

# Technical

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## WHAT'S IMPORTANT WHEN LAYING TIMBER FLOORS

When laying timber floors it is fundamentally important to the success of each job that the installer:-

- understands the characteristics of the timber flooring being used
- considers their client's expectations
- assesses any site related influences that may affect floor performance
- evaluates the influences that building design and construction may have on the floor
- adopts recognised installation practices
- chooses an appropriate finish for the floor

If installers follow the above guideline and have the associated knowledge to make the correct decisions at each stage they are well on the way to consistently providing each of their clients with floors that they will be more than satisfied with.

### Understanding the characteristics of the timber flooring being used

Often it is not fully appreciated that timber flooring, as a natural product, will respond to changes in weather conditions causing it to move (swelling on moisture uptake, shrinkage on moisture loss). Finishes will not prevent movement of timber, however they may slow its movement.

As floors accommodate seasonal moisture changes gaps at board edges can be expected, particularly

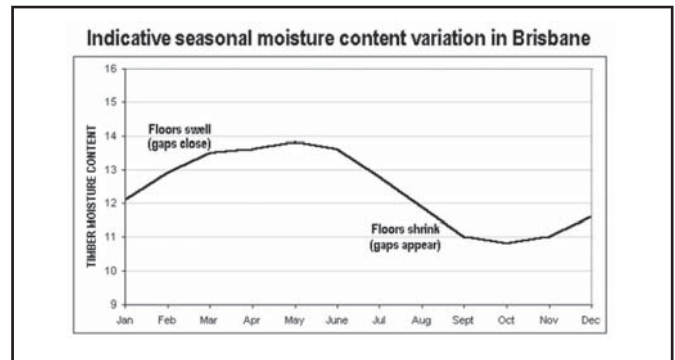


FIGURE 1

during the drier times of the year (see figure 1). Along coastal Queensland, moisture contents of floors may vary from 9% to 14% which is also the usual range in which it is supplied. Small differences in moisture content between boards at the time of manufacture and variable conditions within the house (e.g. westerly facing room) will also cause some further variations in board width. It should also be understood that the overall movement and rate of movement of timber varies greatly depending on the timber species and cutting pattern of individual boards. Generally, softer timbers will move more quickly than timbers of higher density (see figure 2).

At times we see installers having little appreciation for the other inherent differences between species. With moisture uptake, although the hardwoods are slower to expand, they generate much greater compression forces than softwoods. Softwoods require greater care during construction, as they are

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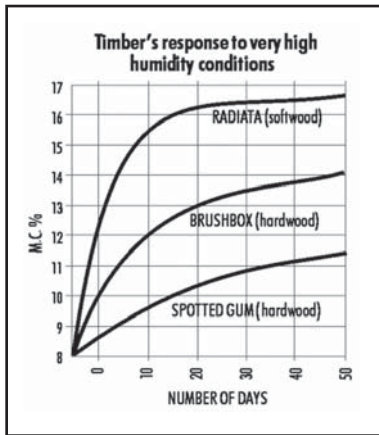


FIGURE 2

softer and more prone to indentation and damage. Light coloured timbers are more prone to show stains, which can come from something as simple as a softdrink can. Even within the hardwood group there are significant differences between the higher density species such as spotted gum and the medium density species such as southern ash. We often see installers use a process that worked with one species and apply the same process to another and have problems. Each specie has different characteristics that must be considered!

Similarly it is important to check the product prior to laying. If there is a period of one to two months between the time of manufacture (dates are usually on pack labels) and installation, this is sufficient time for some equalisation of moisture content to occur. If measurements are close to the nominal cover width ( $\pm 0.5$  mm) and the variation in cover width between wider boards and narrower is less than 1 mm it is unlikely that there are seasoning problems. Similarly, the tongue and groove clearance may be easily checked by slotted some unlaied boards together.

If problems are suspected then the supplier should be contacted. TRADAC will also check flooring samples on a fee for service basis.

## Client expectations

We have found that client expectations vary considerably and at times can exceed reasonable product performance. Communication with the client is often a key to having a job proceed smoothly. Many owners are now more informed about products, however they do not necessarily appreciate the movement characteristics of timber. Communicating this message to the owner can alleviate problems that may unexpectedly arise later on. It is often asked "what are reasonable expectations for the appearance a timber floor?" Due to a diversity of opinion there is no Australian standard that can be referred to and there is not likely to be one in the foreseeable future. However,

for guidance we offer the following with regard to the appearance of a finished floor:-

A level surface (no expansion related problems) that also does not contain areas of cupped boards (board edges higher than the centre of the board) or areas of crowned boards (board edges lower than the center of the board). Note that crowning develops some months after finishing but is a reflection of moisture problems prior to sanding.

Although some gapping at most board edges particularly during drier periods is considered normal, wide gaps (which may be irregularly spaced) and splits passing through boards, significantly detract from the appearance of a floor and are not considered acceptable.

Flooring is manufactured with a clearance between the tongue and groove to allow boards to fit together during installation. When a floor laid over joists is walked on, a limited amount of vertical movement can be expected at tongue and groove joints. The maximum T & G clearance allowed by the Australian standards for hardwood flooring is 0.6mm.

A small amount of noise can be expected from most timber floors. Noises can occur from movement of one board edge against another or from boards moving on nails. A floor is often more noisy during drier weather due to loosening at the joints.

Timber strip floors can be expected to show some indentations depending on the hardness of the species used, volume of traffic and foot ware worn.

A finish similar to that of fine furniture should not be expected. Timber strip floors are not finished in a factory environment and different pieces of flooring will sand differently. The home environment is also not dust free. The finished floor can be expected to have an even appearance free from heavy sanding marks, blooming or frequent air bubbles in the surface. A minimal level of contaminants and minor sanding marks may be visible. The perimeter and other hard to get at places are more likely to contain these irregularities. Some finishes will also yellow with time and if rugs are moved, a contrast in the depth of colour can be expected.

## Site related influences that may affect floor performance

Every site requires assessment prior to the installation of a timber floor. Local conditions can result in floors attaining average moisture contents either higher or lower than surrounding areas and in some instances a greater seasonal variation may be experienced. One specific example of this relates to timber floors that are laid in houses on steeply sloping land or escarpments. Very dry winds or wind blown rain or fog can directly affect the lower surface of the floor and result in either extreme shrinkage or extreme swelling. In elevated areas such as the Blackall Range, average floor

moisture contents may be higher due to the elevation and associated local weather patterns. Similarly, houses built in bush clad surroundings or gullies may experience higher average moisture contents. Floors in houses that are open underneath with little restriction to the prevailing wind can be expected to react more rapidly to changes in humidity. Consideration of these issues will influence how tight the floor is laid, the need for sealing the exposed lower surface of the floor and the provision for intermediate expansion allowance in the floor.

### Building design and construction influences that may affect floor performance

Many dwellings are bricked in underneath and a lack of sufficient ventilation can result in high humidities in the sub-floor space. This may result in expansion and cupping of floorboards. Quoted figures for sub-floor ventilation are based on sub-floor spaces that are neither subject to seepage nor where the ventilation through the sub-floor space is inhibited. Sub-floor ventilation requirements included in recent changes to the BCA are inadequate for timber floors and it is recommended that they be as shown in Table 1. (Note BCA requirements are concerned with sub-floor framing issues not T & G floor performance).

Within a dwelling a number of differing climates can develop causing areas of flooring to respond differently within the same dwelling. Large expanses of glass, fireplaces, air-conditioners, appliances that vent warm air, the aspect of the house and two-storey construction may all have an affect on the dimensional movement of floorboards. When floors are exposed to the sun through large glassed areas, protection should be considered

**TABLE 1**

CLIMATE ZONE & CONDITIONS	Minimum Sub-floor Ventilation mm <sup>2</sup> /m of wall		
	BCA requirement (no membrane)	BCA requirement (with moisture impervious membrane)	T & G Flooring requirements
<b>1. Inland Queensland</b> Average 9am RH < 60% e.g. Roma, Mt Isa	2000	1000	<b>7500</b>
<b>2. Central Queensland</b> Average 9am RH > 60%, 3pm RH <40% e.g. Dalby, Emerald	4000	2000	<b>7500</b>
<b>3. Coastal Queensland</b> Average 9am RH > 70%, 3pm RH <60% e.g. Brisbane, Toowoomba, Cairns	6000	3000	<b>7500</b>

before, during and after construction. Air-conditioning installed after a floor has been laid, may also increase the size of shrinkage gaps at board joints.

There is growing demand to have T & G floors laid over either a concrete slab or sheet flooring. When laid over sheet flooring the strip floor is afforded greater protection from the external environment but is not sufficient to prevent moisture uptake from an enclosed and continually wet sub-floor space. The possibility of moisture uptake from concrete slabs or from sheet sub-floors must be guarded against and this may necessitate testing of the sub-floor prior to laying the T & G floor.

### Adopting recognised installation practices

The laying of timber floors is briefly covered in AS 1684 Residential timber-framed construction and in much more detail in five TRADAC Technical Data Sheets. TRADAC data sheets cover the installation of T & G floors over joints, over concrete slabs and over timber sub-floors. Data sheets also cover aspects such as sub-floor ventilation and timber floor finishes. Some of critical points to be considered regarding the installation of timber floors area outlined below:-

- From the time of manufacture through to installation, it is necessary to ensure that flooring products are kept dry and that packs are not exposed to the sun for long periods.
- Polished or feature floors should only be laid by the cut in method in a weathertight house – not platform floor.

Acclimatising is the process of allowing partial equalisation of the moisture content of the timber as supplied to the moisture content of the surroundings, in which the timber is to be installed. This process should only be carried out when the atmospheric conditions in which the timber is to be acclimatised are similar to the expected average service conditions of the floor. This process should be considered with environments that are air-conditioned prior to floor installation, very dry environments (e.g. Western Queensland) or where the microclimate is moist. The intermittent use of air-conditioners or heating, combined with natural ventilation may only cause a minimal lowering of the average inservice moisture contents.

For continuous floor widths in excess of 6.0 m, intermediate expansion allowance should be provided.

If for any reason a board appears distinctly different to other boards, even if it is within grade, it should be rejected or laid in a location where it will not be highly visible.

Floors laid on joists should be cramped at intervals not exceeding 800 mm. The pressure used to cramp the floor should be adjusted to take account of the moisture content of the flooring at the time of installation and

factors associated with the site location, site conditions and building design. As a general rule cramping should be sufficient to just bring the edges of adjoining boards together.

Where machine nails are used, they shall be a minimum of 2.5 mm diameter x 50 mm long (65 mm long for softwood or LVL joists). During installation of T & G flooring products, the interface between the flooring and joists should be checked to ensure that no gaps are present after nail installation. When unseasoned joists are used, all nails should be punched or repunched just prior to sanding. 'Secret nail profile' boards should be used where nail heads are to be hidden and these boards should not exceed 80 mm in cover width. "Secret Nail" profile flooring should only be fixed to seasoned joists, as there is no subsequent access to nail heads if shrinkage occurs in unseasoned joists.

Houses closed up after completion without curtains or blinds, which are then left vacant, may cause high temperatures and low humidities within the dwelling. If conditions are sufficiently severe, additional shrinkage and cupping of boards may result.

### Choosing an appropriate finish

Many types of floor finishes are currently available in the market place. In applications where greater movement is expected after sanding and finishing (e.g. from seasonal changes, use of wide boards, air-conditioning installed after the floor), a flexible finish is recommended that will allow boards to move individually. If flexible finishes are not used, adjacent boards may become glued together by the finish penetrating into the joints. With subsequent shrinkage, wide gaps every fourth or fifth board may occur or boards may split. This being a cause for complaint.

The less flexible finishes are therefore considered to be more applicable where minimal movement is expected after installation. This usually applies only to a permanently controlled environment (e.g. shopping centres that may be air-conditioned for 20 hours per day). Provided the average moisture content of the flooring when laid is near the inservice moisture content (achievable after a period of acclimatising the floor in the air-conditioned environment), subsequent board movement will be small. In this case, there is little risk of edge bonding being a problem and wear resistance may govern the choice of finish..

Timber floor finishes can be grouped into the three broad categories. These are the oil-based finishes, solvent borne finishes and water borne finishes. There is also a composite group, which is a mix of the oil-based and solvent borne finishes. The oil-based finishes (tung oils) require greater routine maintenance however they have become easier to maintain with the use of vinyl floor polishes. These finishes and those in the composite group (e.g. oil modified urethanes) are not prone to edge

bonding but will darken with age. Solvent borne finishes include mainly moisture cured polyurethanes (single pack) and two pack polyurethanes. These provide the hardest wearing and glossiest finish and will darken with age. However, both these finish types are prone to edge bond boards. Sealers to minimise the occurrence of edge bonding are recommended by some manufacturers. The water borne polyurethanes are flexible and those products containing little or no acrylic are also hard wearing. These finishes are not prone to edge bonding of boards provided they are applied over the specific manufacturers' sealer. These finishes also have minimal odour on application, cure quickly and do not darken with age. Very high gloss levels can not be achieved.

We see a lot conflict occur over floor finishes and it is often because the respective characteristics of the finish are not communicated to homeowner. When selecting an appropriate finish consider what subsequent movement you expect to see in the floor. Consider the time of the year that the floor is laid, the cover width of the boards and any movement that may have occurred in the floor since installation. Be aware that floors considered tight at the time of laying are not void of edge bonding problems.

As indicated at the beginning of this article, if you consider each of the areas above and make the appropriate decisions throughout the process, then few surprises will occur greater customer satisfaction will result.

### Master Builders Advice

- Builders should ensure the flooring is supplied within the 10-15% moisture content range - preferably around 12-13%. Do this by obtaining a written statement from the supplier.
- Protect the material on site from harsh weather conditions.
- Use the "cut in" floor method (fitted floor) and not the "platform flooring" method. The "cut in" method is where flooring is installed after the roof covering and external wall cladding is completed. This provides for weather protection and reduces the risk of water damage.
- In cases where a Builder adopts a "Platform Flooring" System, if it gets wet and subsequently deteriorates through excessive shrinkage, the Builder will be held responsible for rectification.
- Use the correct nails and remember - T heads go across the grain.
- Use polyurethanes to avoid edge bonding.
- Provide your client with a copy of this article.

**NOTE:** If you build faithfully in accordance with these procedures and a failure does occur, it is unlikely you will be held accountable by the Building Services Authority or your client.