TALKING TIMBER

REUSE OF STRUCTURAL TIMBER

***Marlene Cramer** explains how the Australian standard on strength grading recovered timber works and how it compares to new developments in Europe*

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Strength grading of recovered timber is currently a much-debated topic. We all agree that we should reuse timber, but we are not quite clear how we should go about verifying the mechanical properties of reclaimed wood. Can we assume that wood properties are not affected by aging? Do we need to quantify a decline in properties due to prolonged high loads, or other factors? And how do we deal with potential prior grading and sorting effects? Maybe some of these questions have already been answered on the other side of the world...

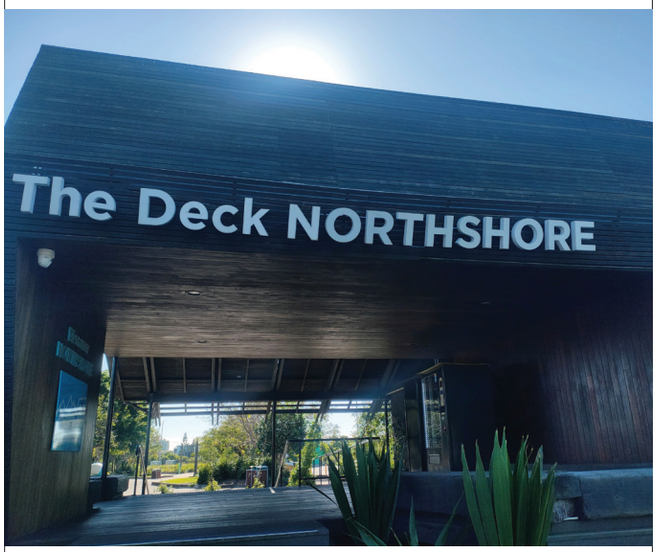
As early as 2008 Australia published its first Interim Industry Standard on the grading of recovered timber for structural purposes. The standard, that covers hardwoods only, is now becoming the official industry standard (currently in draft stage - *FWPA Standard G01 Recycled Timber - Visually Stress Graded for Structural Purposes*). Funded by an IOM3 *Grant to Support Knowledge Exchange* I went to Australia with the mission of finding out more about its recovered timber grading approach.

The first step in the Australian standard is identifying the timber species, because the mechanical properties depend on a "species group". This is similar to the Australian standard for new timber, although it has been simplified somewhat with only four species groups for recovered timber. Visual grading is then carried out according to rules that are similar to the visual grading standard for new hardwood (AS 2082) with additional limits on the size and position of holes and notches.

The mechanical properties of reclaimed timber are assumed to be somewhat lower than similar new timber mostly due to duration of load (DoL) effects. Strength properties are reduced by two grades, but stiffness remains almost the same. Researchers at the University of Queensland tell me that the timber industry is not exactly happy with the significant decrease in strength proposed by the standard. But the reduction in properties can actually be countered in the design, as a less penalising load duration factor is applied to recovered timber. This is because it is assumed that the reduction in mechanical properties due to DoL effects slows down progressively, and so most of the strength loss will have already occurred in the first service life. This is based on relatively old and relatively limited research, and DoL and aging effects are hard to understand in general, as the same timber cannot be tested twice. Some Australian researchers believe that DoL affects high-density hardwoods far less than the standard assumes.

Maybe because of this uncertainty, different approaches to grading recovered timber are being followed in Europe: A new Norwegian standard (NS 3691), similar to the Australian standard, reduces strength by one strength class while stiffness remains unchanged. The same DoL factor as for new timber is used in design, so strength properties come out slightly lower (and hopefully on the safe side). A new German guideline for timber reuse takes the opposite approach – it assumes that wood properties do not change as timber ages, but the load duration factors of the first and second service life must be combined for the new design (provided load history is known). This approach actually results in lower design values when designing for long load durations in either the first or second use.

We don't know yet which is the best approach. The challenge is developing standards that are safe, yet not too penalising or complicated to use, especially with the limited data we have on recovered wood. If you have an opinion on which standards are needed and what they should look like, please complete this survey: https://forms.gle/hi3mbsssybxw3xTe6 ■



Below: A structure built from recovered hardwood in Brisbane, Australia

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