TALKING TIMBER

MAKING THE GRADE IN TIMBER GRADING

Can you visually grade timber rejected by a grading machine? This is the question asked by ***Daniel Ridley-Ellis,*** *head of the Centre for Wood Science and Technology*

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We know that visually grading timber that has been rejected by a grading machine in the mill happens, but is it allowed? More importantly – does it correctly grade timber?

If we look at EN 14081-1:2016, we see a general clause (5.1.1).

"Structural timber that has previously been graded shall not be re-graded to the same or different grades unless the method of determining characteristic values has made allowances for changes to the timber population caused by the previous grading," it says.

Grading is a method of ensuring characteristic values for design. Whether done visually or by machine, it works by sorting timber into grades depending on thresholds (machine settings or visual grading rules). What we end up with, in those grading piles, not only depends on those sorting thresholds; but also on the 'quality' of the original population, before grading.

Characteristic values for design, usually defined by strength classes, are not descriptions of any individual piece – rather they describe the required collective properties of the pieces sorted into that grade. The basis of machine settings and visual grading assignments is the destructive testing of a representative sample of timber to see what the properties of the graded timber actually are. Implicit in this is the assumption that the before-grading population is always the same (near enough) as the representative sample.

Let's examine a simple example – imagine we have graded 200 pieces of timber, and the characteristic (5th percentile) strength is only just what is required for the target strength class. If we actually knew how strong those pieces really were (by testing them) we could rank them in increasing order of strength – and the one that is 10th in the list (5% of 200) would have a strength that is higher (just) than the characteristic strength defined for the target strength class. Everything is fine.

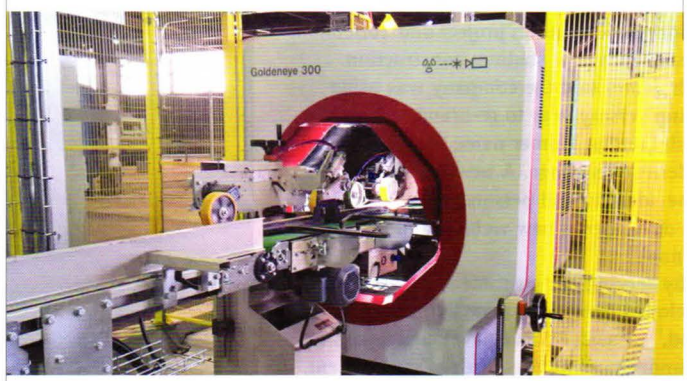
Now imagine we took 100 of those pieces, and we took them in such a way that favoured stronger pieces. Now, if we rank the 100 remaining pieces in order of increasing strength we would find that the one that is 5th in the list (5% of 100) has a strength that is less than the characteristic strength defined for the target strength class. Everything is not fine. This happened because we took away proportionally more of the better 95% than the worse 5%.

In real life, we don't know the actual strengths of the pieces which is why we cannot specify a strength class with a minimum value. Instead we use the 5th percentile because we can design on the basis of 5% of pieces being weaker than this, even if we don't know which pieces they are (this is not unique to timber; we never have perfect knowledge of any material).

Now imagine that we took those pieces of timber out before we did the grading; we'd end up with the exact same problem. The grading wouldn't work because we've done something that changed the population. Our grading thresholds no longer give us what they are supposed to.

This is what happens when you re-grade timber that was already graded. The original grading changed the population – so if we re-grade without accounting for that change, the re-grading probably won't work – the timber might not have the characteristic properties it is supposed to. Accounting for that change is very hard, and very specific – and re-grading machine rejected timber is an extreme case of this – because you really only have the poorest pieces, not a 'healthy' population.

The exception to this is if, after grading, the cross-section is reduced by more than the limits described by Clause 5.1.1 of EN 14081-1:2016. This is because this changes the influence of strength reducing features like knots – potentially changing the grading thresholds. ■



Below: Automatic timber grading technology

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