



TIMBER MOVEMENT THROUGH MOISTURE AND EXPOSURE

Timber elements that are left unrestrained and exposed to the elements for extended periods of time are subject to an increased probability of movement or distortion due to changes in moisture content. This can include shrinkage, swelling, twisting, spring, and bow. This factsheet will focus on softwood materials as they account for most of the issues around moisture movement, with the figures related specifically to Radiata Pine. Other softwood species will react in a similar way.

The moisture content within a tree consists of two separate items; water within the actual cell walls, and 'free' water within the cells. The free water is the first to evaporate during drying, but this does affect the dimensions at all. Once all this water is removed the timber is at a moisture content called fibre saturation point (FSP). For Radiata Pine this is approximately 29%. Below this, water is removed from the cell walls themselves and the timber shrinks as the moisture content reduces. This is taken linearly from the FSP to 3% and in Radiata Pine occurs tangentially (across the grain) at 0.27% per % moisture difference, and radially (out from core) at 0.2% per % moisture difference. Structural pine and LVL is usually supplied at moisture contents of between 8-15%, and ambient conditions in NSW and VIC hover around the 9-12% range.

Now let's put this into context. Take a piece of 300x45 hySPAN delivered to site at 9% moisture content. If this is left uncovered over time and allowed to swell to the FSP of 29%, it will increase in size by $20 \times 0.27 = 5.4\%$. The new depth at 29% moisture content will then be 316mm!! Even if the moisture content only increased by half this amount to 19% the depth would read around 308mm. Once the timber is able to dry out to ambient it should return to original dimensions. Note if a builder installs the timber wet and planes it down to the right size, it will shrink as it dries out and end up undersize.

If this piece of hySPAN is within a pack left uncovered, the moisture content may rise to 19%, making the depth 308mm. As the sun shines on the pack, the top face will dry out quicker and try and shrink back to 300mm whilst the bottom face within the pack is still wet and at 308mm. Cupping is the eventual result.

Remediation of timber that has 'swelled' only is usually achieved by putting the timber undercover and well ventilated to allow it to return to ambient moisture content and dimensions. Depending on the size of the piece and current weather, this could take a week or two. When any distortion such as cupping, twist, spring, or bow are evident the process is a bit more hit and miss. By placing the timber under pressure whilst drying (to 'help' it to move back into original position) you may get a better result, but at the same time you need to allow the wood to balance its moisture profile. Whatever you do or suggest, it is beneficial not to speed the process up too much. Remember, the tree has spent over 30 years growing. The longer you allow the fibres to naturally re-align as the size changes, the better the end result will be.

The most important item is to protect timber over the break, both for builders and suppliers. You can try to minimise any dimensional changes after the fact, but this will take time and level of success is variable. It is much easier to prevent the issues occurring by:

- Ideally, move all timber that is stored for extended periods of timber under cover to prevent moisture changes.
- If outside, cover timber to protect against moisture whilst allowing ventilation (raised off the ground). Without ventilation, condensation can build up within the packaging and increase the moisture content of the pack.
- Strap up loose packs as this limits the amount of moisture change (if covered) and prevents movement of individual sticks.