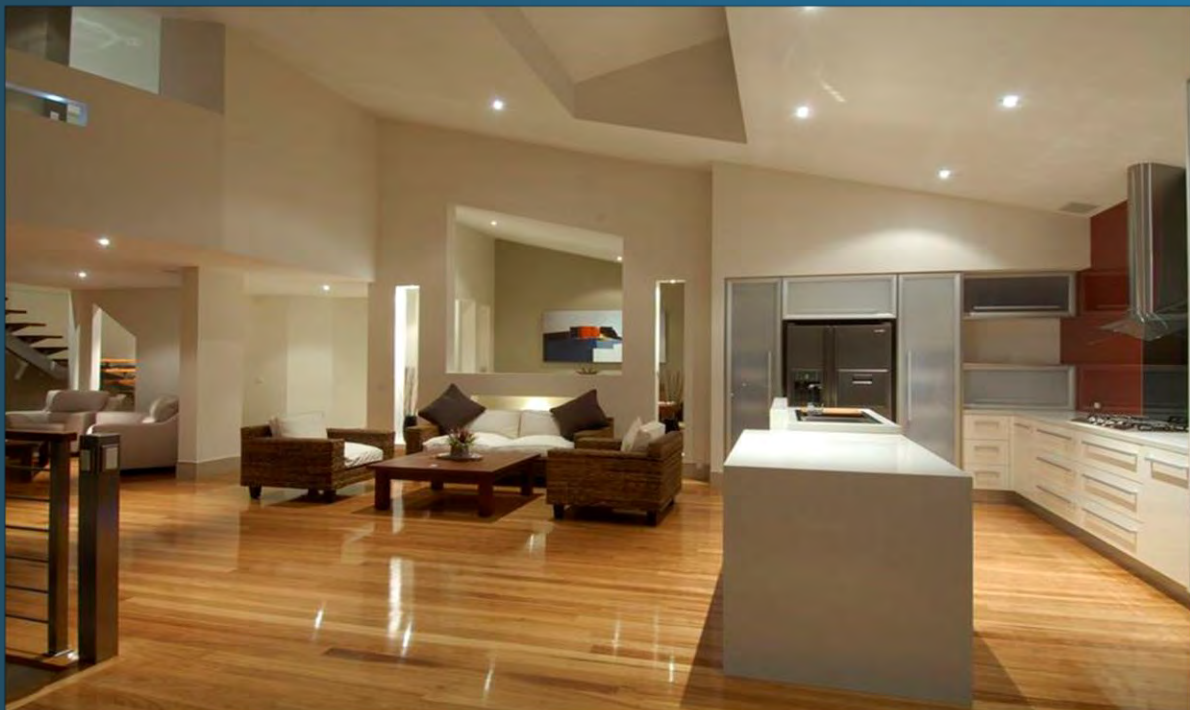




COFFS HARBOUR
HARDWOODS

Installation recommendations

Solid timber and parquetry flooring



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Products and Application

Solid timber flooring that is correctly specified, handled, installed and finished provides a durable floor of lasting beauty. These recommendations will assist in ensuring that the floor's full potential is realised.

These installation recommendations cover the following Coffs Harbour Hardwood products:

- Structural flooring in the following sizes:
60 x 19mm, 80 x 19mm, 130 x 19mm, 180 x 20.5mm, 60 x 20.5mm sports floor
- Overlay timber flooring in the following sizes:
80 x 13mm, 130 x 14 mm
- Block and mosaic sheet parquetry in the following sizes:
BLOCK
 1. 260 x 65 x 19mm
 2. 260 x 65 x 14mm
 3. 340 x 85 x 19mm
 4. 340 x 85 x 14mm
 5. 400 x 80 x 19mm
 6. 400 x 80 x 14mm**MOSAIC**
 1. 5, 6 & 7 Finger: Square on Square, Brickbond and Parallel Sheets = 535 x 535mm
 2. Basketweave Sheets = 445 x 445mm
 3. Gothic & Haddon Hall Sheets = 400 x 400mm
 4. Herringbone Sheets = 440 x 400mm

When installing flooring there are three steps in the process. Firstly, it is necessary to have a full understanding of the characteristics of the product being laid, secondly, an understanding the effect that environmental factors (relative humidity and temperature) will have on the ongoing performance and appearance of the floor, and thirdly to use recognised industry laying practices, designed to provide sound fixing in the specific installation environment.

The recommendations provided cover product assessment, preparation prior to laying, allowing for future movement (swelling and shrinkage), fixing to recognised practices and additionally, consideration of the sanding and coating of the floor. It should be noted that the installer also needs to meet the requirements of the National Construction Code, Australian standards and the ATFA industry standard – Solid Timber Flooring.

It is recommended that floors should only be laid by those competent in laying solid timber floors and equally that they are sanded and coated by those competent in the trade. As such, these trades would be expected to communicate with clients over aspects such as board colour variation, grade and feature distribution, board lengths, laying direction, fixing methods and the benefits and limitations of available coatings. They would also be expected to undertake checks on the product, subfloor, subfloor conditions and installation environment, prior to working on the floor.

As such there is an expectation that the flooring supplied will be checked by the installer and that this would include verification that the specified grade has been provided, a sample of boards in each pack have had their moisture contents and cover widths verified and recorded, and that any boards with visible imperfections (e.g. handling damage, severe warp or unusual colour variance) that may adversely affect the appearance or performance of the floor are not laid. Any significant concerns with the flooring supplied should be brought to the immediate attention of the supplier or Coffs Harbour Hardwoods.

The recommendations that follow should be read in full prior to laying and any questions or concerns directed to Coffs Harbour Hardwoods.

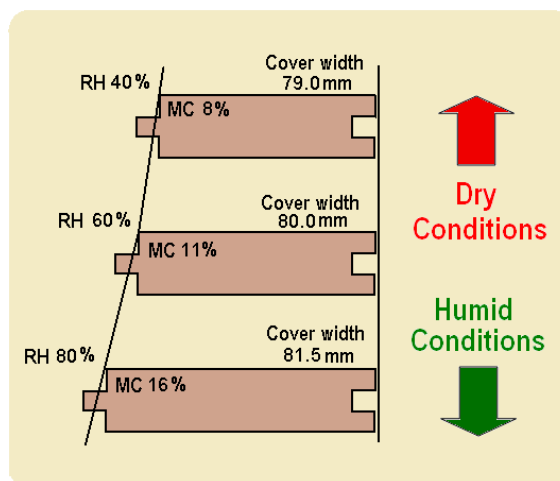
Contents

- 1.0 The nature and characteristics of solid timber flooring
- 2.0 Product storage and handling
- 3.0 Product assessment and fixing methods
- 4.0 Assessing the location and installation environment
- 5.0 Acclimatisation
- 6.0 Assessing the subfloor space and subfloors
- 7.0 State of building completion
- 8.0 Provision for future floor movement
- 9.0 Installation of structural timber flooring
- 10.0 Installation of overlay timber flooring
- 11.0 Installing block and mosaic parquetry
- 12.0 Sanding and coating
- 13.0 Floor care and maintenance

1.0 The nature and characteristics of solid timber flooring

Expansion and shrinkage in timber floors

Timber flooring responds to seasonal weather changes that cause boards to shrink and swell. Relative humidity is a measure of how dry or moist the air is, and it is the main factor influencing board expansion and shrinkage. Dry air (low relative humidity) can absorb moisture from a timber floor, reduce the board's moisture content and with this the floorboard will shrink. Moist air (high relative humidity) will have the opposite effect and cause the flooring to absorb moisture and swell. Dwellings throughout much of Australia experience internal relative humidities that average between about 50% and 60% relative humidity and at these humidities floors will have average moisture contents of 10% to 11%. It is for this reason that Coffs Harbour Hardwoods also target at manufacture, an average moisture content between 10% and 11% for their flooring. As an average, there will be periods of the year when humidities are higher and floorboards will swell, and also periods when humidities are lower and floorboards will shrink. This natural board movement is indicatively illustrated in the diagram, and it is part of the reason why floorboard moisture contents need to be assessed at the time of installation and why the humidity of the building environment also needs to be assessed. It is only after such assessment, that practices such as acclimatisation can be considered along with the degree of expansion allowance that needs to be incorporated into the floor.



Source: ATFA – Solid Timber Flooring – Industry standard

The table below provides the relationship between air temperature, air relative humidity and timber moisture content (termed an Equilibrium Moisture Content (EMC) table). The temperature and humidity of the air are changing on a daily and seasonal basis, but it takes time for flooring to absorb moisture from the air or loose moisture to it. Hence, the movement (shrinkage and swelling) is generally only noticed on a seasonal basis. Coatings also slow this movement and in more stable internal climates the seasonal movement will also be less.

Temperature		Equilibrium Moisture Content (%)																		
°C	RH	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
0		1.4	2.6	3.7	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.4	11.3	12.4	13.5	14.9	16.5	18.5	21.0	24.3
10		1.4	2.6	3.6	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.3	11.2	12.3	13.4	14.8	16.4	18.4	20.9	24.3
20		1.3	2.5	3.6	4.5	5.4	6.2	7.0	7.7	8.5	9.3	10.1	11.0	12.0	13.1	14.5	16.0	18.0	20.5	23.9
30		1.2	2.4	3.4	4.3	5.2	6.0	6.7	7.5	8.2	9.0	9.8	10.6	11.6	12.7	14.0	15.5	17.5	20.0	23.4
40		1.1	2.2	3.2	4.1	5.0	5.7	6.4	7.1	7.9	8.6	9.4	10.2	11.1	12.2	13.4	15.0	16.8	19.3	22.7

Source: ATFA – Solid Timber Flooring – Industry standard

It can be seen from the table that under sustained dry conditions of say 35% relative humidity (at 20°C) the EMC is 7% and under such conditions floor shrinkage and gaps at board edges are to be expected. At 80% relative humidity (at 20°C) the EMC is 16% and

under these humid conditions floor expansion is to be expected and must be accommodated for with appropriate expansion allowance.

The future lived-in climate of a dwelling is often difficult to predict and due to this appropriate expansion allowance is a necessity, not an option. In very dry or very humid climates practices such as acclimatisation can be considered to pre-shrink flooring in dry climates or pre-expand flooring in humid climates. This is discussed further in Section 5.

It should also be noted that floor movement after installation is significantly affected by heat from fireplaces, air-conditioning and sunlight through unprotected doors or windows that often cause gaps to appear at board edges after installation and at times some cupping (raised board edges). Evaporative cooling can have the opposite effect and cause floors to experience expansion.

Colour variation and grain

Within a single species considerable colour variation can occur – tree to tree, outer sapwood to inner heartwood. Hardwood flooring treated to prevent lyctus borer attack may also impart some colouration to lighter coloured sapwood. It needs to be realised that no two floors, even of the same species, will be of the same appearance. Not only are there differences in the colour tones, but also differences in the number of darker or lighter toned boards within a floor. Additionally, differences in grain pattern and the amount of feature present will also cause appearance differences.

Grading

It is important to realise that the overall colour or blend of colour in a floor is dependent on the species or species mix chosen and that the character of the floor, in terms of the features present (such as gum veins), is determined by the grade.

The grading of Coffs Harbour Hardwoods flooring is to Part 1 of Australian Standard AS 2796 – Timber Hardwood - Sawn and milled products and the Part 2 grades Select Grade and Standard Grade-Medium Feature Grade (marketed by CHH as Standard Grade). Note that CHH has its own Feature grade rules which are close to AS 2796 High Feature Grade but with some exceptions.

The three grades may be described as follows:

- Select Grade: This grade provides a very clean appearance and has the least amount of natural feature such as pin holes and gum veins.
- Standard Grade: Contains a moderate amount of natural feature that gives a natural look that only real timber can truly provide.
- Feature Grade: This grade contains boards with similar features to Standard Grade but a little larger thereby providing a more rustic appearance.

The grade has no influence on a floor's fitness for purpose in terms of its manufactured moisture content range or machining tolerances etc. These aspects are the same for each grade.

Also of importance is that different features can predominate in different species. Therefore, two floors of the same grade may appear quite different in terms of the predominating feature and how dominant that feature appears in a floor. If choosing an alternative species from the one originally considered, not only will the overall colour differ but the predominating type of feature may also differ. Hence, floors of the same grade but of different species can have quite different appearances.

How the boards are mixed into the floor both in terms of colour and feature is up to the installer, so if this is of importance, the installer and client should discuss this aspect.

Hardness

Some species are harder than others and this is often well known. However, what is not always appreciated is that the hardness within a species can vary greatly and that quoted hardness figures are averages, with a significant variation in hardness values above and below the average. Generally, the higher the density of flooring, the harder and less prone to indentation a floorboard will be. The species manufactured by Coffs Harbour Hardwoods into flooring are 'hard' species and less prone to indentation. But also note that some footwear, including worn stilettos, cause a force on a very small floor area and indentations will result. Most footwear, such as 'runners' spread this same force over a much greater floor area and will have no effect on the floor.

Board length

Strip flooring is provided in random lengths. For structural 19mm and 20.5mm thick flooring, lengths may range from 0.9m to 6m. For overlay flooring that must be laid over a structural subfloor of plywood, particleboard, T&G boards or concrete slabs, lengths may be from 0.4m to 3m. Parquetry is of set block or sheet size.

2.0 Product storage and handling

Flooring must be handled and stored in a manner that does not allow the product to become damaged.

Flooring packs from Coffs Harbour Hardwoods processing plant are supplied with plastic wrapping (to top, sides and ends). This is for moisture content control and is not designed to prevent possible damage from rain or intense sun exposure. Flooring products therefore require protection from weather exposure and other sources of dampness.

Flooring should be delivered to site when it can be immediately stored under permanent cover and protected from any influence of moisture (e.g. concrete slab moisture) or conditions of high or low humidity. Stacking should be on a flat surface with due consideration to ensuring that boards do not distort and are not in areas of intense sunlight.

3.0 Product assessment and fixing methods

With our products, and in line with industry requirements, not all installation methods are suitable for all products and actual installation practices can also differ state to state within Australia.

For structural 19mm thick T&G flooring the table outlines the fixing alternatives for different subfloor types.

STRUCURAL FLOORING FIXING ALTERNATIVES FOR DIFFERENT BOARD SIZES AND SUBFLOOR TYPES				
Board sizes	Direct to joists	Sheet subfloor on joists	Battens on concrete	Plywood on concrete
60x19mm	Secret fix or face fix	Secret fix or face fix through to joists	Secret fix or face fix	Secret fix
80x19mm	Secret fix or face fix	Secret fix or face fix through to joists	Secret fix or face fix	Secret fix
130x19mm	Face fix only	Secret fix (full bed of adhesive only) or face fix through to joists	Face fix only	Secret fix (full bed of adhesive only)
180x20.5mm	Face fix only	Face fix through to joists	Face fix (70x35mm battens only)	Not recommended
60x20.5mm	To sports floor specifications			

Overlay flooring (13mm and 14mm thick) must be laid over a structural subfloor which can include sheet subfloors (plywood and particleboard), existing timber floors and in some instances direct to concrete. These products are intended for secret fixing (using a combination of adhesive and mechanical fixings) to sheet and timber subfloors that have been fixed on joists or over a concrete slab. Some flooring contractors with specific knowledge and in specific localities will adhesive and mechanically fix direct to concrete slabs.

Parquetry, either block or mosaic sheets must also be laid over a structural subfloor which can include sheet subfloors (plywood and particleboard), existing timber floors and also direct to concrete. With both block and mosaic parquetry, installers will generally include an underlay board (e.g. 6mm thick plywood) over particleboard and this is also necessary over solid T&G subfloors. Underlay sheets may be fixed with beads of adhesive at 100mm spacing and staples around the perimeter of the sheet, 12mm in from edges and spaced at 75mm intervals. Through the main body of the sheets staple spacing is at 100mm.

Before the installation of structural and overlay timber flooring proceeds, the following should be verified and **recorded** by the installer.

- Board moisture contents in the range 9% to 14% (Note: Resistance moisture meter readings must be corrected for temperature and species. Corrected readings are approximate only. If in doubt confirm results by oven dry moisture content testing).
- Cover widths within ± 0.5 mm of the nominal cover width. Variation between individual boards should generally be less than 1mm.
- Tongue and groove tolerances between 0.3 mm to 0.6 mm.
- Flooring supplied to the specified grade.

Before the installation of block or mosaic parquetry begins the following should be verified and **recorded** by the installer.

- For block parquetry in 260x65x14/19mm & 340x85x14/19mm that four block widths do not exceed the length of a block and for 400x80x14/19mm, it will be 5 blocks.
- For mosaic finger that sheet size is within ± 0.5 mm of nominal sheet size.

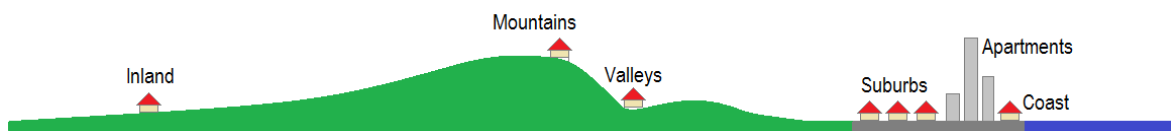
- That the block and finger moisture contents are in the range 9% to 13% (Note: Resistance moisture meter readings must be corrected for temperature and species. Corrected readings are approximate only. If in doubt confirm results by oven dry moisture content testing).
- The flooring is supplied to the specified grade

With any product concerns, immediately contact your supplier. **Do not begin to lay the floor.**

4.0 Assessing the location and installation environment

The ATFA highlights that climates differ markedly around Australia and in their industry standard they consider the temperate climates of Brisbane and Sydney, the colder southern climates of Canberra and Melbourne, the Adelaide and Perth climates, and also the more extreme climates of Cairns, Darwin and Mt Isa. They indicate that experienced installers are generally familiar with climatic influences in locations that they usually lay floors. Much greater care is however needed when laying a floor in a location that the installer is not familiar with. ATFA provides the following diagram and wording to also highlight that the installation environment and future moisture content range can differ over relatively short distances.

2.4.3 Climatic variations within a locality



It is also important to understand that within a locality there are going to be geographic differences between one dwelling and another. This is best explained with reference to the figure above showing dwellings that are on the coast, in suburban environments, and also valley, mountain and inland areas. This is indicative of the types of geographic differences that can occur. Similar principles can be applied to specific locations within the country.

This example illustrates how the foreshore has cool sea breezes that often prevail, causing lower afternoon temperatures and higher afternoon humidity. In such locations internal EMC may range from 12% to 13% with natural ventilation more likely. Apartments along the coastal fringe may be similar if naturally ventilated, although many have controlled cooling systems and therefore internal EMCs may be 9% to 11%. In the suburbs, there are many roads and closely spaced houses. Roads heat up and rainwater is quickly drained away from roofs and roads. As such, internal conditions are usually drier than on the coastal fringe and may be 10% to 11%. The valley environment often has more open land and trees which hold moisture and there is greater shading of the dwelling. This may result in internal EMCs of 12% to 16%. Houses elevated on the likes of escarpments can be prone to periods of lower temperatures due to the height and higher humidity, more rain and mist, yet at other times of the year are subject to dry winds. Houses may also be open beneath. Consequently, quite variable seasonal conditions can occur, and internal EMCs could vary from 11% to 16%. Further inland, the effects of dry winds and moderate rain may see internal EMCs range from 9% to 12%.

Source: ATFA – Solid Timber Flooring – Industry standard

As such, when laying strip timber and parquet floors, it is necessary to understand both the general and specific location effects that will influence floor movement after installation, and which a competent flooring contractor should understand. Further information on this and other factors such the effects of heating and cooling systems is provided in the ATFA industry standard - Solid Timber Floors, which is available from the Australasian Timber Flooring Association - www.atfa.com.au. This is a very important aspect of floor installation as it dictates practices that will minimise expansion or shrinkage effects in the completed floor.

5.0 Acclimatisation

Acclimatisation is one of the most misunderstood concepts in the laying of timber floors. In Section 1.0 - The nature and characteristics of solid timber flooring, it was explained how the relative humidity of the air will determine whether flooring will absorb moisture from the air or release moisture to the air and that timber flooring reacts to seasonal changes in humidity by shrinking and swelling.

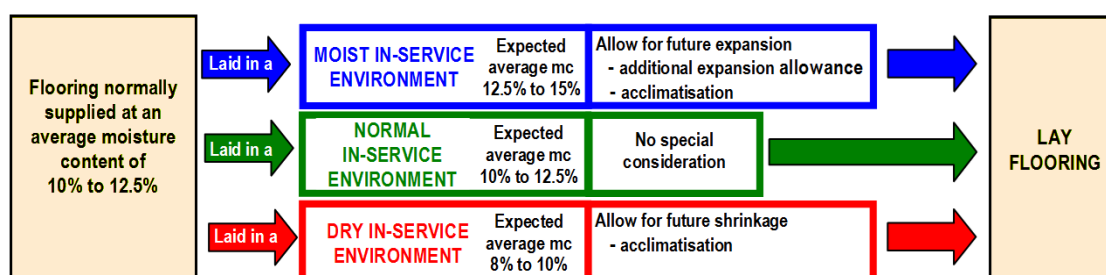
It was also indicated that Coffs Harbour Hardwoods targets at manufacture a moisture content of 10% to 11% as in many dwellings throughout Australia the average in-service moisture content will also be 10% to 11%. You could consider that the flooring has been manufactured to be in balance with its future internal environment. This is the case much of the time and as such, acclimatisation of flooring prior to installation is generally **not** required.

Acclimatisation has a specific purpose to either pre-shrink flooring in dry climates or pre-expand flooring in humid climates. This is saying that if our internal lived-in environment is not going to have an average in-service moisture content of 10% to 11%, we can adjust the moisture content prior to laying, by acclimatising the flooring.

If the intent is to raise the average moisture content prior to laying, thereby expand the board width to prevent excessive pressure after installation, then the conditions need to be quite humid during the acclimatisation process. Similarly, if the intent is to lower the average moisture content prior to laying, thereby shrinking the board width to reduce the size of in-service gaps at board edges, then the conditions need to be dry during the acclimatisation process.

Take special note that acclimatising under the wrong conditions (e.g. low humidity when you want floorboard expansion) then the acclimatising process can do more harm than good. It is not a process that is done 'blind folded', nor 3 months acclimatisation necessarily better than 2 weeks. It is a process where board moisture contents, board widths and the relative humidity during the acclimatisation process need to be monitored to see that the desired outcome is being achieved.

The ATFA has produced the following table to indicate when acclimatisation should be considered. In terms of floor expansion, it also provides the alternative of increasing the amount of intermediate expansion at the time of installation. Some installers in humid locations use that method as a matter of course while others use it when condition for acclimatising the floor are not appropriate.



Source: ATFA – Solid Timber Flooring – Industry standard

When structural flooring (19mm) is to be acclimatised, boards are to be stacked in the installation environment away from direct sunlight but so as to permit good airflow through each layer (refer to the photo). Additional care is needed with 180mm wide boards due to preferential end swelling or shrinkage.



With overlay flooring laid under moderate internal climates (average in-service moisture contents of 10% to 11%) acclimatisation is similarly not needed. Note that thinner overlay flooring is prone to respond more quickly to humidity changes than structural 19mm thick flooring and can distort with the acclimatisation practices outlined above. Hence overlay flooring is generally installed without prior acclimatisation but should be left for about 2 weeks under moderate conditions before sanding and coating. This thereby accommodating minor shape changes (e.g. slight cupping or peaking) that can occur after laying as the flooring becomes accustomed to the building environment. If traditional acclimatisation practices are to be considered, then additional care is needed.

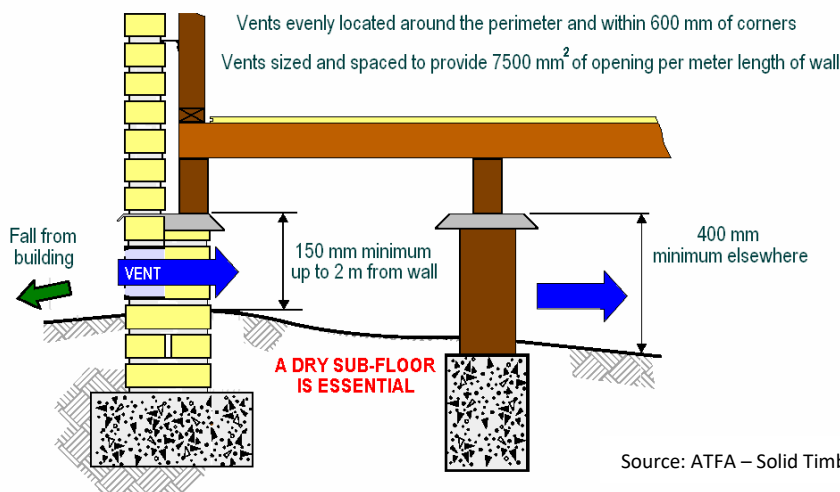
Concerning block and mosaic parquetry it is recognised that this type flooring has with most installations greater in-service stability due to the smaller dimensions and installation patterns that often results in a mix to widths and lengths across a floor area. Note that expansion and shrinkage occurs over the width of a block or finger, not down the length. Due to the small piece sizes and increased stability of these products, acclimatisation is not needed.

6.0 Assessing the subfloor space and subfloors

This aspect is particularly important as insufficient assessment and action has been the cause of performance problems in installed floors.

Subfloor spaces

If a subfloor space is present, then the space must be dry and is to remain dry. It must also have adequate ventilation. The general requirements for subfloor spaces are shown in the diagram from the ATFA industry standard – Solid Timber Flooring.



Subfloor spaces with inadequate ventilation that trap moist air or present 'wet' conditions beneath the building will maintain high humidity in the subfloor space and this will be detrimental to the installed solid timber floor above, irrespective of whether it is laid direct to the joists or other subfloors (sheet or timber).

As such any adverse conditions in the subfloor space need to be attended to prior to the flooring being installed. This may necessitate increased ventilation, closed in drainage and a moisture barrier over the soil to prevent excess soil moisture evaporation. The ATFA provide further details on this.

Concrete slabs

When considering floors laid over concrete slabs there are various requirements. All concrete slabs beneath solid timber floors, including parquetry, need to be assessed that they are sufficiently dry and flat and with adhesive fixing or application of a moisture vapour barrier, that they are also sufficiently sound and clean.

A dry slab would be considered to have an in-slab relative humidity of below 75% (as assessed to ASTM 2170) or an impedance moisture meter (e.g. Tramex CME 4) reading of about 2%. Many new and some old slabs exceed these figures and as such additional moisture vapour protection is required, and particularly with on ground slabs or slabs that have become water affected through leaks etc. It should also be noted that slabs on-ground can change in moisture content with time (e.g. water table changes, moisture distribution within the slab and following mechanical drying).

If a floor is laid on plywood or battens over a slab, moisture vapour protection can be provided with builder's plastic 200µm thick (0.2mm) that is lapped 200mm, joints taped with a water-resistant plastic tape and the builder's plastic brought up to the height of the floor. This has proven to be a very effective moisture vapour barrier, noting that fixing holes through the plastic do not significantly lessen its effectiveness. This system has provided reliable protection for slabs with in-slab relative humidity up to about 85% and impedance readings up to about 4%.

Alternatively, a moisture vapour barrier may be applied over the slab and to maintain warranties it usually needs to be of the same manufacturer as the adhesive and any levelling compound used. The product manufacturer will indicate slab requirements in terms of moisture assessment, integrity, flatness and cleanliness. Flatness and cleanliness are addressed by grinding and levelling compounds (used over applicable primers). Grinding will also address slab integrity where the upper concrete layers can be 'soft' or 'flaky' and need to be removed. The products and recommendations of the product manufacturer need to be followed.

Note that MS polymer adhesives are now available, and some have moisture vapour resistance properties. If such adhesives are used it is important to apply the adhesive as directed by the product manufacturer in order to achieve the desired moisture vapour resistance.

Subfloor requirements when fixing over sheet and timber subfloors, and joists

When fixing strip flooring into a sheet or timber subfloor (including joists), the subfloor needs to be adequately flat and dry, and with the adhesives used, both clean and sound. These same requirements apply to parquetry floors laid over these types of subfloors.

At installation, sheet and timber subfloors and joists, on which the flooring is to be laid, should be within 2 to 3% of the timber flooring (after acclimatisation if applicable) and generally not expected to be above 14% (may be higher in some tropical locations). Note that assessment of sheet subfloor moisture content with moisture meters is prone to error and if there are concerns with readings, oven dry moisture content testing may need to be considered.

In terms of being sound and clean, the integrity and cleanliness of the subfloor needs to be considered. For strip timber subfloors, remedial work may need to be undertaken (e.g. board replacement or additional fixing) to provide a subfloor of sufficient integrity. Note also that particleboard generally has a protective wax in the surface that needs to be removed. Cleaning of such surfaces is achieved through rough sanding. Proud joints in subfloor sheets will also need to be flattened through sanding. The required overall flatness of the subfloor differs depending on the fixing method and this is discussed later under the specific sections on installation.

Possible movement in strip timber or sheet subfloors can telegraph through to the floor above and if considered a risk (e.g. elevated dwelling with noticeable seasonal movement of the subfloor, floors laid parallel over existing T&G subfloors or smaller piece size as with parquetry products), a thin plywood underlay over the subfloor of approximately 6mm thickness should be considered. Such an underlay may be fixed with beads of adhesive at 100mm spacing and staples around the perimeter of the sheet, 12mm in from edges and spaced at 75mm intervals. Through the main body of the sheets staple spacing is at 100mm. The sheets should be laid in a brick bond pattern with the length of the sheets running at right angle to board length. The fixing of the floor may be undertaken relying on a combination of mechanical and adhesive fixing as outlined in the installation sections.

Finally, it needs to be noted that when laying T&G strip flooring over a sheet subfloor on joists and the flooring is of higher density, as with many of the Coffs Harbour Hardwood species, it is important that the sheet fixing to the subfloor is adequate. In moderately humid locations with higher density hardwoods, it has been found that nail and adhesive fixing of sheet flooring has in some instances resulted in the sheets buckled off the joists, even when fixed in accordance with the relevant nailing requirements of Australian standards. Screw fixing to the joists as also often used, provides a more robust fixing and is recommended.

Fixing plywood and battens to concrete slabs

Plywood subfloors that are mechanically pinned to the concrete slab can be either 12mm or 15mm thick and can be non-structural. Sheets are to be staggered 900 mm so that from sheet to sheet, fixings do not line up. A clearance of about 6mm between sheets is provided and a 10 mm gap to internal and external walls.

Plywood sheets are to be staggered 900mm and fixed to the slab with hand driven 50 mm long drive pins (e.g. Powers spikes, Ramset drive pins or other equivalent) to manufacturer's recommendations. In 15mm thick plywood 20 spikes are used (4 rows of 5 pins down a 2.4 x 1.2m sheet), equally spaced and with the outer spikes 50 mm from the sheet edge. The head of the spike is to be driven flush with the surface of the plywood. With 12mm thick plywood 4 rows of 7 pins are used.

When fixing to battens, the battens may be seasoned 80 x 19mm high density hardwood or 70 x 35mm hardwood or pine. Fixings are at 900mm spacing with hand driven pin fixings (e.g. Powers, Ramset or other equivalent) and embedded at least 32mm or other fixings with similar holding strength may be used (e.g. M6 masonry anchors, but not fixings with a nylon sleeve). With 70 x 35mm battens they are similarly fixed but with spacing up to 1200mm. Note that in more humid locations or where higher forces are expected, both the batten spacing and/or fixing spacing should be reduced. Note also that for some products that thicker battens are required (refer to Section 3).



7.0 State of building completion

At the time of floor installation, the building must be complete to the stage of being closed in, weathertight and the flooring protected from possible adverse effects from wet trades and more extreme direct sunlight etc. A roof that leaks after floor installation or plumbing leaks are more common causes of floors being damaged during construction.

Floor protection and temporary window coverings may be needed after laying. Care being needed that the likes of plaster dust is not trapped in open features or board joints. Falling objects can also cause damage.

Internal conditions should be maintained as close as possible to lived-in conditions and note that prolonger high temperatures in locked up buildings can adversely affect floors. Particular care is needed over the Christmas period, and more so in southern and western states that experience hot and dry summers. High temperatures in buildings at this time cause very dry air (very low humidity) and under more extreme conditions this can cause irreputable damage to a floor that was newly installed.

8.0 Provision for future floor movement

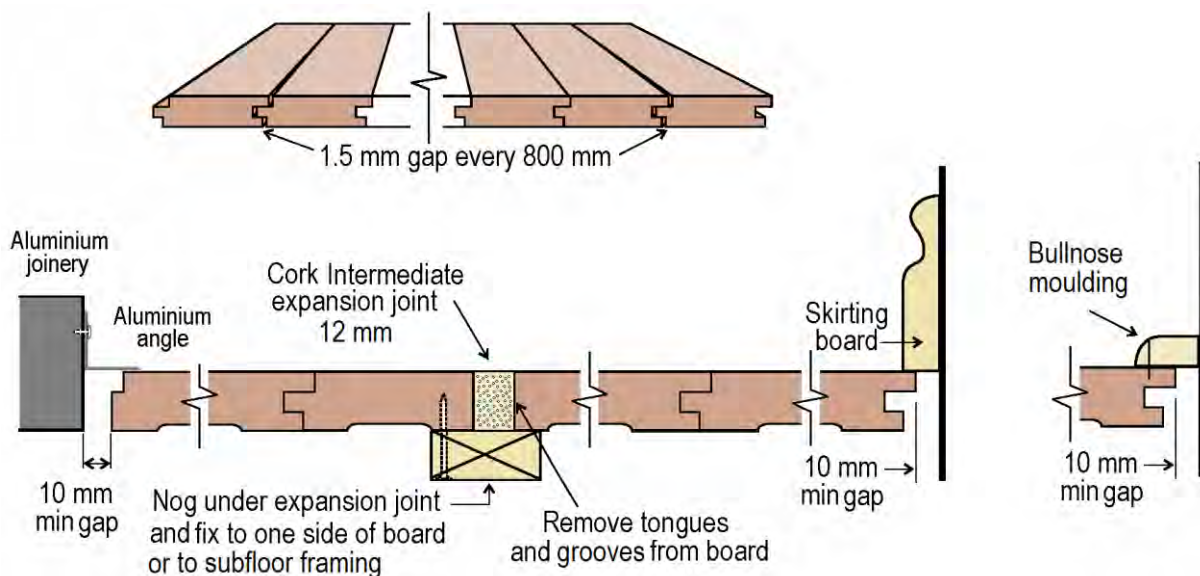
As indicated, flooring swells under higher humidity conditions and shrinks under low humidity conditions and this movement needs to be accommodated, but what is provided will depend on the location, specific installation environment and any acclimatisation that may have been undertaken.

A minimum 10 mm expansion gap between the boards or parquetry flooring (block or mosaic sheet) and any internal or external wall structures is to be provided. The exception being where board, block or finger ends abut doorways, the allowance may be reduced to be a neat fit but having a small gap (approximately 2 mm) to prevent rubbing. This may be filled with a flexible sealant (not silicone). Also note that for structural floorboards direct to joists, AS 1684 – Residential timber framed constructions permits less than 10mm (refer to the standard). If skirtings are only 10mm thick, the wall board can be undercut, or a thicker skirting will need to be used.

When structural and overlay floors are laid direct to joists, battens or over sheet subfloors and the floor width (measured at right angles to the run of boards) is up to 6 m wide, no intermediate expansion allowance is needed provided that an in-service environment with moderate in-service board movement is present. Floor widths over 6 m or where extra allowance for expansion is required (e.g. humid locations) a 12mm wide cork intermediate expansion joint or a series of smaller expansion gaps (1 to 2mm wide) can be provided. Such gaps are often 800 mm to 1000 mm apart and are to provide equivalent expansion allowance to that of a cork joint. Also note that a combination of both methods can be used.

Parquetry flooring does not usually require intermediate expansion allowance due to the smaller piece sizes and patterns having blocks or fingers at right angles. The exception being block parquetry laid ‘edge on edge’ in a brick bond pattern and for this the provisions above for strip T&G flooring apply. Around doorways and architraves, the blocks or mosaic sheets can be trimmed to a neat but not tight fit. To other hard floor surfaces or if it is decided to separate floor areas, then a cork joint can again be used.

When 12mm wide cork expansion joints are installed, the cork is laid about 2 mm proud of the floor surface and the excess is removed during the sanding process. Cork to the perimeter should be installed level with the timber surface. At times, cork to aluminum door joinery has caused the joinery to bow with floor expansion. An aluminium angle as shown in the ATFA diagram overcomes this and they note that this angle can be inverted and adhesive fixed to the aluminium joinery.



Source: ATFA – Solid Timber Flooring – Industry standard

9.0 Installation of structural timber flooring

Floor installation is to follow recognised industry practice as outlined below and with further details as provided in the ATFA Industry Standard – Solid Timber Flooring. Provided below are aspects relating to the fixing of structural flooring.

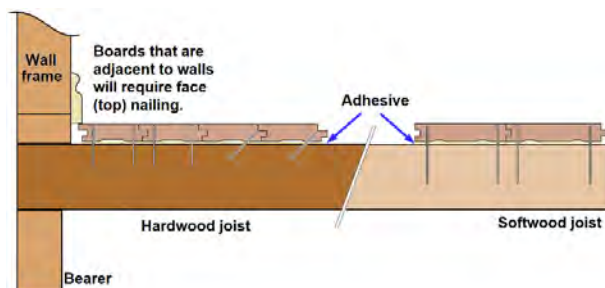
DIRECT TO JOISTS

A 6 to 10mm bead of flooring adhesive (i.e. polyurethane or polymer) is to be applied to the joist.

Face fix with 50x2.2 or 50x2.5 T-head machine-driven or 50x2.8 hand-driven bullet head nails. Two nails at each joist crossing for boards up to 130mm wide and 3 nails for 180mm wide flooring.

Secret fix 60x19mm and 80x19mm to hardwood joists with 45x15 gauge staples or 45x16 gauge cleats.

Secret fix to softwood, LVL and I-Beam joists with 50x15 gauge staples or 45x16 gauge cleats.

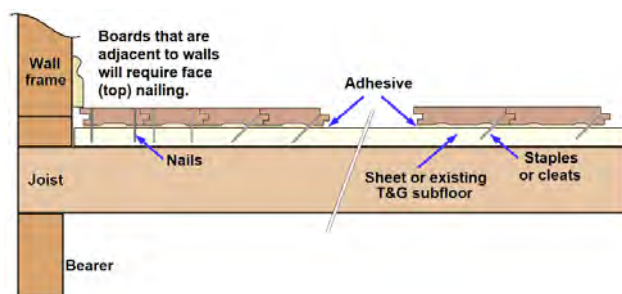


OVER TIMBER AND SHEET SUBFLOORS ON JOISTS

Secret fix 60x19mm and 80x19mm and adhesive beads with 35x15 gauge staples or 32x18 gauge cleats: spaced at 225mm and a 6-10mm zigzag bead of flooring adhesive (i.e. polyurethane or polymer) between fixing points OR spaced at 450mm and 6-10mm bead of flooring adhesive, between and at fixing points.

Secret fix 130x19mm with a full trowel adhesive bed of flooring adhesive (i.e. polyurethane or polymer) applied to the adhesive manufacturer's instructions and with 35x15 gauge staples or 32x16 gauge cleats at 300mm centers.

Face fix 130x19mm and 180x20.5mm through to joists with 65x2.5mm long machine nails and beads of adhesive at and between fixing points.



TO BATTENS ON CONCRETE

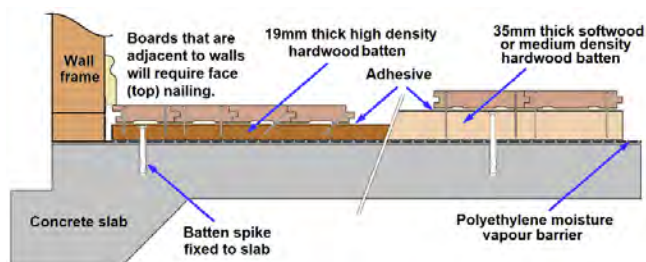
A 6 to 10mm zigzag bead of flooring adhesive (i.e. polyurethane or polymer) is to be applied to the batten.

High density hardwood battens (80x19mm)

- **Face fix 130x19mm** with 32x2.2 T-head machine-driven nails.
- **Secret fix 60x19mm and 80x19mm** with 38x15 gauge staples or 38x16 gauge cleats.

Medium density hardwood and softwood battens (70x35mm)

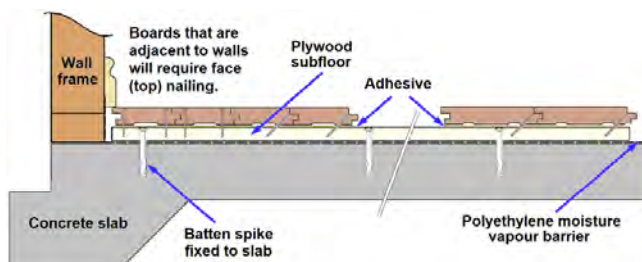
- **Face fix 130x19mm and 180x20.5mm** with 45x2.2 T-head machine-driven nail or 45x2.5 hand-driven bullet head nails.
- **Secret fix 60x19mm and 80x19mm** with 50x15 gauge



OVER PLYWOOD SUBFLOORS ON CONCRETE

Secret fix 60x19mm and 80x19mm with beads of flooring adhesive with 35x15 gauge staples or 32x18 gauge cleats: spaced at 225mm and with a 6 to 10mm zigzag adhesive bead between fixing points OR spaced at 450mm spacing and with a 6 to 10mm adhesive bead between and at fixing points.

Secret fix 60x19mm, 80x19mm and 130 x19mm with a full trowel bed of adhesive and 35x15 gauge staples or 32x16 gauge cleats at 300mm centres.



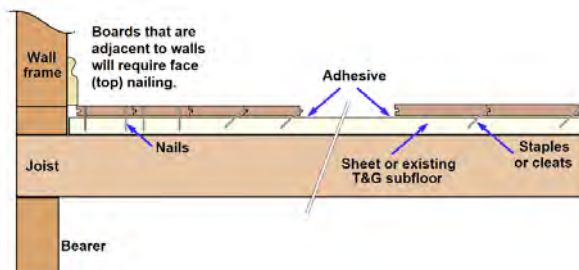
10.0 Installation of overlay timber flooring

Floor installation is to follow recognised industry practice as outlined below and with further details as provided in the ATFA Industry Standard – Solid Timber Flooring. Provided below are aspects relating to the fixing of overlay flooring.

OVER TIMBER AND SHEET SUBFLOORS ON JOISTS

Secret fix and adhesive beads 80x13mm with 35x15 gauge staples or 32x18 gauge cleats: spaced at 225mm and a 6-10mm zigzag bead of flooring adhesive (i.e. polyurethane or polymer) between fixing points OR spaced at 450mm and 6-10 mm bead of flooring adhesive, between and at fixing points.

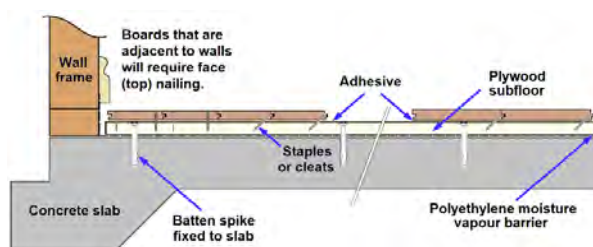
Secret fix 80x13mm and 130x14mm with a full trowel adhesive bed of flooring adhesive (i.e. polyurethane or polymer) applied to the adhesive manufacturer's instructions and with 35x15 gauge staples or 32x16 gauge cleats at 300mm centres.



OVER PLYWOOD SUBFLOORS ON CONCRETE

Secret fix 80x13mm with beads of flooring adhesive with 35x15 gauge staples or 32x18 gauge cleats: spaced at 225mm and with a 6 to 10mm zigzag adhesive bead between fixing points OR spaced at 450mm spacing and with a 6 to 10mm adhesive bead between and at fixing points.

Secret fix 80x13mm and 130x14mm with a full trowel bed of adhesive and 35x15 gauge staples or 32x16 gauge cleats at 300mm centres.



DIRECT ADHESIVE FIX TO SLABS

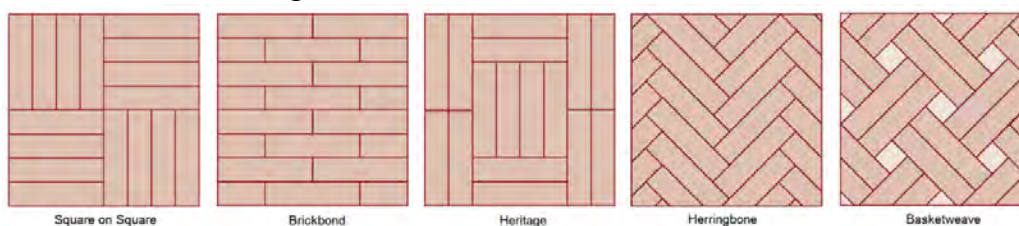
In some locations it is common to install overlay flooring by direct adhesive and mechanical pinning to concrete slabs. Perth, where this method is mainly used, has hot dry summers that are suitable for this method as opposed to some states in the east with warm humid summers. This method is only recommended where flooring contractors have specific knowledge and experience in this method of installation.

11.0 Installation block and mosaic parquetry

Floor installation is to follow recognised industry practice as outlined below and with further details as provided in the ATFA Industry Standard – Solid Timber Flooring. Provided below are aspects relating to the fixing of block and mosaic parquetry flooring.

BLOCK AND MOSAIC PATTERNS

Block parquetry may be installed in a range of patterns with some more common patterns indicated in the ATFA diagram.

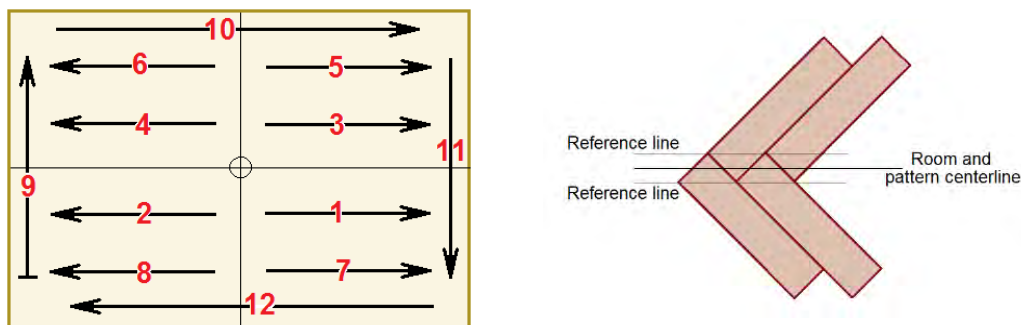


Source: ATFA – Solid Timber Flooring – Industry standard

Mosaic parquetry is provided on a backing sheet as a square on square pattern.

SET OUT

Installations vary significantly due to the variety of patterns achievable and with some also containing borders. It is usual that setting out utilises two string lines at right angles through the centre of the room and that installation also begins from the centre of the room, and in a set sequence. The main body of the floor is completed prior to any borders. When parquetry blocks are laid in a herring bone pattern, additional reference lines are needed. Similarly border lines would also be included if applicable. These aspects, along with a suitable laying sequence are shown in the diagrams from ATFA's Solid Timber Flooring - Industry standard, and also from this source additional information may be obtained.



Source: ATFA – Solid Timber Flooring – Industry standard

FIXING PRACTICES

Water-based parquetry adhesives have been largely replaced with polyurethane and polymer adhesives. Some of the polyurethane adhesives foam on curing and due to this, installers may prefer not to use this type.

Fixing of blocks and mosaic sheets is with a full trowel bed of adhesive applied to the slab and spreading about 1 m² at a time before laying the blocks or mosaic sheets into the spread adhesive. Care is needed to ensure the spread rate and height of adhesive is maintained.

During the laying process it is necessary to keep to the string lines and to ensure the pattern remains tight and even. With block parquetry some variation in block sizes can be expected and needs to be accommodated during laying. 'Creep' cannot be corrected so centre and reference lines as well as the laying sequence is important. Blocks may be tapped with a rubber mallet and timber block to reduce any mismatch at block edges with care needed during installation to ensure blocks do not shift.

When the perimeter of the floor is laid, blocks or mosaic sheets will need cutting, taking into consideration the perimeter expansion allowance. If a border is being installed, then the blocks or mosaic sheets are cut back to a border line before working on the border. Expansion allowance at the floor perimeter is to be covered by the skirtings which need to be of sufficient thickness. The adhesive is then allowed to cure before sanding and coating as outlined in Section 7. With many patterns the level sanding is undertaken so that the blocks or pieces are at an angle to the sanding machine.

Parquet may also be laid on acoustic underlays and it is important that the correct underlay is used. More flexible underlays can result in blocks or fingers depressing under foot pressure once the floor is laid. Underlays more specific to parquet are often cork and rubber composites to avoid this.

12.0 Sanding and coating

Timber floor finishes include oils and hard wax oils, oil modified urethanes, solvent and water-based polyurethane. When choosing a floor finish it is necessary to consider aspects that include the following: wear and ongoing maintenance, the effects that different types of coatings can have (e.g. edge-bonding, tram lining, colour changes), the desired gloss level and health aspects during application. A finish similar to that of fine furniture should not be expected, as site sanded and coated floors are not finished in a factory environment and different pieces of flooring will sand differently. The home environment is also not dust free and subject to greater variations in temperature and humidity. However, the finished floor can be expected to be of a high standard and have an even appearance. A minimal level of contaminants, minor sanding marks and other minor imperfections may be visible. Some finishes will also 'yellow' with time and if rugs are moved, a contrast in the depth of colour can occur. Aspects relating to coating choice should be discussed with the flooring contractor and noting that the ATFA consumer website www.floorchoices.com.au provides information sheet No. 7 – Coating choices which explains considerations when choosing coatings.

13.0 Floor care and maintenance

Solid timber floors are one of the easier floor surfaces to keep clean and maintain, however what is required will relate to the coating system chosen, with methods differing to a degree between coating types. Therefore, full care and maintenance instructions should be provided to you by your flooring contractor or builder. Below are some aspects common to all solid timber floors.

- Anti-static mop and soft head vacuuming (ensuring brushes are not worn) may be used on a frequent basis.
- Only use cleaners as recommended by the timber floor coating manufacturer and only damp mop a floor. Never wet mop a floor and damp mopping should only be needed on a fortnightly to monthly basis.
- Use door mats at external doorways (internally and externally and keeping these clean) to trap grit and lessen the risk of scratches from grit being walked across the floor.
- Consider carpet runners and area rugs in high-traffic areas to prolong the need to refurbish the coating.
- Be aware that floor rugs can result in colour tone differences beneath, and such differences can be reduced by not laying floor rugs for perhaps 6 months after coating.
- Add floor protectors to the bottom of moveable furniture and be mindful to lift furniture, not drag it. Be aware that heavy appliances etc. can indent timber floors if rolled over them.
- Wipe up drips and spills as soon as they occur, as stains can develop if left for longer periods.
- Take care with pets, as active dogs with untrimmed nails can damage the floor (coatings can scratch, and floorboards can indent). Pet urine, if not cleaned up quickly, can result in stains.

- Don't wear shoes that may damage the floor. Most footwear is fine but the likes of worn stiletto heels can damage a floor. Shoe soles may also hold stones and for these reasons some owners remove shoes when entering their home.

If some years later the coating is looking tired it may be refurbished by cutting back the existing coating (light rotary equipment) and recoating. If the coating has worn through or the floor has changed colour significantly over time, and it is desired to have a 'new look' again, then a full re-sand and coating will refurbish your floor to near new condition. A benefit with solid timber floors not found in other floor coverings.