



## August 2011 Newsletter

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### *Theory Must Match Performance*

After an exhausting and stressful day I like nothing better than to visit the Royal Hotel in downtown Gatton and have a mug of flat white prepared the way I like it, sit down, read the paper and unwind. I always look in the cake display and long for all the things that I used to be able to eat when I was slim.

Unfortunately, sometimes there is a lemon meringue pie there. I look at my waistline and I look at the pie and invariably the pie wins. To make a good lemon meringue pie I have learnt that you first must have a good recipe and then you need the best of ingredients and a finally a good cook. At the end of the day the proof of the pudding is still in the eating, not the recipe.

The Millennium Bridge was designed by some of the UK's finest engineers, a quality recipe so as to speak. It certainly used quality ingredients but it had to be closed on the day it was built. Ultimately, even with bridges "the proof of the pudding is in the eating".

When I first started building bridges (a long time ago now) I am afraid to say that I built a bridge that I was ashamed of! It caused my customer and me considerable embarrassment. It was a hard learnt lesson on the need to only use consultants of the highest calibre. (If you are an engineer and on my mailing list you are obviously one of that select group).

I resolved that day to excel in this field. Sometimes I walk away from one of our jobs and think, "I could do that better next time around if we tweak things a little" and when it comes around again I make sure I do do better.



What does a lemon meringue pie have in common with the London Millennium Bridge?



I mention this because I am the horns of a dilemma with shaky bridge built by a competitor. A newly installed imported aluminium bridge that is not too far from home moves like no truss or girder bridge I have ever walked on before.

Its deck is like glass when wet, to the extent that the asset owner placed a caution sign on very soon after it was built. Pensioners that I know personally use the bridge and find it difficult because of the movement in the deck and its slipperiness.

On top of this, specialist bridge engineers have written saying that they cannot understand how the bridge is open to the public. On the other hand it is certified, just like the millennium bridge, so the owner believes that there is no problem.

I really don't know what to do. I am looking for advice from my readers. If you have any stories (or video) about bridges that shake I would love to hear (see) them.

This bridge is what led me to write my paper on how to avoid common problems with kit bridges. If you are in the market for a bridge, especially a long span bridge please read the paper. I know the links are a repeat from May but this is a serious business.

### Links

Recipe for lemon meringue pie:

<http://au.lifestyle.yahoo.com/better-homes-gardens/recipes/recipe/-/6974513/classic-lemon-meringue-pie/>

Paper on SW1 Berrinba Wetlands:

<http://www.outdoorstructures.com.au/pdf/south-west-enterprise-park.pdf>

Paper on footbridge specifications:

<http://www.outdoorstructures.com.au/pdf/a-bridge-too-far.pdf>

Specification for a footbridge:

<http://www.outdoorstructures.com.au/docs/footbridge-specification.doc>

Specification for a combined bikeway/pedestrian path:

<http://www.outdoorstructures.com.au/docs/cycleway-specification.doc>

## ***Bolt Edge Clearances***



Edge distances are not maintained



Possible consequence of edge clearance not being maintained

I was reminded recently of the importance of maintaining bolt edge clearances. The picture on the left shows a newly installed 150x100 crossarm mounted on its edge on a pole, i.e. the 150mm face is up. A 20mm bolt passes through the 100mm face. This is common practice with crossarms. The edge clearance required for a perpendicular load, which this is, is 3 bolt diameters i.e.  $3 \times 20\text{mm} = 60\text{mm}$ .

The face therefore should be  $60\text{mm} + 60\text{mm} = 120\text{mm}$  not  $100\text{mm}$ . When the load is in compression and tension the clearance only needs to be 2 bolt diameters i.e. an  $80\text{mm}$  face is needed so a  $100\text{mm}$  face would be acceptable. The picture on the right shows what can occur when three bolt diameter edge clearance is not maintained in a perpendicular load. Any degrade in the bolt hole, a real risk when timber is fully weather exposed, goes from an inconvenience to being critical.

Likewise end clearances are very critical. The bolt should be 8 diameters from the end. For OSA this is fairly simple, we use a  $12\text{mm}$  bolt in our  $150 \times 75$  joists.  $12\text{mm} \times 8 = 96\text{mm}$ , then add an extra  $50\text{mm}$  for weathering and you have  $150\text{mm}$ . The width ( $150\text{mm}$ ) equals the end clearance. It works the same for a  $200\text{mm}$  piece with a  $20\text{mm}$  bolt. Sometimes it takes a lot of thought to be able to achieve it though.

## ***Solicitors and Decking Gaps***

A few weeks ago I had a phonecall from a solicitor who had found our information on the web. She was acting for a woman who had her high heel caught in an alleged  $12\text{mm}$  gap and broke her ankle in two places! This is messy as  $12\text{mm}$  is within the codes. I referred her on to a Forensic Engineer who is one of our readers. If repeating myself helps keep you out of the clutches of the legal fraternity I am happy to do so. Below is a link to the newsletter dealing with how to design gaps in decking. We normally aim for about a  $7\text{mm}$  gap and there is no need to exceed  $9\text{mm}$  except on vehicle decks, and this is with unseasoned timber.

### **Links**

[http://www.outdoorstructures.com.au/pdf/osa\\_newsletter\\_01\\_11.pdf](http://www.outdoorstructures.com.au/pdf/osa_newsletter_01_11.pdf)

## ***Shelter Sheds in Natural Disasters***

We have been making shelter sheds for a few years now. To be perfectly honest, I believed that our shelters deserved to sell better than they were. They were of a robust design that functioned well. I agree that they probably are not cutting edge architectural wonders but I do not have to apologize for them either. The Lindsay especially is easily adapted into some amazing shelters.

Fortunately, sales of our shelters have taken a rather dramatic jump this year. Why? Floods and cyclones have “sorted the men from the boys” to use the vernacular. An interesting exercise next time you are near some shelters is simply to give them a shake. Then ask yourself, would I like my house to shake like this? Sometimes the answer is “no”. If it is “no”, remember that shelters are designed to the same codes as your home and should not behave any differently. How does it happen?

The shelter on the right is a custom shelter we designed and built for Toowoomba Regional Council and was in the thick of the flooding this year. It came through unscathed. When we say our products “Outlast and Outperform” it is not hype. If you have forgotten how extreme the flood was, the youtube link was taken a short distance upstream from our shelter.



Flood proof OSA shelter in Toowoomba



Not quite so robust shelter by others



We have put the revised (lower roof height) dynamic blocks back on our website.

### Links

Flooding in Toowoomba:

<http://www.youtube.com/watch?v=Vt-FT-skins>

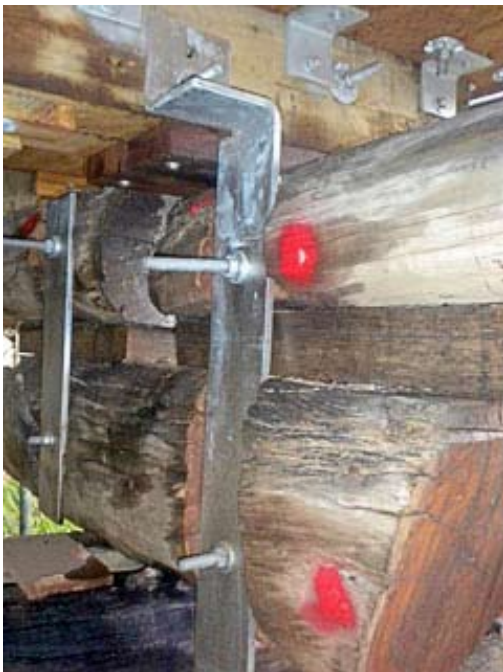
Dynamic Blocks for shelters:

<http://www.outdoorstructures.com.au/tpd-shelter-traditional.php#gregory>

## ***Timber Bridge Refurbishment***

Some of our council readers will be faced with what to do with a large inventory of timber bridges and no money to replace them. The images above should get your attention. When I attended the Small Bridge Conference in May, I sat mesmerized during a presentation by Prof. Dan Tingley of Wood Research & Development Ltd, Oregon.

His paper was entitled Advanced Inspection and Restoration Techniques for Timber Bridges. He showed how an old, worn out timber bridge that you would consider only fit for the recycling yard can be refurbished and carry a load higher than when new. Many of these bridges can be completely refurbished with



Left: Proper horizontal bolting detail



Cross head retrofit with Kevlar

Retrofit by chemically welding Kevlar to a log stringer



Horizontal bolting, diffusing and injected log stringer



traffic still running on them, others only have to be closed only for a few days if the deck has to be replaced. Sometimes a bridge can be refurbished for a third the price of a new bridge.

Late in July I visited a bridge in Boonah, Qld that Dan was upgrading from a 28 tonne capacity to a T44 without closing the bridge. I saw

- Undersize girders having Kevlar strips chemically welded to the underside
- Injection of a structural polymer into timber with a small annulus
- Fibreglass reinforcing of damaged piles
- Diffusion of the logs with a borate - basalt compound

It was a pleasant surprise to find someone with a passion for things that I am passionate about, both at and away from work. A personal friendship is developing which I hope will last many years. We intend to strengthen our ties with Wood Research and Development and hope to see a fruitful exchange of ideas in the future.

#### Links

Below is a link to the paper given by Dan at the 4th Australian Light Bridge Conference. This is a seriously large file but if you have timber bridge infrastructure to repair/replace it will open your eyes to possibilities you would have never considered

[https://www.yousendit.com/transfer.php?action=batch\\_download&batch\\_id=UnlCSIJ5OC9CSm8wTVE9PQ](https://www.yousendit.com/transfer.php?action=batch_download&batch_id=UnlCSIJ5OC9CSm8wTVE9PQ)

Regards

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## Bridge Quote Requests

If there is any doubt that OSA make the best kit bridges in the country look at the [Ber-rinba 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 2010 Newsletter](#). Refer to the May OSA Newsletter when assessing the suitability of quotes.

See our [Steel Bridge Quotation Request Form](#) and our [Timber Bridge Quotation Request Form](#)

#### Steel Bridge Quotation Request Form

[http://www.outdoorstructures.com.au/bridge\\_request.php?Mode=st](http://www.outdoorstructures.com.au/bridge_request.php?Mode=st)

#### Timber Bridge Quotation Request Form

[http://www.outdoorstructures.com.au/bridge\\_request.php](http://www.outdoorstructures.com.au/bridge_request.php)

#### More information:

If you have timber road/rail/heritage bridge issues, we suggest you talk to:

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