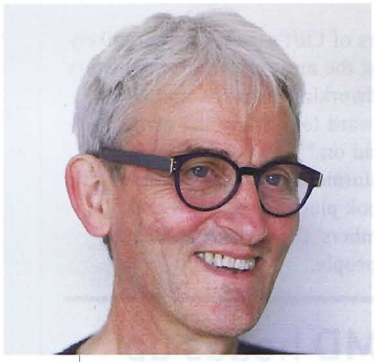
TALKING TIMBER

WOOD AND WATER

Moisture content is an important facet of today's timber product, says Wood Technology Society chairman ***John Park***



John Park – Wood Technology Society chairman and manager of Canada Wood UK

Water, like wood, is the most fascinating of substances. Paradoxically trees don't do very well without it yet cut them down and the resulting wood doesn't do very well with it! More than anything, water has the most significant influence on the performance of wood in all its uses.

It should, therefore, come as no surprise that it is water which accounts for the majority of problems encountered with wood in service so it follows that a better understanding of the relationship between water and wood might not be a bad idea.

How much water? Taking one of the more ubiquitous softwoods as an example; Scots pine – Pinus sylvestris, PNSY its European single species marking code in EN 14081-1 – dried to 12% moisture content (m.c.) weighs in at about 500kg/m³. At saturation m.c, which is not the same for all wood species, PNSY contains about 1.6kg of water per 1.0kg of wood which is 800kg of water per cubic metre. A gallon of water weighs 10lbs so that's somewhere in the region of 176 gallons! At fibre saturation point (fsp), 30% m.c, the amount reduces to 0.25kg of water per 1.0kg of wood which is about 28 gallons. At 12% m.c it is a mere 11 gallons. In a linear metre of Scots pine measuring 19mm x 150mm that equates to about: saturated - 4 pints; fsp - 0.64 pints; 12% m.c - 0.25 pints.

Where is it all? Most of it, known as 'free water', all 148 gallons of it in this case, is in the cell cavities adding considerably to the weight – the first reason to dry wood; to reduce the weight.

There are 220 gallons of water in a cubic metre so that provides a rough idea of the porosity of Scots pine. Below fsp the wood starts to shrink as the 'bound water', 28 gallons, is removed from the cell walls, the shrinkage continuing down to 'oven dry', the point at which constant mass is attained and any other water present, the water of constitution, is required for the wood to remain as wood. An interesting point is that the cell cavities do not reduce in size, it's all down to the cell walls; but wood physiology is for another day!

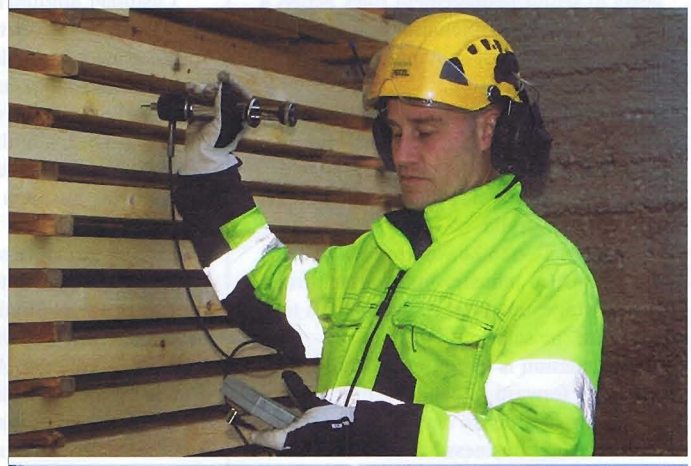
Wood is hygroscopic, absorbing moisture from or giving off moisture to the atmosphere depending on how dry or wet the wood is. The point at which the moisture in the wood is in equilibrium with the ambient temperature and relative humidity is known as the equilibrium moisture content (e.m.c.). Depending on ambient conditions (seasonal differences for example) and condition of the wood, moisture will be absorbed causing wood to swell or desorbed causing wood to shrink, the resulting dimensional changes known as 'movement' – the second reason to dry wood; to attain moisture content commensurate with end use to reduce the risk of problems caused by further shrinkage in situ and to keep associated movement to a minimum.

The reasons for drying wood are, of course, all related to enhancement of performance: stability, strength properties, resistance to decay, finishing, surface coatings, gluing and machinability, although should you ever find yourself working oak with hand tools then.... the wetter the better! ■

FURTHER READING

Timber: Its nature and behaviour
J.M. Dinwoodie ISBN 0-419-23580-9

From FPRL 'Technical Note No. 46 – The Moisture Content of Timber in Use'



Below: Checking moisture content
Bottom: A few gallons leaving the dry kiln!