

Moisture Content

Knowing the exact moisture content of the wood you are working with is very important. Using wood that is not at the appropriate moisture content can result in warping, swelling, cupping, splitting, or loose joints in your finished work.

Over 50% of a living tree's weight is moisture. This moisture content is expressed as a percentage of its "oven-dry weight". This means that to determine the moisture content of a piece of wood you must first weigh it, and then oven-dry it until it no longer loses weight. This oven-dry weight is then subtracted from the initial wet weight and the difference is divided by the oven-dry weight.

(wet weight – dry weight/dry weight X 100 = % moisture)

Although this method is most accurate, it is not practical for everyday use. There are electronic moisture meters which will give instantaneous readings, accurate within 1% in the critical 6 to 12% range.

Moisture in wood is contained both within its cell cavities and in the cell walls. As wood dries, moisture first leaves the cell cavities (free moisture). When the cells are empty, but the cell walls are still saturated (bond moisture), it is said the wood has reached its "fibre saturation point". This is about 30% for most woods.

Wood will not change dimensionally until it is dried beyond the fibre saturation point. As the moisture is removed from the cell walls, the cells begin to shrink. Maximum shrinkage takes place in the wood as the wood dries from 20% down to 10%.

Seasoning Wood

The object of drying or "seasoning" wood is to bring the moisture content of the wood down to an acceptable level quickly, but gently, to avoid distortion. This results in the wood that is lighter, stronger, and less susceptible to splitting, warping, cupping and rot.

There are two methods of seasoning wood, air drying and kiln-drying.

Air-drying reduces the moisture content to 15-20%. It usually takes about one year for every inch of thickness to air-dry hardwoods. Soft woods will air-dry in about half that time. With exceptionally dry weather, air-dried wood may reach 12%.

Kiln-drying can dry wood to any given moisture content in a matter of weeks. Heated air is used to drive out the moisture and steam is used to control the rate of evaporation to avoid distortion and splitting. Dehumidifiers are sometimes used in small kilns as a method of drying wood without heat. This process is much easier on the wood. A more recent method is to use a microwave on half-power for 2-3 minutes and allow about an hour between each drying to allow the surface moisture to evaporate. It is when using the microwave that weighing the wood each time becomes more practicable and when there is no difference in the weight then the wood can be considered dry.

Equilibrium

Wood is always susceptible to changes in surrounding humidity levels. It will try to reach a state of equilibrium with the surrounding atmosphere. When lumber leaves the kiln and is stored outside, it will gradually pick up moisture from the air until it reaches an equilibrium level. No matter how old the wood is, it will always respond exactly the same way to environmental changes.

Fortunately, wood responds very slowly, therefore day to day changes in humidity can usually be ignored and only seasonal changes considered.

When green wood has been dried down to an equilibrium level, additional waiting time will not dry it further, but aging wood does have certain advantages. Mature wood will have its remaining moisture more evenly distributed and will be therefore be even less likely to distort.

For fine woodworking, lumber should be kiln-dried to a moisture content below the required level and then stored in an atmosphere that will permit it to reach an equilibrium level that will be maintained throughout the building and finishing process.

Shrinkage

An understanding of how wood shrinks is important as wood does not shrink equally in all directions. It will shrink along the direction of its annual rings (tangential shrinkage) about twice as much as it shrinks between its rings (radial shrinkage). There is practically no shrinkage in length.

If a plank is cut tangentially, the greatest amount of shrinkage will be across its width. If cut radially the greatest amount of shrinkage will be in thickness. Therefore radially cut timber is more stable, with less tendency to distort.

The amount of shrinkage varies considerably from one species to another.

Wood Rot

For wood to rot three things are required, oxygen, heat, and moisture. If these three factors exist, living fungi (rot) will attack the wood.

There are two main types of wood rot. The first is “wet rot” (white rot). This is usually seen outdoors on rotting logs and stumps. This fungi feeds on both the cellulose and the lignin content of wood leaving a white, slimy residue.

The other common type is “dry rot” (brown rot). This is mainly an indoor type which feeds on only the cellulose content of the wood. The fungi leaves a brown residue with the wood spongy and deeply cracked.

Since oxygen and heat are usually present, moisture then becomes the deciding factor on whether conditions are suitable for rot. If the moisture range is between 0 – 12% then wood rot is impossible. If the range is over 18% then wood rot is inevitable. In the mid-range, 12 – 18%, wood rot is possible but not likely. Wood that is over 18% will burn poorly and provide limited heat.

It should also be remembered that no two trees are exactly alike.

N.B. It should be noted that wood will begin to split the moment the tree is felled and it is important to start the drying process as quickly as possible. However this is not always practicable and you can reduce the incidence of wood splitting by sealing the ends with either an oil based paint (not emulsion), a liquidised wax or PVA glue. Wherever possible when cutting branches cut them into lengths as long as possible because you are almost always going to get some end splitting and this will give you more usable wood from the cut branch.

Also, it is worth considering cutting/ splitting sections of the trunk down their length as soon as possible after felling – to reduce the damage from shrinkage cracks.