



Oak Behaviour in Structural Use

Ever since fresh sawn oak timber has become popular as a building material throughout the regions where it is available, special methods of construction have developed to accommodate its unique properties.

Freshly cut logs from the forest may well have a moisture content of 60% - 80% water, depending on the season it is felled. Most of this water is held in the cells of the oak, and this simply dries out during the drying process.

The wood also holds water in the cell walls, these are the cellulose fibres that give the tree its stability. The water held in these, once lost, will cause the cell wall to shrink. When this shrinkage is made across the whole piece of oak, major changes occur.

Timber shrinks mostly tangentially, that is, it attempts to shrink around the heart. The most obvious result is the appearance of drying fissures, which appear quite rapidly.



Drying fissures in air dried beam

Due to the tangential drying movement, these fissures will reach in towards the heart of the tree, or log, as below.



The fissures will take the shortest route to the heart, oak framers would often historically have put large moulds on the beam, so that fissures would form on an internal corner of a mould, and not be seen.

The owner of a fresh sawn building should be made aware that these fissures are inevitable, and a natural part of the drying.

There are several ways of cutting beams, depending on end use, size of the log and availability.

Most common is 'boxed heart' as the picture above shows where the beam is cut around the heart of the log. This has the advantage of staying reasonably straight and square throughout the drying process, although a slight disadvantage of having more drying fissures.

Also reasonably common is 'halved', this is where the log is cut down the line of the heart. The advantage this has, is to minimise fissuring on one face, and the wood

itself is generally stronger and more resistant. However, as it dries, it will form a flattened curve across its section, as the picture below.



Less common, is the 'quarter' because a beam cut on the quarter needs a large log, and these are more expensive, and less readily available especially in long length. The advantage of this is again, less fissuring, but a disadvantage is the fact that after drying it forms a diamond shape, as the picture below shows.



There are ways in which the oak framer can attempt to reduce or eliminate fissuring and movement. Boring out the heart can help, but it has negative effects in that you are removing strength from the wood, which has implications for structural use.

Below are some beams with bored centres, to effectively reduce fissuring. They are not actually cut on the heart, but it has still had a beneficial effect.



Another method sometimes used is glued laminated members. This is very familiar in softwood, but much less common in oak as this is very expensive in comparison with fresh sawn oak.