

PREMIER SOLID FLOORING™

INSTALLATION GUIDE



AUGUST 2023

Pentarch Forestry's Premier solid flooring™ is a structurally solid hardwood tongue and groove strip flooring profile designed to be installed over bearer and joists, or timber battens/15mm+ structural plywood over concrete, or particleboard sheets and solid structural subfloor. The boards are precision-milled to either 63mm, 85mm, 108mm, 130mm and 180mm wide.

The following should only be used as a guide and the installer should apply all Australian Standards, NCC requirements, and best practices when installing. The sub floor moisture and under floor humidity must comply with NCC and AS 1684 requirements. This must include the relevant safety protocols required. This guide should not be used as the sole means of direction.

Pentarch Forestry recommends that a qualified professional timber flooring contractor installs, sands and finishes a Pentarch hardwood timber floor. Read all instructions before starting and take the time to plan the job properly. Please check all material for faults or defects prior to installation. If there are any problems before or during the laying of a Pentarch Forestry product, stop and do not continue laying. Contact your Pentarch representative immediately.

1. Properties of Timber

Timber is hygroscopic – meaning it is capable of easily absorbing and expelling moisture in response to local conditions. As timber absorbs moisture it expands and as it expels moisture it contracts.

As such, factors such as relative humidity (atmospheric moisture), moisture ingress (sub-floor or other), direct sunlight, air conditioning and lack of adequate ventilation can cause timber to expand or contract.

Therefore, care must be taken to correctly assess the suitability of the site prior to the installation of timber flooring, as well as to maintain a suitable environment where the timber floor has been installed.

2. Site Climate Assessment

Every site requires climate assessment prior to the installation of a timber floor. It is important to know the long term relative humidity (RH) for the area where the floor is to be installed. Relative humidity is the major influence determining whether solid timber flooring will absorb moisture from the air and swell, or whether it will lose moisture and shrink.

If the moisture content of the timber floor is close to the average long term relative humidity for the area then subsequent seasonal changes will be minimal. However, if the long term relative humidity for the area is significantly different to that of the timber flooring, seasonal changes in the moisture content of the floor needs to be considered.

Solid hardwood timber flooring is kiln dried to 9 to 14% moisture content as per AS 2796.1.

On-site relative humidity is measured with a Hygrometer. It is recommended that Relative Humidity (RH) and temperature levels are recorded prior to and during installation.

The local site climate can be assessed using data from the Australian Bureau of Meteorology website at www.bom.gov.au/climate/averages. Approximate average equilibrium moisture content (EMC) is provided for each climate in Australia. EMC is the moisture content that timber will reach under set conditions of relative humidity and temperature.

Where seasonal variations are greater, seasonal movement (shrinkage and swelling) can be expected to be larger. Areas that experience high levels of seasonal variation require greater allowance for floor expansion at the time of installation.

Adequate subfloor ventilation is an important factor in the performance of hardwood timber flooring. The sub floor moisture and under floor humidity must comply with BCA and AS 1684.2 requirements. Where humidity remains high beneath a floor, the boards will absorb the moisture and expand.

It is recommended that the ground below the subfloor be sealed with an impervious membrane, such as 200 micron plastic or vapour barrier. The plastic should be taped continuously with a 200mm overlap.

2a. Internal Micro Climates

The internal environment should also be assessed before installation. Within a dwelling, a number of climates may develop, causing areas of flooring to respond differently within the same dwelling. These include large expanses of glass, fireplaces, fridges, air conditioners, and any appliances that vent warm air, the aspect of the house and two-storey construction. All of these can have an effect on the dimensional movement of the boards. When floors are exposed to direct sun through large glassed areas, protection should be considered before, during and after construction. Evaporative coolers add moisture to the air and raise the relative humidity, resulting in moisture contents in the flooring that are higher than under ambient conditions.

The likely movement of a floor after installation should also be a consideration when assessing the site. Small differences in moisture content between boards at the time of manufacture (5% is allowed by Australian Standards) together with variable conditions within the house (such as a west-facing room compared to a south-facing) will cause further variation in board width.

For this reason, it can be expected that small gaps will occur at the edges of most boards, particularly during drier months. These gap sizes may differ across the floor.

In cases where shrinkage may occur after installation, wider solid strip flooring boards such as 130mm will result in larger gaps at board edges when compared with narrower board widths (e.g. 85mm). Air conditioning that does not have a humidity control system, which is installed after a floor has been laid, may increase the size of shrinkage gaps, as it changes the relative humidity in the area.

Some movement occurs after laying timber floors as the timber adjusts to the climate. Although some floor finishes may reduce moisture content changes, they will not prevent this kind of movement. In cases where greater movement is expected after installation, such as from seasonal changes, the use of wider boards or from air conditioning installed after installation, particular care should be taken to ensure that the flooring finish does not act as an adhesive by bonding a number of boards together. With subsequent shrinking, wide gaps between groups of four or five boards may occur, or boards may split.

2b. Installation Moisture Content and Acclimatisation

Solid timber flooring may need to be acclimatised to their new local environment before installation. It is important to allow the timber to adapt to the conditions mentioned above in site climate assessment.

Timber is a natural product that expands and contracts with seasonal changes and is affected by the moisture content of the air. The moisture content of timber is the percentage weight of water present in the timber compared to the weight of the timber with all water removed. Moisture content varies with changes in humidity and temperature in the surrounding air.

Small seasonal changes in timber flooring are a normal occurrence and small gaps that open up during dry periods are not considered a defect.

To minimise the movement of a hardwood floor caused by swelling on moisture uptake and shrinking on moisture loss, it is important to lay and fix a timber floor that is close to the average moisture content of the environment in which it is to be laid. This guide outlines the procedures required to assess the site and acclimatise solid hardwood timber flooring for the best results.

Solid hardwood timber flooring is kiln dried to 9 to 14% moisture content as per AS 2796.1.

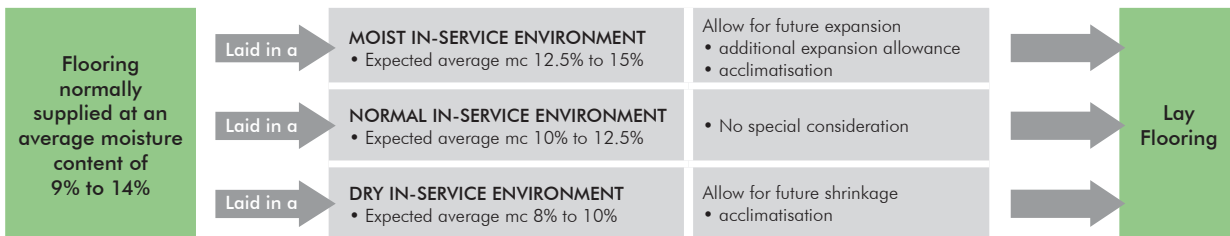
Where the average supplied moisture content of the flooring is near the expected average in-service moisture content, acclimatisation of the hardwood boards may not be necessary. Where conditions are drier, such as inland areas or air conditioned buildings, or where conditions are humid, such as in coastal areas or elevated regions, flooring may need to be acclimatised on site.

Acclimatisation can only be effective in dry locations during dry periods or in an air conditioned building if the air conditioning is operating at the time.

Acclimatisation is only complete when the moisture content of the timber flooring is equal to the Relative Humidity (RH) in the environment. This usually takes about 14 days for 19mm flooring, but the time may vary depending on the species used and the weather conditions. To check that the timber flooring has reached this point it should be moisture tested with an appropriate timber moisture meter.

This reading can then be compared to the Relative Humidity (RH) using Table 1.1.

1.0 – A simple guide to whether acclimatisation is necessary is provided in the flow chart below



Some of the information regarding acclimatisation has been sourced from the FWPRDC document 'Timber Flooring' version one December 2005.

1.1 – Moisture content of wood at various temperatures and relative humidity readings

Temperature (°C)	Relative Humidity (percent)			
	40	50	60	70
10	7.9	9.5	11.3	13.5
16	7.8	9.4	11.1	13.3
21	7.7	9.2	11.0	13.1
27	7.6	9.1	10.8	12.9
32	7.4	8.9	10.5	12.6
38	7.2	8.7	10.3	12.3

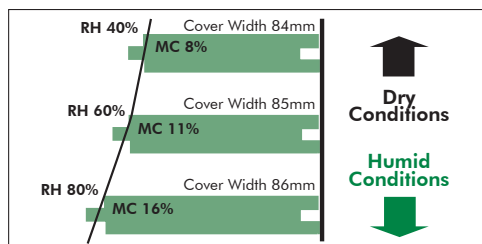


Chart taken from Wood Handbook: Wood as an Engineering material, (Agriculture Handbook 72), Forest products Laboratory, US Department of Agriculture.

3. Product Handling on Site

The packaging around Pentarch Forestry products is designed to protect it during transport only. Upon delivery timber flooring products should be stored indoors where they can be protected from the elements.

Do not store outside using a protective covering such as a tarpaulin as condensation can occur underneath.

4. Suitable Subfloors

Pentarch 19mm is designed for any subfloor that is structurally sound, level, flat, clean and dry such as:

- Bearers and joists
- Concrete slab
- Sheet flooring such as plywood or particleboard
- Existing strip timber floors

5. Important Issues About Subfloors

1. The sub floor moisture and under floor humidity must comply with BCA and AS 1684.2 requirements.
2. Air vents should always remain unobstructed.
3. Number of air vents and size should meet or exceed BCA requirements.
4. Ground level below flooring should be well drained.
5. The subfloor ground should be flat, level and clear of any debris

The following should only be used as a guide and the installer should apply all Australian Standards, BCA requirements, and best practices when installing. The sub floor moisture and under floor humidity must comply with BCA and AS 1684.2 requirements. Relevant installation safety protocols are required. This guide should not be used as the sole means of direction.

Pentarch Forestry recommends that a qualified professional timber flooring contractor installs, sands and finishes a Pentarch hardwood timber floor. Read all instructions before starting and take the time to plan the job properly. Please check all material for faults or defects prior to installation.

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6. Prior to Installation

Before installing a timber floor, ensure the site conditions are suitable. A timber floor should only be installed in a weatherproof building. The project should reach near completion before installation begins to avoid damaging the newly fitted timber floor from heavy trade traffic. The roof, external doors and windows, exterior cladding and wet trades should all be complete before a timber floor is installed. The storm water system must be complete or effectively directed away from the sub-floor.

7. Inspection of The Site and Subfloor Preparation

- 7.1 Conduct a visual inspection for signs of moisture possibly resulting from pipe leaks, window seal leaks, bathroom/laundry overflow problems, ceilings leaks or rising damp. Any signs of moisture ingress must be remedied prior to installation.
- 7.2 The sub-floor must be dry and free of contaminants including but not limited to oil, paint, grease, dust, metal shavings, saw dust.
- 7.3 Fully scrape the sub-floor with a wide blade scraper to remove all cement render spoil, plasterboard setting residues and mortar excess at the base of walls.
- 7.4 Make sure the concrete slab is flat with no more than +/- 3mm deviation in a 3 metre radius as per AS 3600 – 2001: Concrete structures. Deviations to the surface greater than 3mm over 3m are to be filled with a self-levelling compound following manufacturers recommendations, or ground

down to conform to the aforementioned specification for flatness. Note: When installing timber flooring over battens, unevenness in the sub-floor can be remedied through the use of packers or by planing down the battens.

- 7.5 A concrete sub-floor should be moisture tested in accordance with AS 1884 – 1985. Excerpt from ATFA guidelines – Concrete moisture assessment – A 'dry' slab is signified by impedance moisture meter readings of up to 2.0% and in-slab relative humidity (RH) up to 75%. Where floors have been covered by previous floor coverings values are often up to 3.5% and 80% in-slab RH. Higher readings require investigation as to possible moisture sources and may require more than the slab moisture protection outlined in this specification.

Moisture assessment does not preclude the need for moisture vapour barrier assessment. It is also recommended to provide a 200 micron plastic membrane (builder's plastic) as a moisture/vapour barrier prior to installation of the battens or plywood substrate. This minimises the risk of moisture uptake into the timber flooring from the concrete slab after installation.

- 7.6 The plastic barrier should continue 75mm up the walls and all joins should overlap by 200mm. Joins should then be sealed with duct tape.
- 7.7 If using a paint on moisture/vapour barrier apply as per manufacturer's instructions. Ensure a compatible adhesive is used with the moisture/vapour barrier.
- 7.8 Timber substrates such as particleboard, plywood or existing timber floors should be sanded to create a clean flat surface.
- 7.9 If plywood is used it must comply with AS/NZS 2269 – Part 0 Plywood Structural Specifications.
- 7.10 If installing timber flooring over bearers and joists or a platform floor it is particularly important to maintain adequate sub-floor ventilation. If the area underneath the timber flooring is consistently damp (high humidity) this can adversely affect the timber flooring and lead to increased expansion and/or cupping.
- 7.11 Excerpt from ATFA subfloor ventilation guidelines – T&G floors should be provided with sub-floor ventilation that exceeds minimum Building Code of Australia (BCA) requirements. The levels outlined in the BCA (currently limited to 6000mm² per meter length of wall for higher humidity areas) are primarily to limit the moisture content of sub-floor framing timbers, which can generally tolerate greater fluctuations in moisture content, than timber floors. The recommended minimum ventilation for T&G timber floors is 7500mm² per meter length of wall, with vents evenly spaced to ensure that cross ventilation is provided to all sub-floor areas.

8. Installation of 19mm Solid Flooring

8.1 Battens or Plywood Over Concrete

Battens may be used to compensate for minor fluctuations in concrete level. For secret nailing, use 19mm battens and for top nailing use battens that are at least 35mm thick.

Lay battens 450mm apart on the plastic membrane at right angles to the direction of the new floor. Adjust levels with plywood or masonite packing and use masonry anchors to attach battens to the slab.

For the best result, Pentarch Forestry recommends the use of kiln dried hardwood battens to give the highest possible nail hold.

An alternative method is to fix plywood sheeting (recommended minimum thickness of 15mm or greater) to the concrete slab after first laying a polyethylene membrane (minimum 200 micron). For this application top nailing is not suitable. Plywood must comply with AS/NZS 2269 – Part 0 Plywood Structural Specifications.

8.2 Bearers and Joists

Existing joists should be inspected for structural soundness prior to installation of new timber flooring. Ensure there is sufficient subfloor ventilation and clearance between the ground and flooring. The subfloor ventilation and clearance should meet or exceed BCA requirements. Air should circulate below the new floor from all four sides of the house.

The level of the floor frame must be suitable for the installation of the strip flooring, ascertaining the suitability is the responsibility of the builder or floor contractor. A number of alternative methods exist to assess the floor frame.

The method most commonly used is to place a straight edge of a minimum of 3 metres on top of the joists and assess the various high and low members. The joists can be planed down if too high or packed if too low. Care must be taken to ensure that the joists are not reduced in sectional size below that required under AS 1684. This same structural requirement prevails in cases where the joists are “crippled” i.e. cut through over a support to reduce the bow in the timber.

8.3 Existing Timber Flooring

When laying a Pentarch Premier solid flooring over existing timber floors make sure the existing boards are structurally sound and not warped or cupped. Sand for an even surface if necessary.

If the existing boards cannot meet requirements, remove the entire floor and lay the new boards directly over the joists.

Pentarch Premier solid floorboards may be glued using a flexible timber flooring adhesive and nailed at 90° to the boards. To run the new timber floor boards in the same direction as the current timber floor boards, a plywood layer is required between the new and existing floor boards. The plywood must comply with AS/NZS 2269 – Part 0 Plywood Structural Specifications.

8.4 Plywood or Particleboard Sub-Floor

When laying a Pentarch Premier solid flooring over a Plywood or Particleboard sub-floor ensure that the sub-floor is structurally sound. Ensure the surface area is clean of any contaminants and moisture. Ensure the sub-floor is level and sand for an even clean surface if necessary. Pentarch recommends Plywood and Particleboard substrates over battens or joists and should be screwed down as per manufacturer’s recommendations.

9. Laying the Boards

Timber flooring boards need to be mixed on the floor according to colour and feature. This is at the discretion of the installer and the end user.

Sort the timber into two stacks: one of similar length boards and one of varying lengths. Start by laying the varying lengths, longest first, in a triangle or “rack” from one corner. Lay first board with groove towards the wall and leave a 12mm expansion gap all-round the room between the floor and the wall.

This gap will usually be covered by the skirting. Retain the existing skirting if the new board can slide under it. If not, remove the skirting. Continue each row by laying the similar-length boards in each row, adding and cutting short lengths to finish the row (still leaving a 12mm gap). There must be at least 450mm distance between butt joints in adjacent rows.

9.1 Expansion Gaps (Control Joints)

Plan expansion gaps and perimeter fixings before commencing the job. Due to the hygroscopic nature of timber, the flooring will expand and contract with changes in moisture content making expansion gaps essential. The allowance of expansion gaps at the perimeter walls and around obstructions will allow the floor to move as required. Insufficient expansion gaps can result in buckling and deformation of the flooring.

For domestic applications floor widths over 6m will require an intermediate expansion joint. Alternatively, a series of smaller expansion gaps every 800mm to 1000mm can be used to provide equivalent spacing. If cork expansion joints are used, the cork should be approximately 2mm above the floor surface when installed. This will be removed during the sanding process. However, cork to the perimeter should be installed level with the timber surface.

Expansion gaps can be readily increased by under cutting plasterboard walls or through the use of thicker skirtings or beading. Expansion joints are best placed at doorways or in line with internal walls. Expansion joints help to break large floors into smaller sections thereby maximising total expansion gaps.

9.2 Framing the Floor

The 12mm expansion gap left between the wall and the floorboards will need to be covered. This can be covered

with an appropriate skirting which should be nailed to the wall and not fixed to the floor. If the timber flooring is installed with existing skirtings in place use a fillet mould or bead to cover the gap, fixed to the skirting and not the floor.

9.3 Nailing the Boards

Once acclimatised correctly, secret-nail boards permanently to the joists or battens with a secret-nailing gun, or cramp them and top-nail with a traditional hammer or standard nail-gun.

9.4 Recommended Nails

Recommended Fixing of T&G Flooring to Joists.

Type of Fixing	Method	Joist Type	
		Hardwood and Cypress	Softwood, LVL and I-Beams
Secret Fixing		For board widths up to 85mm wide only	
19-21mm thick boards	Machine driven	<ul style="list-style-type: none"> • 45 x 15 gauge staple or 45 x 16 gauge cleat • and adhesive¹ to joist 	<ul style="list-style-type: none"> • 50 x 15 gauge staple or 50 x 16 gauge cleat • and adhesive¹ to joist
TOP (face) Fixing		For board widths up to 130mm, 2 nails at each joist crossing. For board widths over 130mm, 3 nails at each joist crossing.	
19-21mm thick boards	Machine driven Hand driven	<ul style="list-style-type: none"> • 50 x 2.2mm T – head or 50 x 2.5mm T – head and adhesive¹ to joist • 50 x 2.8mm bullet head and adhesive¹ to joist 	

Note: 1. A continuous bead (6 mm to 10 mm approx.) of flooring adhesive to be applied to the joist in a tight zigzag pattern.

Recommended Fixing of T&G Flooring to Subfloors of Plywood, Particleboard and T&G on Joists.

Type of Fixing	Board Size	Subfloor on Joists
		Plywood, Particleboard or Solid T&G
Secret Fixing	T&G boards up to 85mm in width and 19-21mm thick	<ul style="list-style-type: none"> • 32 x 15 gauge staples or 32 x 18 gauge cleats at approximately 225mm centres with adhesive beads¹ to be provided midway between fixing points. • 32 x 15 gauge staples or 32 x 18 gauge cleats at approximately 450mm centres and adhesive beads¹ to be provided at the fixing points and midway between fixing points.
	T&G boards up to 130mm wide and 19-21mm thick	<ul style="list-style-type: none"> • 32 x 15 gauge staples or 32 x 16 gauge cleats at approximately 300mm centres with a full adhesive bed².

Note: 1. Adhesive beads of 6 mm to 10 mm are often applied in a zigzag pattern
2. Full bed adhesive to be applied.

9.5 Secret Nailing 63mm and 85mm Wide Boards

A secret-nailing gun will “kick” the boards together at the same time as it drives the fasteners in at 45°. When installing over an existing floor or on a plywood or particle board base also use a flexible timber flooring adhesive as per manufacturer’s instructions. If nailing into plywood or particle board, nailing should be on every joist or at 450mm centres and alternate to the bead of flexible timber flooring adhesive, as per manufacturer’s instructions, between nail centres.

9.6 Top Nailing 63mm, 85mm, 108mm and 130mm Wide Boards

If top-nailing the floor directly onto joists, attach floor-cramps to a few joists to lever the strips together evenly across the room. Cramp nine or ten boards at one time – do not cramp two or three strips together as this may set up excessive strains in the floor causing over-cramping.

9.7 Secret Fixing Wide Boards

The following procedure is for secret fixing 108mm and 130mm Pentarch Premier solid flooring by using a combination of flooring cleats/staple and full trowel adhesive to attach the hardwood flooring to a solid sheet subfloor.

The following subfloors are suitable for secret fixing wide board flooring:

- 15mm (or greater) plywood (must comply with AS/NZS 2269 – Part 0 Plywood Structural Specifications)
- 19mm (or greater) particleboard flooring. The plywood or particleboard subfloor must have a moisture content that is within 2% of the acclimatised timber flooring being installed.

Note that secret fixing wide board flooring directly to floor joists is not recommended.

9.8 180mm Wide Boards

180mm wide boards should be face (top) nailed in accordance with AS 1684.2 (refer chart in section 9.3 for sizing).

Pentarch recommends the use of 3 top nails and beaded flexible timber flooring adhesive for direct to joist installations.

Installations on substrate require 3 top nails and full trowelled flexible timber flooring adhesive.

If the combined floorboard and substrate thickness is less than the nail length care must be taken to nail through into the joist below.



10. Sanding and Finishing

Pentarch Forestry recommends a professional sander and finisher to complete the job successfully. Refer to AS 4786 for sanding and finishing of timber floors. Once installation is complete the new floor should be left to allow the glue to cure before sanding machines are used. Refer to adhesive manufacturers recommendations for the appropriate timing.

There are many different types of finishes available from the increasingly popular water-borne polyurethanes to oil based and solvent based coatings. All of these coatings will affect the look of the timber floor in a different way so it is important for the installer/customer to be informed when deciding on the coating. Sheen levels choices can be influenced by the colour of the timber e.g. dark timbers and gloss finishes will highlight dust and matt finishes will minimise reflection.

Pentarch Forestry recommends water-borne or oil based finishes because they are less prone to "edge-bonding". Edge-bonding can occur when the coating bonds the flooring together so tightly that the flooring splits mid – board instead of on the joints during contraction. Always follow the manufacturer's recommendations when choosing and using floor coatings.

Care and Maintenance

For information on care and maintenance of a timber floor download a Pentarch Forestry Care and Maintenance brochure at <http://www.pentarch.com.au/flooring.html>



Sustainably Grown. Australian Made.

Note: Variations within a timber species are normal, therefore photographs, samples and displays can only be indicative of colour and should not be used for final selection. It is normal for natural timber products to react to changes in atmospheric and environmental conditions such as humidity and temperature.

pentarchforestry.com.au

National free call 1800 818 317

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