MonaroTimber News

The monthly newsletter for people who love timber

November 2014
Volume 13, Issue 11

## The wood water relationship.

On a semi regular basis I visit the question of moisture content and wood movement in these newsletters. I like to refer to it as the "wood water relationship". I find myself on topic again due to a recent problem job where yet again the environment in which the timber has been placed is quite a lot drier compared to the starting point of the timber. Throw in a few design elements which push the limits and you end up with the timber dictating the outcome. Let me explain a few simple facts and common terms.

MC. The Moisture Content of the timber. This is a ratio of water to wood by weight, expressed as a percentage. The upper limit for furniture and flooring timber under AS2796 is 14%.

EMC. Equilibrium Moisture Content is the MC the timber adjusts to in a given environment at a given time. In many Canberra area buildings the EMC can be around 10%, down on the coast we often see around 14% and in far north QLD I have been told closer to 20% is the norm.

RH. The Relative Humidity, which is the amount of moisture held in the air expressed as a percentage. ( It's not that simple, look it up for a fuller explanation ). This figure can vary through the day externally and depending on the type of environmental controls employed within a building can be varied or maintained within a building. Humans are happiest at around 50—60 % and funnily enough timber seems happy at these levels too.

Now most of the timber we use for flooring and joinery applications is kiln dried to a MC around 12%. The mills do this to keep below the 14% upper limit and this MC is a good starting point for most areas. When the mills dry the timber they don't know where it will end up so they have to pick an MC that works most places. The next stage, in an ideal world, would be to acclimatise the timber to the final conditions. Two things throw this idea out the window a lot of the time. Firstly, the conditions on a building site are usually very different to those in service, and secondly, the in service conditions often change throughout the year affected by factors such as weather and the changing use of heaters and coolers. A lot of the time it is simply impractical to acclimatise timber on site and in fact can be counter productive if you acclimatise to the wrong conditions. Whether to acclimatise or not will depend on many considerations and will vary from job to job. When it comes to joinery items such as solid timber bench tops the normal approach is to construct the items and then allow for in service movement in both the design and the installation. Acclimatisation is rarely a practical option.

**Summary.** Timber is like a sponge. Add water and it will suck it up and expand. Place it in a drier environment and it will dry out and shrink. Simple really. All the numbers, terms like EMC etc really just serve to explain these facts. I have heard many misinformed comments in the past such as "it's kiln dried, it wont move" or " its recycled, it wont move" or " all commercial buildings are very hot and dry and the timber should just deal with that". All incorrect. If you are using timber in a building you should take these basic principles and apply them to the particular scenario. This will help you determine how to go about the job. You may need to acclimatise, you may need to change the way the building is heated or cooled, you may have to accept a fair bit of timber movement or you might decide not to use timber at all. What you shouldn't do is expect the timber will automatically comply with your wishes because it won't, it always behaves according to the basic principles and to ignore this is just inviting a problem. On the next page I have included a couple of extracts from the Australian Timber Flooring Association Info sheet #25, Acclimatisation of solid T&G flooring. This data sheet refers to flooring but the wood water relationship is the same regardless of the application, it's all timber. If you want a copy of the full sheet which runs to 6 pages just let me know and I will send you one.

That's all for another month. *Cheers Shaun*

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| Temperature | Moisture content at various relative humidities | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| °C | 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 |

This table gives you the moisture content for a given RH and temperature. Note that dropping the RH can dramatically reduce the MC of the timber. The RH can be brought right down using refrigerated air-conditioning.

## The expected in-service environment is influenced by a number of factors, including-

- Heating which has the effect of lowering the EMC in the house. In cool temperate climates this can create quite a dry internal environment. The environment in the upper level of a heated two storey house is often drier than the lower storey.
- Refrigerated air-conditioning if used continuously can dramatically reduce the general moisture content within the house.
- Shutting a house up when away on holidays for long periods can create abnormal humidity conditions and therefore some ventilation may need to be considered depending on the time of the year.
- Full length windows, large glass areas and skylights which admit direct sunlight can create sunroom conditions with high temperatures and low moisture conditions causing flooring to shrink.
- Proximity to bodies of water such as the ocean, a river, lake, dam or wet lands.
- Prevailing winds that are either moist or dry.
- Climatic variation throughout the seasons.
- Local environment e.g. leafy gully, rural residential areas or generally treeless area.

If the environment inside a lived-in house has an EMC variation from summer to winter of no more than about 3%, there is not likely to be a very noticeable difference in the floor as it adjusts to the changing EMC. However if that environment has an EMC variation from summer to winter above 3%, there is likely to be more noticeable difference. A general rule of thumb is that for every 3% change in moisture content, the dimensional change of the timber will be about 1%. A 3% change in moisture content will cause a change in width of up to about 0.8 mm in a board with a cover width of 80 mm. A 3% change in moisture content will cause a change in width of up to about 1.80 mm in a board with a cover width of 180 mm.

This last paragraph is particularly useful in explaining why timber shrinks or expands as much as it does. When a 600mm wide timber top goes from our workshop at 12% to a site at 7% we see on average 5—6mm of shrinkage!

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