October 2013 Newsletter

Written by Ted Stubbersfield

For Infrastrucxion Pty Ltd

Dear Reader

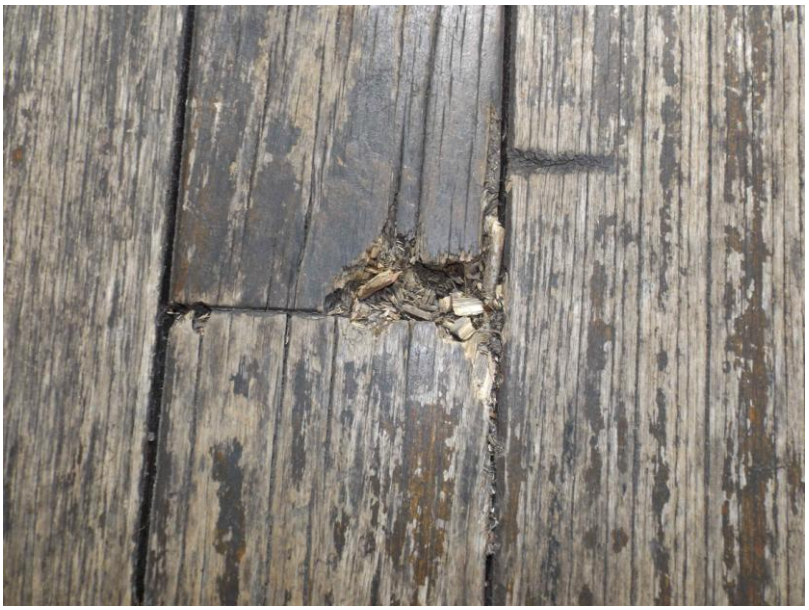
This newsletter speaks about the very best and the very worst of timber supply. I love timber but I am growing increasingly disillusioned with the industry. This newsletter starts off questioning whether we (not me, but others) can even supply a simple timber deck any longer. It then looks at what is possible with high tech timber products developed using the latest science. Fortunately these later developments are too advanced for the "cowboys" to dabble. I have asked my friend Dr. Dan Tingley to contribute an article on the refurbishment of road bridges. All our council readers will know that there is not enough money in the country to replace all the old timber bridges still in service. To my readers who aren't into bridges, Dan's article should still be of interest to you as the same materials can be used to build very large and aesthetically pleasing structures as illustrated below.

I have been able to obtain some remarkable images from overseas showing the imaginative use of natural round timber in architecture and plan to bring them to you in November.

All Ted's Timber Books Available For Only $264.

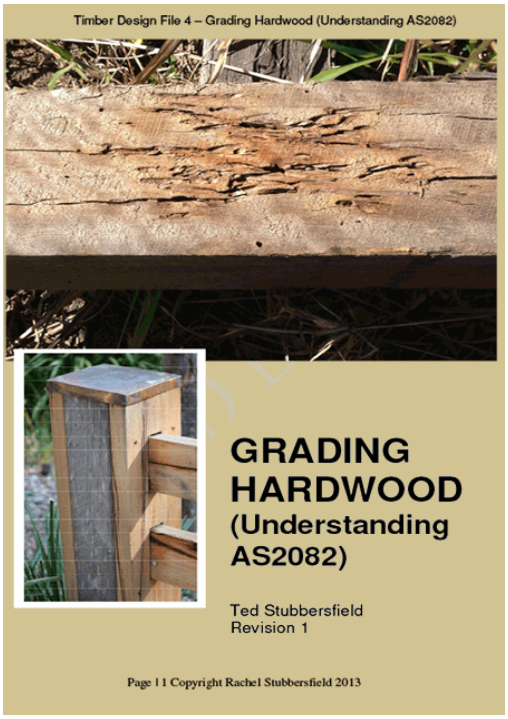
If you are doing any timber design and you really should have our guides available to guide you through the process, but then I know their content and how valuable they would be to you. For a short time only I am making them all available for $264 ($311.50 normal price). There are still large timber structures worth hundreds of thousands of dollars being built where the basics are not right. That puts the cost of my books in proportion. I am also coming across new work where steel and plastic is being used, a far more expensive option than well designed timber. This aversion to timber has only come about through people not getting the basics right.

Why is Timber Use/Supply Deteriorating?



F17 Vic. Ash used as decking in Queensland

We have had to deal with the inadequate lack of teaching in timber design at universities for some time but the deterioration not just in design but now supply has accelerated over recent time. When the Queensland Government issued the discussion paper about repealing The Timber Utilisation and Marketing Act it gave one of the reasons for not doing so was the possibility that the lower standards of timber supply and design in southern states (without a similar Act) might creep into Queensland. Well that has been proven correct. Now NSW has got rid of their Act they also will all be facing the general decline in the standard of timber use. The Queensland government argued that getting rid of the policeman would lead to "innovation" and some of the "innovations" out there frighten me and others. What happens when you get rid of the policeman? Lawlessness would be my best guess. The next section illustrates this.



Guide to Grading Hardwood

(Understanding AS2082)

Book four in my series *Timber Design Files* is all but completed and I am now offering advanced drafts for sale for only $33. If you are thinking, "Why would I part with $33 when all I have to do is specify timber to an F grade to AS2082"? A better question is "Why would I spend hundreds of hours writing the book"? I have subtitled the book "Understanding AS2082" because this guide alerts you to the severe limitations of this Standard and the need for extreme care when it is being used. Feed back from another timber consultant relating to last months newsletter warning about garo garo illustrates why you need this book:

"I recently was called to a deck where the 'F17?' joists were decaying severely. The timber was garo garo (Check out last months newsletter) and whole deck has had to be rebuilt. I also recently checked a number of decks in a home unit complex where joist decay was occurring. Fortunately only a few were a problem. Culprit [untreated] sapwood! While the species was not at fault as it did not require treatment against lyctus it was no good as regards durability. Unfortunately [untreated] sapwood was present in joist hangers and at other critical areas. I also recently condemned a whole deck because of excessive [untreated] sapwood in the decking (you could put your foot through it).

My friend then offered his thoughts on generally why this type of thing is happening and his conclusion is exactly the same as mine.

"The basic problem is the lack of staff trained in timber knowledge at all levels from the people ordering the supplies to the ordermen to the reps. When engineers and

architects specify correctly, the situation then breaks down because people supplying the product don't know what its about

New Life for an Old Timber Bridge:
Retrofitting Boundary Road Queensland Rail Railway Overpass Bridge

(Not a paid advertisement)

The old Boundary Road Bridge was so dilapidated and unsafe that it had been closed to all traffic weighing over 2 tonnes. The bridge was limited to one lane of traffic manned 24 hours a day by traffic controllers.

Boundary Road Bridge in Dakabin, Queensland, was an old overpass crossing Queensland Rail lines. The timber structure had stood for over fifty years, but recently had been left to deteriorate and was showing its age. The bridge was in such disrepair that it had been deemed unsafe and restricted to one lane with a 2 tonne load limit. Traffic controllers monitored the bridge 24 hours a day to ensure heavier traffic did not try to cross the busy old structure. Local residents were angered not only by the loss of a major thoroughfare to heavy traffic and emergency vehicles, but also the cost to rate payers of enforcing the restrictions. Replacing the bridge appeared imminent. Would one more old timber bridge fall by the wayside to be replaced by steel and concrete?

Replacing the bridge with a new structure would be very costly and involve closing both the bridge and the rail lines for extended periods of time, disrupting both vehicle and train traffic. But a new concrete structure would last approximately 50 years and would be able to carry heavy, T44, traffic. What was the best, most cost effective solution? Queensland Rail decided to enlist the help of Wood Research and Development (WRD), a company specializing in nondestructive testing of old timber bridges and the design of restoration systems for timber structures, to inspect the old structure and make recommendations as to what could be done with the old structure.

Rail traffic on the line was high and access to the bridge was limited, so WRD inspectors worked at night, over a few days to inspect the structure. They found that the significant cracking in the asphalt wear surface was caused by excessive deflection in the spans. The log girders were in decayed condition and the structure was undersized for the loads it was receiving; it had never been designed for modern day T44 traffic. The girders and deck were in extremely poor condition; the piles, however, while showing signs of deterioration and neglect, were in salvageable condition. The engineering staff of WRD made the recommendation that the substructure could be rehabilitated and superstructure elements in poor condition could be replaced with new lightweight, pentachlorophenol-treated glulam members. Surprisingly, the old timber bridge could be not only salvaged, but could be upgraded to carry T44 traffic.

Shown above, the WRD inspectors, found the underside of the deck and the girders were discolored, indicating water had been penetrating the deck, accelerating decay. Girder ends and corbels were visibly hollow and decayed, and nondestructive testing showed the girders were in poor condition throughout.

The girders were also undersized for the weight of the traffic crossing the bridge and excessive deflection was occurring. Bottoms of the piles at the concrete sills had elevated moisture levels and nondestructive testing showed they were deteriorated but were salvageable; however, the 2-bolt connection of the cross heads to the piles that is so common in older timber bridges in Australia was designed for lower loads carried by the bridge decades ago, but insufficient for a T44 rating.

At the advice of WRD engineering staff, Queensland Rail chose to perform a complete replacement of the deck and superstructure with treated glulam girders and transverse deck panels; the piles were to be restored using high-strength fibre wraps and injected with Structurfill™ epoxy and the cross heads were to be strengthened and upgraded to carry 44T traffic. Timber Restoration Systems, an Australian firm that specializes in advanced timber bridge restoration techniques performed the restoration work and WRD completed the working drawings, shop drawings, project engineering oversight and final inspections.

The bridge superstructure was stripped off to prepare for installing the replacement spans and the piles were reinforced with high-strength fibre wraps.

The spans were pre-assembled in a staging area adjacent to the bridge to limit the time the rail traffic would be affected. The girders, cross braces, and deck panels for each span were assembled on the ground and then lifted into place on the existing substructure as a single unit.

Span 1 was lowered into place using a crane.

By preassembling the spans on the ground adjacent to the bridge, they could be dropped in place quickly, greatly reducing the impact on rail traffic.

The final span was lowered into place over the tracks.

Restored pile bents are shown here with high strength fibre wraps. The yellow bungs are the locations where piles have been diffused with sodium-borate based wood diffusers which are moisture activated to release when the moisture content of the timber rises above the point at which decay will start. Crossheads were reinforced with Retroten® high-strength fibre reinforcing to increase their bending strength. The pile to crosshead bolt connections were upgraded to the standard for T44 loading by increasing the number of horizontal connectors.

The existing concrete abutments were used to support the new superstructure.

The finished bridge, with guardrails installed and paving complete, is now open to traffic without load limits. Rehabilitating the existing substructure and replacing the superstructure with lightweight glulam components that could be prefabricated and then quickly lowered into place provided significant savings not only monetarily, but in a single weekend scheduled passenger train closure period. Freight trains still operated during the installation weekend. The project was completed in two available three day work windows centered around previously planned track closures; the first closure was used to retrofit the substructure and the second closure to install the new prefabricated superstructure. The new superstructure was installed in just 42 hours. During this time 12 trains passed under the works causing a suspension of works such that the new superstructure and deck was installed in a net 32 hour window. The new penta treated glulam system has a 100 year rated life time, rivalling that of a new concrete bridge, and is able to carry T44 traffic. All of this was accomplished at approximately 1/6th the cost of

replacing the bridge with a new concrete structure since the old abutments, piers and substructure were able to be upgraded and remained in place. The new glulam bridge weights 1/8th the weight of a new concrete bridge. This weight savings is enough to allow the old substructure to easily carry the T44 loads. The new glulam bridge is 1/3rd the dead weight of the old hardwood timber bridge. The new bridge is also 16 times more carbon friendly than a reinforced concrete bridge.

The restoration brings the best of both worlds; the old heritage of the original structure and aesthetics together with advanced technology that is both carbon friendly and cost effective all the while extending the life of the structure past a conventional concrete structure utilizing old and new timber elements!

(Dan's contact details are found at the bottom of this newsletter)

This Has to be Ted's Decking!

We supplied and arranged certification for a small boardwalk kit measuring 12.3x2.6 m to Myles Harm of H&G Contractors (07 3288 8609) very recently. It was reported back that when the inspectors from the council came out they were very impressed. One apparently commented, "This would have to be Ted's decking". There is a difference that discerning specifiers and purchasers should be seeking out (even though strictly speaking it is Chris's decking). Even in a small boardwalk, detailing is still crucially important. Note the abutment with back and wing walls.

Bridge Quote Requests

If there is any doubt that OSA make the best kit bridges in the country look at the Berrinba Wetlands Project . Not all bridges are equal. After encountering three bridges in one month that did not meet the Bridge Code I wrote the May 2012 newsletter.

Refer to it when assessing the suitability of quotes.

Steel bridge Quotation Request Form

Timber Bridge Quotation Request Form

More information:
If you have timber road/rail/heritage bridge issues,

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