Introduction

Engineered, bamboo and laminate flooring are all products that may be floated on an underlay over a structural subfloor. With floating floors, the boards are fixed to each other but not to the subfloor. Another commonality with these products is that they all contain cellulose fibre which has the property of being hygroscopic. A hygroscopic material is one that will absorb moisture from the air under higher relative humidity conditions and swell, and under drier conditions with lower air relative humidity, the material will release moisture to the air and shrink. Due to this each of these products used in floating floors are prone to seasonal swelling and shrinkage and as these products are not fixed to their subfloors, seasonal movement effects can be greater at times than some owners or contractors might expect. This information sheet will discuss this aspect of the seasonal movement in floating floor products.

Movement in solid timber

Firstly, we need to consider solid timber flooring and how it shrinks and swells with changing relative humidity. This is shown in the adjacent diagram with board expansion occurring under higher humidity conditions and board shrinkage under lower humidity condition. Although both temperature and humidity alter throughout the day and night, a floor’s response is usually relatively slow, and we often only see minor changes from month to month. However, during prolonged specific wet periods or consistent hot and dry weather things can be different, and a floor may react significantly over the space of a week. It is therefore necessary that every site and the expected in-service environment is assessed for a floor to be able to perform to its optimum and this includes floating floors, engineered, bamboo and laminate.

Movement in floated engineered floors

Engineered flooring differs from solid timber flooring in that it is a generally a multi-layered timber product and the reason for this type of construction is that it reduces the amount of width movement in a board when the moisture content of the flooring varies.
changes. Hence, under wet conditions an engineered floor will expand but less than a solid timber floor and similarly under dry conditions it will shrink, but also less than solid timber flooring. Movement is mainly in width but there is also some lengthwise movement, and in this respect, it differs from solid timber flooring.

**Movement in floated bamboo floors**

Technically bamboo is not a timber but a grass. The most common form of bamboo flooring is strand woven bamboo and to manufacture this flooring, the bamboo is cut into long strands, the strands are then coated with adhesive and under pressure and heat the adhesive cures and a beam is formed. The beam is then cut into boards. The fibres generally align and due to this, most of the movement with changes in humidity is in the width of board, but we do get some lengthwise movement as well. With floated floors the seasonal movement in board width (shrinkage and swelling) is usually more than with engineered and laminate floated floors.

**Movement in floated laminate floors**

Laminate flooring differs from the above two types in that the core layer is high-density fibreboard. In fibreboard the wood fibres are not orientated in any particular direction. The seasonal movement is therefore equal in both the width and length directions. It is important to understand this difference in the above two products.

**Design limitations and product movement**

With these floating floor products, it must be considered that they do have design limitations and that if the humidity remains either too low or too high for long enough, then the performance of the product may be less than optimum. Note that floated floors can also be less resilient to more extreme conditions than solid timber floors. With solid timber floors it can be easier to adjust the flooring moisture content prior to laying to accommodate more extreme conditions. It is therefore important that when installing floating floors, the manufacturers’ instructions are considered and adhered to. Often, they will indicate an optimum humidity range for their products and if conditions fall outside of this range for extended periods, then both the performance and appearance of the floor can be affected.

As each product is individual to the manufacturer, so are the optimum performance ranges indicated by them. One manufacturer may indicate that their product performs best under conditions between 35% to 60% relative humidity, while another may indicate their product to be more suited to 40% to 70% relative humidity. Most dwellings in the major cities have internal relative humidities between 50% and 60% but do realise that there are times when the internal climate can fall outside this range and for floors to be affected.

In addition to seasonal changes, the internal climate associated with building design and the effects of both heating and cooling systems needs consideration. The conditions we like to live in are also the conditions best suited for floating floors. Window coverings can be important to reduce heat gain in the room and the direct heating of the flooring from intense sunlight. Evaporative coolers can be beneficial in hot, dry conditions as they add humidity to the air when it is low. Refrigerative air conditioning can also be beneficial in hot, humid climates as it reduces humidity under humid conditions. Wood fired heaters can cause severe drying effects due to higher temperatures and low humidity, and therefore care is needed with all systems providing dry heat.

It is for these reasons that the installation environment, along with building design and heating and cooling systems needs to be assessed so that an appropriate product can be laid, and the expected seasonal movement in the floor accommodated for at the time of installation. Similarly, owners can be advised on aspects that they may need to be cautious with.
The need for control and expansion joints

We should now consider expansion allowance and control joints. If a floor is in a controlled environment with minimal fluctuations in humidity, then there will be little movement in the floor (seasonal shrinkage or swelling). Some floors are like this, however it also difficult to predict how much seasonal movement a floor may experience because as already indicated this depends on external weather conditions, building design and both the heating and cooling systems installed, as well as how they are used. Expansion allowance and control joints are therefore not considered to be an owner option. Details of what is required regarding this is provided in manufacturer installation instructions.

As indicated above, the boards in floating floors are not fixed to the subfloor but must be fixed to each other. This therefore creates a panel of flooring that is also called a raft (a raft floats on water and these floors 'float' on an underlay). It is therefore the movement of the raft that must be accommodated which can be significant with seasonal changes causing movement in both width and length. We therefore need to consider not what is happening to the boards, but what is happening to the rafts. Compartmentalisation is a term used that describes laying the floor to form a number of smaller rafts, that are joined together by expansion or control joints using trims. The reason being that if we did not, the movement of one raft area can interfere with the movement of another raft area. An understanding of this is very important and is shown diagrammatically where each raft will shrink and swell in both directions from the centre of the raft.

Each individual raft will expand in width and length due to seasonal weather changes. If the floor is not separated into enough individual rafts then movement of one area of flooring can affect the adjacent area and result in buckling, separation at board joints and flooring moving out from beneath skirtings. Where seasonal movement is greater, then more allowance for raft movement is needed, with wider skirting boards used or smaller rafts being created.

If a floating floor is in a rectangular room only, then there is a single floor area. However, we also need to consider the size of the raft, and if it is too large then intermediate expansion allowance would need
to be provided. This is again an expansion trim that is inserted part way across the floor. Manufacturer instructions outline maximum floor widths and lengths. Also to be considered, is that heavy objects such as kitchen benches cannot be laid on top of floating floors as it holds the floor in that location and all expansion and shrinkage is from the fixed point of the bench, rather than the centre of the raft.

**Floated floors under expansion pressure**

When floated floors expand during periods of prolonged high humidity, with this often associated with wet weather, floor expansion may cause unevenness across the floor and squeaking at board joints can be induced. Similarly, if the expansion allowance is taken up or was insufficient when the floor was installed or the floor was not adequately compartmentalised, then sections of the floor may lift and buckle. Under severe conditions it is also possible that the flooring will take on board shape changes. In engineered flooring a crowned appearance may develop, with the centres of the boards higher than edges and splits can develop in the face lamella (or veneer). In engineered, bamboo and laminate flooring raised board edges and end joints can also develop (known as peaking) if a floor is under too much expansion pressure.

**High shrinkage in floating floors**

High levels of shrinkage can occur due to a number of factors, but mainly an internal environment that is too dry or a raft that is too large or not adequately compartmentalised. Resulting from this, flooring can pull out from beneath skirting and scotia, and board joints can separate within the floor.

Severe dry conditions with engineered flooring can also result in surface checking (split appearance) of the face lamella and possibly some cupping or delamination of the face lamella at board edges. Also, be aware that intense direct sun exposure on engineered floors can also cause checking and with bamboo and laminate floors, higher levels of shrinkage.

**Providing for floor movement at installation**

As the saying goes; prevention is often better than cure. The first stage to this, is to ensure that the floor is installed correctly, including consideration for the possibility of prolonged wet or dry weather which may persist sometime in the future, and installing appropriate expansion allowance and control joints. Anecdotally, floors also tend to be more stable after a few years of use and when a new floor is under expansion pressure, due to more extreme wet weather, some owners have purchased small dehumidifiers to extract moisture from the air and reduce the pressure in the floor. Similarly, refrigerative air conditioning will also extract moisture from the air but is not as effective as a dehumidifier. Under very dry conditions, similar but opposite means can be used with the use of portable evaporative coolers to add moisture to the air or pots of water on wood fired heaters.
Knowing the conditions inside the dwelling is also a useful management tool for owners and temperature/relative humidity meters are now quite inexpensive and a good investment. Owners taking these pro-active approaches during these times of more extreme weather have lessened or negated possible problems with their floors.

For those floors that have experienced either greater expansion or shrinkage effects, it must be recognised that the weather has often played a role in this. Such conditions may not happen every year and extremes, when they do occur, are often for relatively short periods of a few weeks or even less. The bottom line is that if a floated floor has been provided with the appropriate expansion allowance and is compartmentalised correctly, then possible problems are much less likely to occur. However, if problems do occur in properly installed floors, then they can often be remedied through trimming the floor or providing additional expansion trims. At times some immediate work to relieve the effects may be required, but care needs to be exercised in the timing and extent of such, with it often best not to complete remedial work until the extreme conditions are over and weather conditions are closer to the average ‘more normal’ conditions that the floor was performing in. At that time final tidying up can be undertaken.