Avoiding Issues with Hardwood Sapwood

Ever increasingly, we are seeing professionals that do not know the difference between hardwood and pine, let alone sapwood, heartwood and heart. This is not my readership of course. The new book I am working on is intended to help such people get a good understanding of the basics. Here is an extract from the chapter on sapwood, heartwood and heart. Understand this and it may help you avoid some expensive rectification. The newsletter is longer than normal but the content is critical for designers.

Lyctus Susceptible Hardwood Sapwood

Figure 1. Lyctus beetle

Figure 2. Lyctus larvae turning sapwood to powder

Figure 3. Lyctus attack on a truss member

Image copyright Trevor Smith, South Coast Home Check

Some hardwood sapwoods contain starch, e.g., spotted gum, tallowwood and alpine ash, which attracts the lyctus beetle. It lays its eggs in fallen trees and any sawn timber that has sapwood containing starch. The larvae hatch out and eat the sapwood which turns it to powder. Further, the timber keeps getting re infected until it the sapwood has totally disintegrated. There is no situation a specifier will encounter where the sapwood of lyctus susceptible sapwood should be purchased untreated[1] though it is less of a problem in the cooler climates.[2] Before the widespread adoption of vacuum pressure impregnation (VPI) timber containing any sapwood was regularly sawn into boards for flooring and treated to what we now call H1 with a borax solution.[3] The Timber Utilisation Acts in Queensland and New South Wales had very strong penalties for selling untreated lyctus susceptible timber. With their repeal, there are increased incidents of untreated lyctus susceptible timber being sold.

The allowance for want and wane under AS2082 is very generous and even after the lyctus attack in the spotted gum roof truss web in Figure.3, it still likely meets the want and wane requirements of F17. However, what does the nail plate connect to, thin air? The web may as well not exist.

Non lyctus susceptible hardwood sapwood

Untreated blackbutt exposed beams with no obvious sapwood

Figure 4. Freshly sawn blackbutt with sapwood clearly visible

Figure 5. Decay in a blackbutt sapwood in a verandah joist

Image copyright Ed Scott

Blackbutt is a species that is not susceptible to lyctus attack because its sapwood does not contain starch. I described blackbutt earlier in the book as "sub optimal" for external use but in an environment where we are spoilt for choice with higher performing species. For protected environments it is a highly prized species because it is strong, easier to work than the denser timbers and, very importantly, does not require any preservation as seasoned timber lacks the moisture needed to allow decay. Its light colour makes it ideal for decorative applications (Figure.4). But that all changes with external use.

In the log form it is often easy to tell the sapwood/true wood boundary as the colour of the sapwood can be distinct but not in blackbutt. Once it has lost its free moisture. In fact, it can be difficult to determine the sapwood/heartwood boundary once the sawn timber has lost its free moisture, i.e., determining what is durable in the weather and what is not. However immediately after sawing the boundary is distinct (Figure 5) and, in a jobbing sawmill cutting to order, those pieces containing sapwood can be separated and treated. Unfortunately, AS2082 only requires lyctus susceptible sapwood be treated so what is likely to happen in a production setting, where product is sold kiln dried, is that timber containing sapwood and that which is free of sapwood will be mixed into the same pack. This is inconsequential when used in the perimeter of a house but can result in expensive rectification work when used externally. Figure 5 shows a blackbutt verandah joist which has decayed. The ends were suspended in joist hangers and the consultant reported to me that most of the joists were similar. They simply decayed as they must. Note that this change in colour only occurs after decay has started.

Another issue with kiln dried blackbutt is that some mills will mix New England blackbutt (E. campanulate, E. andrewsii) with blackbutt. The higher shrinkage is irrelevant when dry, but it has lower durability (above ground 2) making it unsuitable for external use.[4] Unlike blackbutt, it is lyctus susceptible, however the sapwood should have been treated. If using an off the shelf kiln dried product for external use, i would recommend using a durability 1 above ground species that is lyctus susceptible to ensure that the sapwood is treated. This can be met with spotted gum, a dark coloured timber.

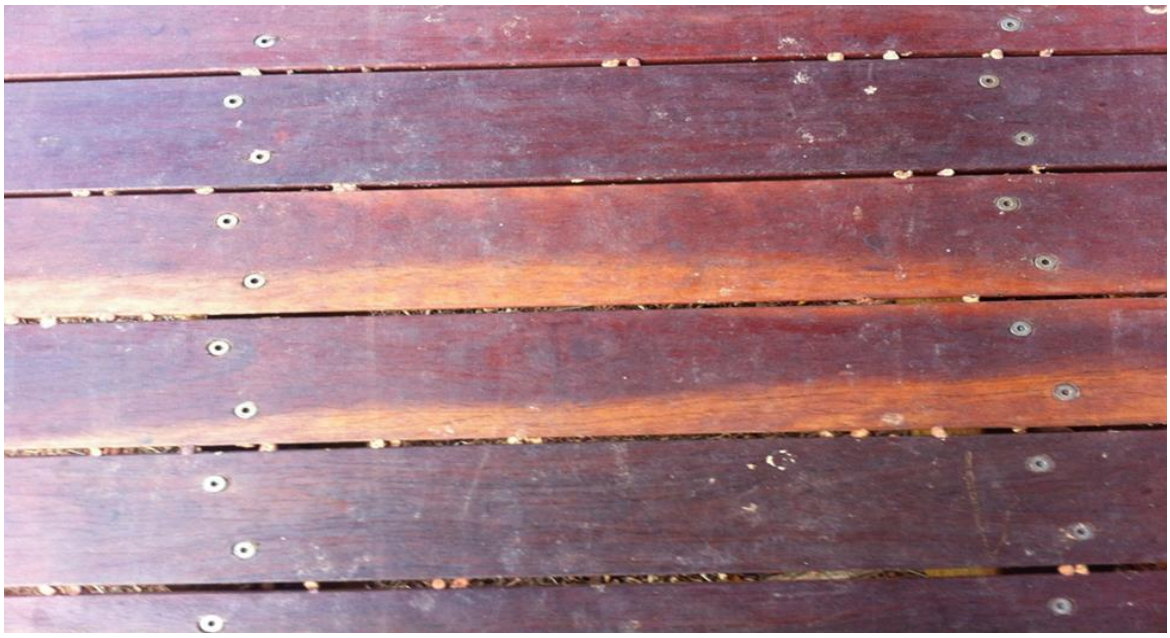

Figure 6. Ironbark decking with untreated sapwood

Figure 7. Untreated sapwood in sapwood is decaying

The extent of the non lyctus susceptible sapwood in Figure 5 is so great that it caused a deck to fail. Clearly, it isn't always so large that it effects structural integrity, but safety goes far beyond actual failure. The ironbark decking in Figure.7 has untreated sapwood on the top face, (it is identified by the light colour). Ironbark sapwood is rated as the same durability as pine sapwood, i.e., class 4 in ground and above ground, however in practice it is more durable than pine but only by a few years and not decades. The decay in Figure 8 is from the same boardwalk situated in Ipswich, Queensland after ten years. The decking is still capable of carrying the required load, but unacceptable trip hazards are now developing. It is critical that all external sapwood is treated to H3, whether it is lyctus susceptible or not.

How do I know if a species is susceptible?

Construction Timbers in Queensland, Volume 2 should be your go to source for the basic properties of the timber you are planning to use. It will identify a much broader range of species than AS5604 Timber—Natural durability ratings, is equally authoritative under the NCC and, best of all, is a free download. Remember, if the species you are looking for is not found in Volume 2. you need to exercise great caution as it likely has not been tested for Australian conditions.

References

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[1] Under Queensland's TUMA, it could only be sold with untreated lyctus susceptible sapwood if requested in writing. Ted would do this when purchasing feed stock for manufacturing Deckwood. It would be processed in days and then treated which meant there was no contaminated shaving to dispose of.

[2] Victorian Ash is a trade name for a group of species similar in appearance and includes alpine ash (E. delegatensis) which can be lyctus susceptible. When Victorian ash flooring was first sold in the warmer Queensland climate there were instances of lyctus attack, but this would not have happened in Victoria or Tasmania.

[3] The process involved placing the packs of timber in a tank of boiling borax solution which drove out the air in the vessels. As the water cooled, the solution was drawn into the sapwood. It was a very effective and colourless system.

[4] Bootle, Wood in Australia, 253.

Thank you, Ted, for allowing me to put this on my site and a special thanks to the image suppliers

Ted Has Courses available please look at the courses he provides and please visit his website https://www.timberwithted.com.au/ on all available courses plus Brochures.

Or just drop him an email. Edgar Stubbersfield edgarstubbersfield@gmail.com

A bit about Edgar know as Ted he is the author of this fine information.

A Senior Timber Consultant at Your Service

He has over 45 years of experience in the industry and can assist you with many of your timber needs.

Inspection – He can assess timber products on their performance, fitness for purpose or cause of failure. I also examine whether best practice was used in design and construction. I have recently completed inspections on boardwalks, bollards, support beams and external timber furniture.

Grading – Quite literally, he has written the book on the subject. Recent experience has shown that up to 30% of timber supplied may not be to grade.

Design – He can provide detailed technical drawings and advice. He can also review already prepared drawings.

Reports – He has authored many books on timber and can prepare a report providing recommendations and practical instructions on to how to rectify issues.

Trainer and Presenter – He can provide tailored training to meet your CPD needs and also have experience at lecturing to universities and presenting at conferences.

Please note Ted is now employed as a Senior Timber Consultant with the firm BCRC all large and complex consultancies and requirements for an expert witness will be handled in conjunction with them. Existing consulting arrangements remain unchanged and I am also available to assist on small projects. For more information see www.bcrc.com.au