

Tunncliffe's

Tunncliffe Timber Company Limited

Moisture and Exterior Timber Joinery

One of the most important factors affecting the performance of timber is its moisture content. With moisture we mean water.

It is not only important to get the timber conditioned right before we are able to work with it. It is also very important to understand how crucial it is during the manufacturing process, handling and installation of exterior timber joinery.

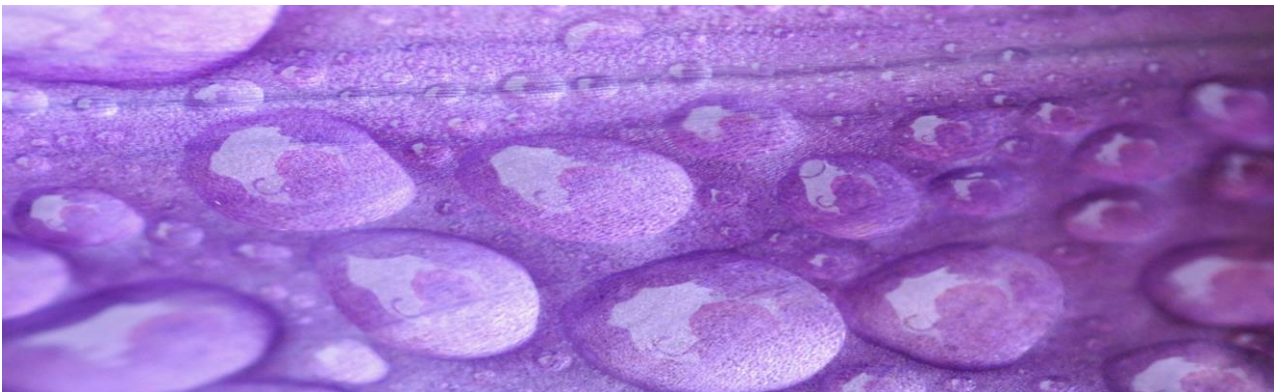
Life cannot exist without water. There can be too much (floods) and too little (draughts). Life is all about balance, which applies to timber as well.

Timber is a natural product, it comes from a living organism. In today's world there are people thinking that milk comes from a dairy factory and timber from a timber factory, they are not factoring in the natural ingredients cows or trees.

Timber contains organic matter and was formed with the help of water, this "life-line" is forever present. There is an ongoing relationship between timber and water which is described as being hygroscopic. It is the phenomenon of a material attracting and holding water molecules from the surrounding environment but also releasing them depending on the atmospheric circumstances.

The amount of moisture in timber is called **Moisture Content** (MC) and is expressed as a percentage of the oven-dry weight of the timber. Oven-dry timber has an MC of 0%. Living trees and freshly felled logs contain a considerable amount of water, the MC can exceed 100%.

A critical moisture level is the **Fibre Saturation Point** (MCfs). Moisture can exist as either free water or bound water. The water vapours of liquid water in the cavities and cell lumen is termed as **free water**, whereas the water that is held by the intermolecular attraction within cell wall is termed as **bound water**. Fibre saturation point is the point at which no water exists in the cell lumina but the cell walls are completely saturated. Typically the value of MCfs is about 30% depending on the timber species. Variation in the MC above MCfs has no effect on the properties of the timber, in other words it does not move. Variation below the MCfs does have an effect on the properties of the timber resulting in movement.



In the exterior joinery industry we are only dealing with timber dried below the MCfs and therefore we are having to deal with the effects variation in MC has on the timber.

The most talked about parameter is the **Equilibrium Moisture Content** (EMC). This is the moisture level in the timber where it neither gains nor loses moisture since it is at equilibrium with the relative humidity of the surrounding environment. In other words the timber found its balance with its surroundings.

The lower the EMC of a timber species the more stable it is.

When we refer to kiln dried timber this means that the timber is dried and conditioned to meet the EMC.

For Radiata pine in our New Zealand climate it is generally stated that the EMC is 12 to 14%. This would mean that during a dry summer it can be as low as 9% and during a wet winter 15%. An absolute EMC can never be established, it is a moving target. The EMC for our ThermoWood® is 7 to 9%.

So, the reality we are having to deal with is that moisture in timber is never a constant, it changes depending on air temperature and relative humidity of its surroundings. Relative humidity is the amount of moisture in the air compared to what the air can "hold" at a particular temperature expressed in %.

As this happens the timber moves, if the moisture content goes up it swells and when it goes down it shrinks.



his movement is probably the biggest issue when dealing with timber. The magnitude of movement between MCfs (30%) and oven-dry (0%) is approximately 5% (a 200mm wide board would move 10mm between these two points). Under realistic circumstances a 200mm wide board machined at a MC of 20% would shrink by approximately 5mm going to an EMC of 12% over time. You can imagine how big the issue can be if you are producing grooved door jamb which needs to match timber framing and fit the gib-board accurately. Also when you are asked to produce consistently 29.6mm thick door core for the accurate manufacturing of flush doors.

As we encountered numerous problems of moving Radiata pine products in size-critical applications we developed our more stable ThermoWood® range but this would lead us to a different story.

The most accurate way to measure Moisture Content is to take a sample, oven dry it and establish the difference in weight. Since this is not practical there are meters invented which give a good "indication". Best results will be achieved with electrical moisture meters calibrated correctly for the timber species you want to measure.

As a timber component supplier we endeavour to supply the Radiata pine product to the EMC of 12 to 14% and for ThermoWood® 7 to 9%. Most timber supplier use plastic wrapping when packaging, which is designed to protect the timber from direct rainfall during transport. This does not mean you can leave a packet sitting outside for any given time or drive with it on a flat deck truck through the rain. When a packet is on the fork-lift moved from a dry storage shed to a curtain-sider truck in the rain it will be adequately protected.

So when a delivery is made in the rain make sure packets are put away dry immediately. Ideally truly indoors. We will all be familiar with the old covered timber racks outside the joinery factory. Historically we have seen problems with the ends of the timber getting rain-wet due to driving wind. Also more than often puddles form under the racks which cause damp conditions, the timber adjusts by taking up more moisture than it should. Manufacturing joinery with this timber will cause problems as it will shrink after manufacturing compromising the quality and performance of the product.



A myth, or just a misunderstanding we sometimes encounter is people thinking that it is less critical for chemically treated timber to become wet than untreated timber. This is true with regard to durability over time but certainly not if you plan to use it for the manufacturing of timber joinery. Chemically treated timber takes up moisture equally well as untreated timber and will move to the same extent causing as much problems during manufacturing.

Monitoring and controlling moisture content of the timber from rough sawn kiln dried to finger-jointed components in our factory during all stages of manufacturing is a very important aspect of our quality control. It is equally important for our customers when fabricating the finished product. After the manufacturing of the joinery major care has to be taken during transport, storage on the building site and installation of the joinery avoiding direct exposure to moisture. Timing is everything. Delivery of the joinery shortly before installation and making sure the paint finish is applied soon after, is absolutely crucial. Primer just by itself is no adequate protection against moisture (refer to our article The Myth of Primer).

A quality paint finish is an essential component of exterior timber joinery. The main purpose is to form a barrier to protect the timber against moisture ingress. The timber needs to be dry to establish such a quality paint finish, paint does not adhere well to a surface with too much moisture. By dry we mean the timber needs to be consistently at its equilibrium moisture content.

If you build joinery with timber that is relatively wet, joints will open up when the timber dries out at a later state, after installation and painting. The opening up of the joints will cause the paint to crack and moisture getting a chance to ingress.

When timber is too wet, it does not machine well. Timber fluffing up when machining is a sign of wet timber and should set off alarm bells in the joinery shop.

Last but not least, moisture is the major factor influencing the durability of a timber product. Fungi causing rot can only live if there is enough moisture available to them. The dryer the timber the lower the risk of rot. A key design factor for exterior timber joinery is shedding rain water, avoiding moisture ingress and entrapment in the joinery. This is achieved with adequate fall on sills, drip grooves and seals etc. A principal to keep in mind also is ventilation, air circulation is a good way of draining moisture away from timber.

While pointing out the risks of timber being too wet, we equally need to mention the risk of processing timber that is too dry. Although it happens less often it can cause as many problems. The instances that we know of this happening is when wet timber has been re-dried, in other words "over-corrected" timber, used too soon. Once timber has been artificially dried it needs time to rest, to equalize with its environment, finding its EMC before it can be machined.●

