

Feature T&G Timber Floor Installation and Finishing Recommendations

Version 1 October 2005

DATA SHEET 1 - GENERAL INFORMATION

1.0 Introduction

This data sheet outlines the product types covered in this series of data sheets. It also includes information on timbers used in flooring, the nature of timber floors over various sub-floors, characteristics of floor finishes available and aspects relating to the natural movement that occurs in timber floors after they have been finished.

1.1 Product Types

The recommendations contained in these data sheets relate to timber floors that are intended to be sanded and finished after installation. Generally floors of this type are of solid timber or a product made up from layers of timber, bonded together.

Depending on the T&G sub-floor supporting system (e.g. joists, plywood etc), timber floors will both feel and sound differently when walked on. Generally T&G timber floors laid over joists or battens will have more spring under foot and there is likely to be some vertical movement at board edges and end matched joints when walked on. Some squeaks can therefore be expected from most timber floors of this type. Squeaks can occur from movement of one board edge against another or from boards moving on nails. Squeaks are often more prevalent during drier weather due to loosening at the joints. Floors that are laid over a plywood or similar sub-floor will have a firmer feel underfoot. Similarly when floors are glued directly to concrete, the feel is firmer, but some boards may sound 'drummy' when walked on.

1.2 Movement in Timber Floors

Timber is a natural product that responds to changes in weather conditions. During periods of consistently high humidity timber will absorb moisture from the surrounding air causing it to swell or increase in size. Conversely, during drier times when humidities are low, timber will shrink, reducing in size (refer Figure 1a). Unless T & G flooring is placed in a permanently controlled environment, it will always move in response to changing environmental conditions. Gaps between individual T & G boards will occur as the floor shrinks in dry weather.

Therefore a 'continuous mirror finish' cannot be expected from floor finishes. Localised shrinkage may also occur when areas of flooring are exposed to heat sources such as fireplaces or sunlight through large doors or windows. The overall movement and rate of movement of timber varies depending on the timber species and cutting pattern of individual boards. Small moisture content variations in boards at the time of installation and differing conditions within the house (i.e. from sun exposure or fireplaces) will also cause variation in board movement.

Consequently, gapping across a floor can be expected and may be relatively even, depending on individual circumstances, but actual gap size between individual boards will vary. An uneven distribution of gaps detracts from the appearance of the floor and can occur if a number of boards are bonded together by the finish penetrating into the joints. Floor finishes will not prevent timber movement, but may reduce the rate of response to climatic changes. Applying a finish to the underside of a floor may further assist to reduce seasonal movement.

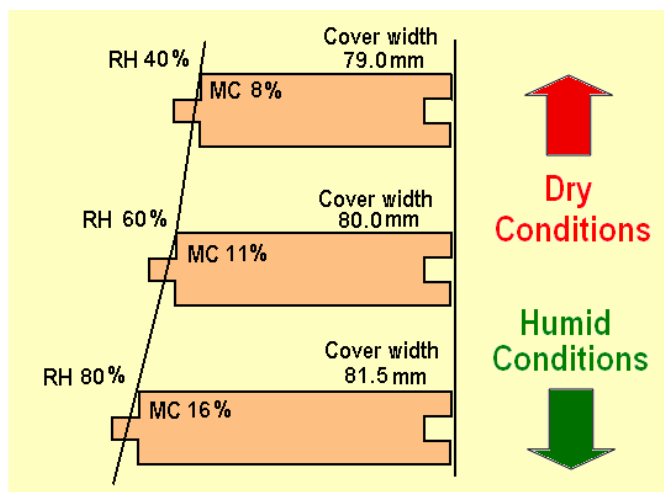


Figure 1a – Cover width variation with changing Relative Humidity

1.3 Timber species and characteristics

Species, Colour, Grade and Hardness

The species or species mix chosen will generally determine the overall colour of the floor. It should also be noted that species mixes may contain different species from one producer to another and may therefore appear different. As a guide, Table 1b indicates the range of colours that may be expected. The sapwood of many hardwoods can be much lighter than adjacent heartwood and some boards may contain both light and dark colours. Even within a single species large colour variations can occur, not only due to the age differences between trees but also between different growing locations. Also, older sample panels in showrooms generally darken with age. Colour should therefore be discussed with flooring suppliers.

Lycid susceptible sapwood of some hardwood species e.g. spotted gum is required by some state legislation, including Queensland and New South Wales, to be preservative treated. Some treatments may impart a brown or green-grey tinge to sapwood, while boron preservative is non-colouring. LOSP treatment is also used. In this instance an H3 treatment may be used in lieu of H2 treatment to avoid the coloured from dyes often used with H2 LOSP treatments.

The character of the floor is influenced by the species characteristics and therefore the grade. Grading is a process that sorts boards according to the number and size of features present (e.g. gum veins and knots). Table 1b indicates the grades contained in relevant Australian Standards, but it should be noted that manufacturers often have their own grades.

Hardness indicates a species' resistance to indentation and abrasion. Damage to timber floors may occur due to continual movement of furniture, heavy foot traffic and in particular "stiletto-heel" type loading. The selection of a hard timber species ensures improved resistance to indentation and abrasion. Soft timber species in feature floors can be expected to indent and finishes do not significantly improve hardness.

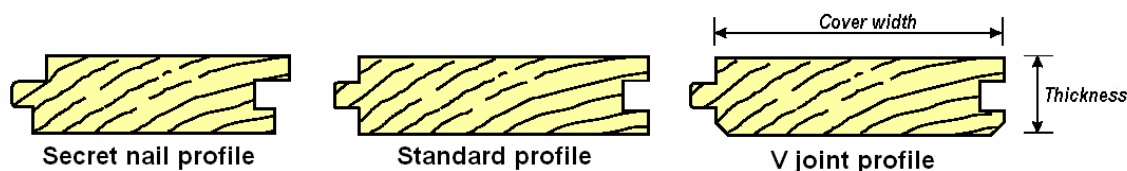
Table 1b – Species Properties

Species	Colour	Hardness	Common cover widths (mm)	Thickness (mm)
Australian Hardwoods – to AS 2796 – Timber – Hardwood – Sawn and milled products				
Select Grade, Medium Feature Grade (Standard) and in some species High Feature Grade				
Spotted Gum	brown, dark brown, light sapwood	very hard	60, 80,130	19,12
Ironbark	dark brown or dark red brown	very hard	60, 80,130	19,12
Blackbutt	golden yellow to pale brown	very hard	60, 80,130	19,12
New England Blackbutt	straw to pale brown	very hard	60, 80,130	19,12
Forest Red Gum	dark brown or dark red brown	very hard	60, 80,130	19,12
Brushbox	mid brown even colour	hard	60, 80,130	19,12
Jarra	dark red brown	hard	67, 80,125	19,12
Karri	rich reddish-browns to pale pinks	hard	67, 80,125	19,12
Rose Gum	straw pink to light red	hard	60, 80,130	19,12
Sydney Blue Gum	pink to dark red	hard	60, 80,130	19,12
Tallowood	pale straw to light brown	hard	60, 80,130	19,12
Southern Blue Gum	pale brown with some pink	hard	63,80,85,108,133	19,12
Stringybark	yellow brown with pink tinge	hard	63,80,85,108,133	19,12
Messmate	Pale yellow to pale brown	moderately hard	63,80,85,108,133	19,12
Tasmanian Oak	pale straw to light brown, pink	moderately hard	85, 108,133	19,13
Victorian Ash	pale straw to light brown, pink	moderately hard	63,80,85,108,133	19,12
Manna/Ribbon Gum	pale straw pinks	moderately hard	63,80,85,108,133	19,12
Imported Hardwoods – to AS 2796 – Timber – Hardwood – Sawn and milled products				
Select Grade, Medium Feature Grade (Standard) and in some species High Feature Grade				
Kwila / Merbau	dark brown	hard	80,130	19
Northern Box	mid brown even colour	hard	80,130	19
Cypress – to AS 1810 – Timber – Seasoned Cypress – Milled products				
Grades No.1 and No. 2				
Cypress	straw sapwood, dark brown heartwood	moderately hard	62,85,98	20
Australian Softwoods – to AS 4785 – Timber – Softwood – Sawn and milled products except Araucaria (hoop pine) for which industry grades apply				
Standard Grade for AS 4785 Australian Softwoods				
Radiata	white to straw	soft	104	19, 21
Araucaria (Hoop)	straw	soft	87,89,102,133,152	19, 20, 21

Cover Widths, Profiles, Spans and End-Matching

Typical cover widths and thicknesses for T & G strip flooring are as shown in Table 1b. Actual cover widths may vary from those shown and should be checked with individual suppliers. Typical T & G profiles are shown in Figure 1c. Some profiles are produced with grooves or rebates on the underside. Where the underside of a floor forms a ceiling, the board edges may be arrised to form a 'v' joint profile. The secret nail profile is used for both top nailing and secret fixing. When secret fixing, the cover width should be limited to a maximum of 85 mm. The "standard profile" is used for face nailing and is the profile commonly found on wider boards. Some wider board flooring has the secret nail profile which allows temporary secret fixing prior to top nailing.

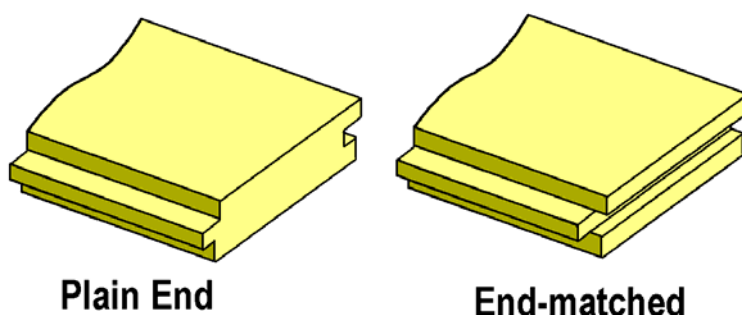
Figure 1c



If the species or species mix contain a significant variation in colours the appearance of the floor will differ depending on the cover width. Narrower boards tend to blend the colour variations together. Gapping between individual boards during drier times is also less with narrower boards than it is with wide boards. A maximum board width of 100 mm is recommended to limit potential gap size and other movement effects such as cupping (edges of the board higher or lower than the centre).

End-matching is a process where a tongue and groove joint is provided at the ends of boards. This allows joints to be placed between joists, resulting in less wastage than plain end flooring, which must have its ends fixed over joists (refer Figure 1d).

Figure 1d



Ordering Flooring

When ordering timber flooring, the following details should be provided to the timber supplier: -

- species (or species mix)
- grade
- profile and end-joint type
- cover width
- thickness
- quantity (in linear metres)

Flooring should be supplied within the moisture content range from 9% to 14%, except for Cypress which should be supplied in the range of 10% to 15%. For larger jobs in specific environments a different range may be specified.

To calculate the linear metres of flooring required, the following method is recommended.

$$\text{Total length of flooring required} = \frac{\text{area of floor (m}^2\text{)} \times 1000}{\text{cover width (mm)}} + \text{Wastage}$$

Allowance for waste should be approximately 5% for end-matched flooring and 10% for plain end butt joined flooring.

1.4 Floor finish types and characteristics

Timber Floor Finishes

Timber floor finishes can be grouped into the four broad categories. These are the oil-based finishes, composite finishes (mixes of oil-based and solvent based polyurethane finishes), solvent based polyurethane finishes and water based finishes. With time all finishes will change in colour and film build as the wears. Therefore the ability to touch up becomes more difficult with time, however all coatings can be restored by recoating. In the long term a resand and refinish may be necessary depending on the wear and age of the floor.

Oil-Based Finishes

Oil-based finishes (alkyd/oleoresins) are the more traditional types of finish manufactured by reacting a natural oil (e.g. linseed and tung) with another chemical. Varnishes and the traditional tung oils fall within this category and are associated with the polished and waxed timber floors of the past. These types of finishes are still available and require greater regular maintenance than the other finishes. However, with the use of acrylic floor polishes, they have become easier to maintain. These finishes will darken with time. They are unlikely to edge bond boards (defined in Table 1e).

Composite Oil-Based/Solvent Based Finishes

Finishes containing oil-based alkyds with the addition of urethanes provide a finish with reasonably good abrasion resistance. Oil modified urethanes, which are one of the predominant floor finishes used in the USA and many of the 'tung oil' based finishes are of this type. The odour during application is very strong but dissipates as the finish dries. These finishes provide a subdued, satin to semi-gloss appearance and are unlikely to edge bond boards. They darken with time and require more frequent maintenance particularly in high traffic areas. Acrylic floor polishes may be used to protect the finish.

Solvent Based Polyurethane Finishes

Solvent based polyurethanes (one pack and two pack) provide a harder finish, generally with limited flexibility but much greater abrasion resistance. Consequently, this greatly reduces the level of routine maintenance. They currently provide some of the hardest finishes available today with gloss levels from matt through to a very high gloss. These finishes, as with the oil-based finishes, will generally darken with time. The odour during application is very strong with these products but dissipates as the finish dries. Due to their high strength and generally limited flexibility, edge bonding of boards can occur.

Water Based Finishes

Some water based polyurethane/acrylic mixes of moderate durability are available but straight one and two pack water based polyurethanes with very good wear resistance are gaining in popularity. These finishes are generally applied over a sealer (either solvent or water based), that not only enhances the colour of the timber but can significantly reduce the risk of edge bonding. Rapid shrinkage in the floor and the associated stretching of the finish at board joints has on occasions caused the appearance of light coloured lines at board joints. Matt through to gloss finishes are available and these finishes generally darken little with time. During application there is low odour associated with water based finishes. A curing additive (catalyst) may or may not be recommended by the manufacturer.

Refer to Table 1e, which outlines the types of finish available and lists various characteristics of each.

Table 1e - PROPERTIES OF COATING SYSTEMS

Timber Floor Finishes							
Oil based Alkyds		Composite		Solvent based		Water based	
Tung oil	Linseed oil based varnishes	Oil modified Urethanes (OMU)	Urethane oil/alkyd 'Tung oil'	2 pack Polyurethane	Single pack Polyurethane (moisture cured)	Polyurethane/ Acrylic	Polyurethane (Single and two pack)
Less wear resistant finish requiring more frequent maintenance Unlikely to edge bond boards #				High wear resistant finish May edge bond boards#. There is a reduced risk of edge bonding when applied over an appropriate sealer.		Moderate to high wear resistant finishes Unlikely to edge bond boards # when applied over an appropriate sealer	
6-24 hour drying by solvent evaporation Some tolerance to waxes Moderate to strong odour on application Avoid inhalation and contact				1-4 hour drying by chemical reaction Not tolerant to waxes Strong odour on application Avoid inhalation and contact		2-4 hour drying by evaporation and reaction Not tolerant to waxes Minimal odour on application Avoid inhaling cross-linkers and hardeners	
Matt to gloss levels Darkens with age				Matt to very high gloss levels Darkens with age		Matt to gloss levels Less darkening with age	
Generally ready for use 2-5 days from completion*				Generally ready for use 2-3 days from completion*		Generally ready for use 2 days from completion*	
*Varies with weather conditions and product. Full curing may take a longer time.							
# Edge bonding relates to the finish acting as an adhesive and bonding board edges together. When board shrinkage occurs, this can result in wide irregularly spaced gaps at board edges or splitting of boards.							

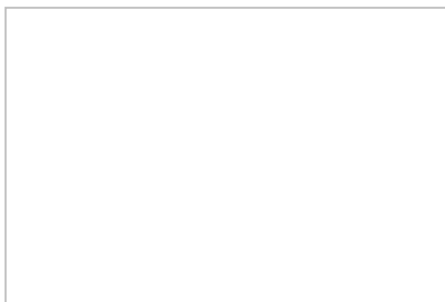


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