort regulations across Australia.

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 floor system. 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 is used within the NSW BAXIS 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 standards 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

For both approaches the insulation properties of the particulate floor flooring or the insulation properties of particulate floor 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.

STRUCTAfloor, TERMIfloor or R-flor particulate floor 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:

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

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 ensuring your home stays warm 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 in colder months of the year, insulation may be needed to stop heat heating upwards through the floor. The direction in which insulation needs to inhibit this heat transfer, depends upon if the climate zone your home is in.

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.”Guide to building in bushfire affected areas”.

Specific floor system R-values can vary depending on:

• Sub-floor perimeter enclosure – if the area under the ground floor (the subfloor) is enclosed the air movement is greatly reduced, substantially increasing the R-value of the floor system. Note that minimum subfloor 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 cooler or more humid climate zone will require less subfloor ventilation if the sub-floor perimeter is enclosed. Less ventilation (and air flow) increases the R-value of the floor system.

• 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 – if there is a sub-floor cavity barrier or 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 Joists as set out in Australian Standard AS1884.2. 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 wall or ceiling or on stilts placed under the floor joists.

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

When using bulk insulation and recalcultating 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 floor's R-value by R entries upwards and R12.1 downwards not R15.

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

Inside the sub-floor perimeter wall

In cold climates installing additional insulation inside the sub-floor wall enclosing the perimeter joists 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 below. 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 the floor is to be sought from the insulation for the correct installation of additional insulation under the floor. 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.

For assistance in calculating the R-value of other suspended partcleboard flooring systems visit the Borg Manufacturing website on www.borgmanufacturing.com.au and download the free R-values Calculator under R-flor. 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 0.02-0.06 compared to Yellow Tongue.

Table 5. R-values for selected suspended ground floor systems using STRUCTAflor, TERMINflor and R-flor Yellow Tongue – enclosed perimeters

<table>
<thead>
<tr>
<th>Flooring product details</th>
<th>STRUCTAflor and TERMINflor Yellow Tongue (19mm)</th>
<th>R-flor Yellow Tongue (19mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height of floor above the ground (metres)</td>
<td>0.6</td>
<td>1.2</td>
</tr>
<tr>
<td>Additional insulation type</td>
<td>Direction of heat flow</td>
<td>R-Value</td>
</tr>
<tr>
<td>No additional insulation</td>
<td>downwards</td>
<td>1.06</td>
</tr>
<tr>
<td>With carpet and underlay</td>
<td>upwards</td>
<td>0.93</td>
</tr>
<tr>
<td>No carpet and reflective membrane between or under joints</td>
<td>downwards</td>
<td>1.54</td>
</tr>
<tr>
<td>With carpet and underlay</td>
<td>upwards</td>
<td>1.42</td>
</tr>
<tr>
<td>No carpet and R-flor under joints</td>
<td>downwards</td>
<td>1.26</td>
</tr>
<tr>
<td>With carpet and underlay</td>
<td>upwards</td>
<td>1.13</td>
</tr>
<tr>
<td>No carpet &amp; R-flor bulk insulation between joints</td>
<td>downwards</td>
<td>2.35</td>
</tr>
<tr>
<td>With carpet and underlay</td>
<td>upwards</td>
<td>1.52</td>
</tr>
<tr>
<td>Notes:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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 maxiwall (110mm), floor joist depth 300mm over a clay soil.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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-values of suspended timber floors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Assumption of carpet: 10mm carpet, 10mm underlay both with conductivity of 0.05 W/m2K.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Additional R-value for adding a non-reflective membrane between or under joints 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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wet Area Installation

Particulateboard 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 3390, have a State or National Certificate of Accreditation are generally suitable for use over particulateboard flooring.

Australian Standard AS 3390, 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 3400, with sealants and membranes meeting AS 4846, particulateboard 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 season 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.

Notes: 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.

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 underfloor.

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.

FLOORING
### FLOORING

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

Flashings 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.

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

Prefabricated shower basins 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.

### 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 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 STRUCTAlor sheet joins by means of separating tape or flashing. The liquid membranes may be used over interior 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 3790.

#### 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 lashing. 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.
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.

Decorative & Surface Finishing
Particleboard flooring is an ideal base for underlayments, floor coverings and finishes. Surface treatments include carpet, vinyl sheet or tile, cork, linoleum, Quarry & ceramic tile and clear or tinted paint coatings.

Surface Finishing
Apply the covering or finish in accordance with the manufacturer’s instructions. The application should also meet the requirements of the relevant Australian Standards: AS/NZS 2455.1, Textile Floor Coverings – Installation practice general.

Preparation
Preparation of particleboard flooring to receive floor coverings 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.

Sanding
Sand the surface of the product to level sheet underlay joins do not coincide with flooring joins. 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 fast to fail water pipes is required. Refer “Wet Area Installation” page 7.

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 rakes depth on the back of the tiles.

Space tiles evenly apart to accommodate grouting. Joint widths can range from 1.1mm to 12mm depending on the tile type. Apply grout when the adhesive has cured. Adhesives 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 polyurethane foam bead covered with silicone or other suitable sealant.

Resilient Sheet and Tile
Resilient sheet and tile flooring 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 button type underlay nails. Ensure underlay joins do not coincide with flooring joins.

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.

FLOORING

Wet Area Surfacings
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 surrounding the shower area should be sealed with an epoxy sealer. Apply a second coat of the shower tray. Where the ceramic tile application extends over the wet area surrounding the shower area should be sealed with an epoxy sealer. Apply a second coat of

In shower areas, ceramic tiles are usually loose laid and perimeter stapled. Sheet underlay in all ceramic tile applications. Underlay/Mortar Beds:
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as close as possible to the expected in-service conditions.

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

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 thres through the floor finish. The use of an underlay will reduce these risks. Nail and staple heads as well as underlay nails may still be visible when very thin, soft and flexible resilient floor coverings are laid over underlay sheeting.

In some instances sheet sub-floors (substrates) can sag between joins and if not levelled, 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 subfloor 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&D floor may be reduced by providing a bed of polyurethane floor 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.atla.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.

STRUCTA® 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 levelling 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 hygrometers.

Fixing:

Use tongue and grooved STRUCTA®, arranged in rows in a brickwork pattern. Provide 10mm clearance at the room perimeter. Provide 10mm clearance around loose laid sheets. Leave a 10mm clearance around the perimeter of the room. Pack the room perimeter with a moisture impervious membrane such as polyethylene, should be laid over any concrete slab.

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 joins and fold the barrier up walls. Loose lay the STRUCTA® as outlined under “Fixing.”

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, 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.

Concrete Topping:

When using adhesive, fix one sheet of STRUCTA® 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.

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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, expanded polystyrene, resin bonded fibreglass or mineral wool insulation (see also “Raft and Floating Floors”).

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), a bedroom at 40 dB(A), a quiet room at 20 dB(A), and the threshold of pain is 120-130 dB(A).

Further typical examples are given in Table 6.
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 (Rw) and is in general applied to both wall and floor elements. The higher the number (e.g. Rw 50) the better the performance. Rw can be used on its own or modified using the spectrum adaption term, Ctr, to take greater account of low frequency noises like bass or sub woofer. Ctr is usually a negative number with a typical range of -1 to -15, and so, even though it is added to the Rw value, the net result is a lower number than the Rw value on its own. It is therefore significantly harder to achieve Rw = Ctr than Rw 50 on its own.

Impact sound

Impact sound comes from common sound sources such as heavy footsteps (particularly on bare timber or tile floors), hanging 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 (Ln,w). The lower the number (e.g. Ln,w 62) the better the performance. Ln,w can be used on its own or modified using the spectrum adaption term, Cl, to take greater account of low frequency impact noises like footsteps. Cl is usually a positive number, and so when added to the Ln,w value, the net result is a higher number than the Ln,w value on its own. It is therefore significantly harder to achieve Ln,w + Cl 62 than Ln,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 F6 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 sound insulation of wall and floor elements where separating:

• adjoining units;
• common spaces from adjoining units

It prescribes a Rw or Rw + Ctr value of not less than 50 and for floors an additional impact requirement of Ln,w + Cl or Ln,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 layer 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/m³, above this the density has a minor effect. It is recommended that a minimum density of 10 kg/m³ 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 manufacturers of these products.
Flooring Maintenance & Repairs

Timber Floor Restoration
Particleboard can be laid over severely warm 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/screw 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.

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
The thermal conductivity of STRUCTAflor and TERMIflor is 0.12 W/mK. Thermal resistance (R-values) result for typical STRUCTAflor, minimum 19mm thick. Table 9 below shows the properties of typical particleboard flooring.

<table>
<thead>
<tr>
<th>Index</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignitability</td>
<td>12 - 13</td>
</tr>
<tr>
<td>Spread of Flame</td>
<td>6 - 7</td>
</tr>
<tr>
<td>Heat Involved</td>
<td>7 - 8</td>
</tr>
<tr>
<td>Smoke Developed</td>
<td>2 - 3</td>
</tr>
</tbody>
</table>

Source: Facts About Particleboard and MDF, EWPA 2010

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

<table>
<thead>
<tr>
<th>Board Type</th>
<th>Thickness (mm)</th>
<th>400</th>
<th>450</th>
<th>500</th>
<th>550</th>
<th>600</th>
<th>650</th>
<th>700</th>
<th>750</th>
<th>800</th>
<th>850</th>
<th>900</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB Flooring</td>
<td>P</td>
<td>V</td>
<td>P</td>
<td>V</td>
<td>P</td>
<td>V</td>
<td>P</td>
<td>V</td>
<td>P</td>
<td>V</td>
<td>P</td>
<td>V</td>
</tr>
<tr>
<td>19</td>
<td>8.1</td>
<td>2.4</td>
<td>3.6</td>
<td>2.2</td>
<td>3.2</td>
<td>2.2</td>
<td>3.2</td>
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<td>3.2</td>
<td>2.2</td>
<td>3.2</td>
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<td>22</td>
<td>10.3</td>
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<td>4.3</td>
<td>2.5</td>
<td>4.3</td>
<td>2.5</td>
<td>4.3</td>
<td>2.5</td>
<td>4.3</td>
<td>2.5</td>
<td>4.3</td>
<td>2.5</td>
</tr>
</tbody>
</table>

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.epw.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 affects 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 interior exposure, a creep factor of four should be used.

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

Structural Insulation

The thermal conductivity of STRUCTAflor and TERMIFlor is 0.12 W/mK. Thermal resistance (R-values) calculated in accordance with the relevant provisions of Australian Standard AS/NZ4889.1 for the nominated thicknesses are:

<table>
<thead>
<tr>
<th>Product</th>
<th>R-value (Thermal resistance m²K/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flooring</td>
<td></td>
</tr>
<tr>
<td>R-Asr</td>
<td>Refer to Table 6 or the R-flor calculator for the R-value of R-Asr as part of a flooring system</td>
</tr>
</tbody>
</table>