



October 2011 Newsletter

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Update on Grantham Redevelopment

I had always lived with the impression that my home, the Lockyer Valley was all but immune from natural disasters. Nothing could have prepared us for the extreme flood event of January 10 which impacted many of the small townships in our shire.

Because the flood event was declared a “crime scene” there was an embargo on official images that showed the true devastation so what I have above is very “sanitized”.

One community particularly, Grantham, briefly became the centre of world attention when an overland wall of water engulfed much of the town in minutes. Nothing like this has ever been recorded in Australia.

People I know well had harrowing accounts of how they were barely able to survive while they could only watch helplessly while people were swept to their fate. There are 17 dead and 3 missing from our valley, most from Grantham and over 120 homes were either lost or severely damaged.

It is unnerving looking at a barren slab where once a home stood well above an accepted flood level!. Our valley will never be the same and many people remain deeply traumatized. Had this tsunami occurred at night the consequences are unthinkable.

The immediate response from all levels of government was unprecedented. There were helicopters scouring the valley for weeks and the army and police presence remained for months while they searched and cleared the homes and creeks.



Historic Spring Bluff Railway Station.



Flooding in Grantham.



From dry to this in a matter of minutes.
Images courtesy of the Gatton Star

Grantham was off limits to most of us all this time. When it opened we could not believe what we saw, a third of the town had ceased to function. Support by community, church groups and service organizations was exceptional e.g. teams of builders came from interstate to rebuild ruined homes and Rotary are turning the old butter factory into a new community centre.

The costs associated with the repair of the assets are beyond comprehension for our small shire. Our council area has a population of about 37,000 people and an annual budget of approx. \$35M yet the damage to council assets was approx \$220m and to state assets about \$200m.

The response by our local Council in face of this crippling burden has been exceptional. Within months it had purchased 900 ha on high ground and pushed through a development plan for a new flood free Grantham community (a further \$30-40M project when completed).

Those affected by the flood were offered a land swap, a high block for the old. In the first ballot 75% of the affected residents participated and 72% were able to receive their first or second choice of land. Construction has already started and the first homes are expected to be completed by Christmas!! See link below for the masterplan.

There are various stages to the project which will progress depending on the demand for lots etc,

Stage 2 and the landscaping surrounding it is also moving forward.

The Council understood that this new development had to be of a very high standard. Many of the people from this community now carry deep emotional scars so the new town had to be one where people could feel good about their new circumstances. It was decided to incorporate into the new town, infrastructure that was planned for the shire, including a new "Gatton" showgrounds, a large equestrian centre, four Australian Rules (football for my overseas readers) playing fields and clubhouse. The landscaping had to be of a very high standard (see link below) Planning is underway to rebuild the now nonexistent commercial precinct but built up 2.4m above natural. Grantham, once voted as Queensland's most boring town is going to become one of the most exciting.

OSA has assisted Mr Joseph Brownlie, Project Manager LV Master Plan, Architects Deicke Richards and Landscape Architects Cardno Splat, Cardno Civil and landscape contractor Naturform as they developed the landscaping for the project which on paper looks terrific. In real life we expect it will be even better as OSA Products will be used extensively including about 1000 bollards, a large trellis utilising Pioneer Posts and a custom shelter. There are many promises of donations from local and national businesses to make this a reality.



Many bridge approaches had severe washout



Massive damage to creek crossings

Note on Bridges:

Despite the extreme flooding no bridges were lost but there was extensive damage to the approaches. I did see an image of a bridge high in the air sitting on just its piles showing the wisdom of incorporating skewed piles with the vertical. The lack of cleaning in the creeks up our valleys has been an ongoing issue (EPA did not like the idea). The damage was extensive to the road and creek crossings and residents were cut off for an extended time. The creeks are clean now and the effects of future flooding is expected to be less.

Gratham Links

Development plan for Grantham

<http://www.outdoorstructures.com.au/docs/grantham-master-plan-03-05-11.pdf>

Landscaping Plan for Grantham

<http://www.outdoorstructures.com.au/docs/grantham-park-developement-03-10-11.pdf>

Man O War Nuts, a Useful Piece of Hardware

During September I was asked to give a presentation at Cardno Splat in Brisbane which included the subject of fasteners in landscaping. I promised to include links to a CAD drawing of a Man O War nut in this newsletter.

When we first started manufacturing bridges and landscaping we were very aware of the potential for injury when using conventional nuts and bolts. We first used a diecast product called a TouchNut which was better than nothing but not ideal.

When Man O War, a former playground manufacturer, started making their own M12 tube nuts we quickly adopted them and have been using them for many years now without any problem. If you incorporate them into your plans we suggest that you say Man O War nut available from OSA. We also have a limited stock of 16 and 20mm nuts available.

Incidentally, this was the first time I had a complaint about my presentation. The talk was fine I just didn't wear one of my colourful shirts. If you have not had an OSA presentation you have missed something.

Links

AutoCAD block for Man O War nut side elevation

<http://www.outdoorstructures.com.au/docs/12-man-o-war-11.dwg>

Long Span Bridges

The January floods have seen a big change in bridge enquiries. We had forgotten that sometimes it rains very heavily indeed and that, when designing a bridge, every effort should be made to keep its feet dry.

Before the flood it was unusual to have enquiries beyond a 24 metre span. Now we are being asked for 50 metres and even an 89 metre clear span. We are able to meet these spans through our association with Wood Research and Development in the United States.

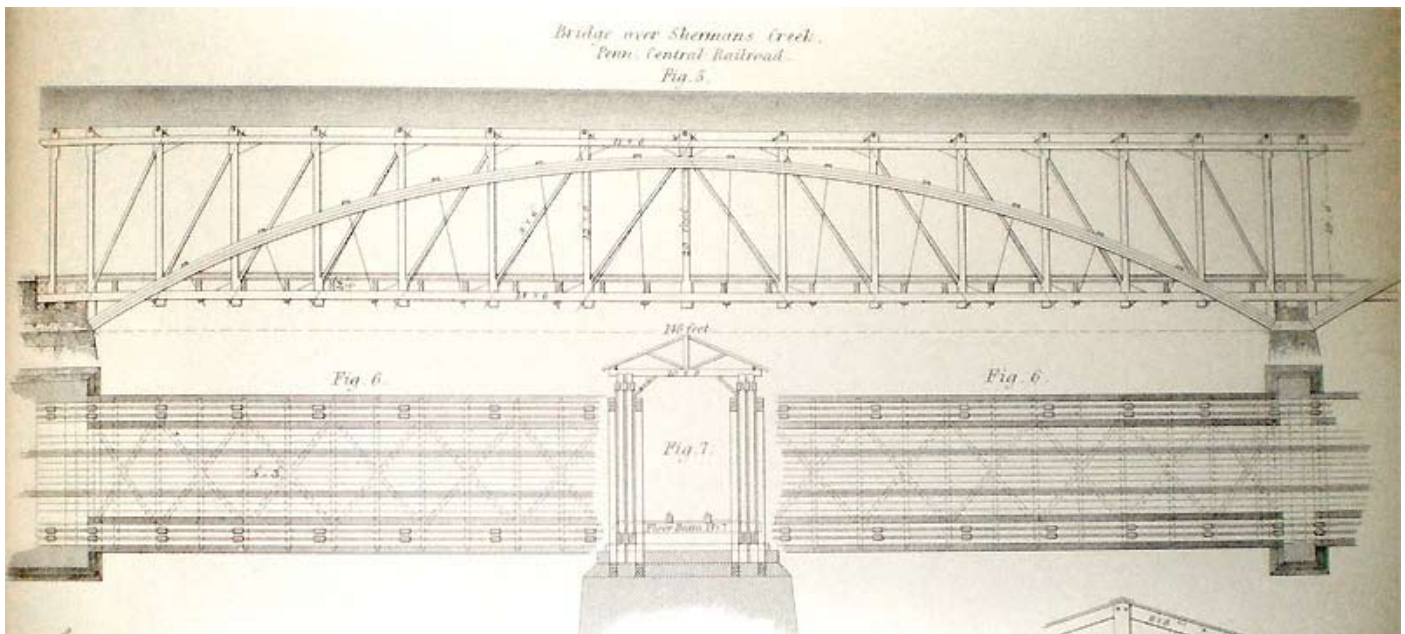


Protruding Bolts are Dangerous



Man O War Nuts

How can you reach such spans when often the dead weight of a concrete or steel beam makes a simple span in these materials impractical? In my grandfather's book on carpentry and joinery from the 1880's there is information on how to build a 45m span Burr arch truss railway bridge using timber trusses (sadly before the days of timber treatment so they have only lasted in covered bridges). Suspension bridges were a popular answer to long spans and many have proved very durable. These bridges require all the loads to be transferred back into the banks and so, ideally, require rock at each end to make serious connections.



Timber bridge over Sherman Creek (148 ft) Penn. Central Railway drawing C.1880

They can be very attractive bridges as images of Brunel's bridge at Clifton and the Szechenyi bridge in Budapest show. (Beware the travel bug there is no cure except perhaps a recession). Sadly, for recreational paths, suspension bridges are frequently under-designed and structures that are quite literally life threatening can be built. If you ever wondered why you have professional indemnity do a Google do a search under Youtube for "Class of 25 almost Break Bridge". You may search "Bridge Failures" in Wikipedia and find a short list of the top 200 bridge failures of all time. Fortunately suspension bridges are not always like this as the 320m bridge we supplied timber for in Japan shows. OSA does not design suspension bridges.

OSA believes a better and even more attractive arrangement to a suspension bridge is a cable stayed bridge. The two bridge types are frequently confused. Instead of the load being transferred to the bridge approaches, the loads are carried within the bridge itself. So long as you can get a good foundation for the pier/piers only a standard abutment is needed at the ends. They can be striking architecturally and would be the natural choice if you require an "iconic" bridge as opposed to the most cost effective option. The OSA bridge shown is probably close to a million dollars now.

Unfortunately these are all 'one-off' bridges and there may even be a fee to give a quotation as a certain amount of engineering is required. As a minimum we require a CAD drawing of the cross section and the Q100 level marked. It is too early for soil tests as the pier positions are not known.

Trusses are an excellent method to span long distances as they avoid the massive dead weight of a simple beam. The range of truss types is vast (see "truss types" under Wikipedia). They all have different advantages, e.g. a Warren Truss is probably the most aesthetic but a Howe truss is more efficient and will span further with the same member sizes. Trusses can even be architectural as well as functional. We think our Warren Truss falls under that category as does the Bligh Tanner bridge above (with shades of the Sherman Creek Timber bridge in the introduction).

Trusses are available in timber, steel and aluminium. The Bridge Code requires truss bridges to be U frame construction, (i.e. The rigidity of a transom to the vertical truss member is utilized to elastically laterally support the top chord) and it is all but impossible to achieve this in a light bolted construction. Failure to achieve the required U frame action may be why many light trusses shake when you walk on them.

Long span timber bridges have been used in covered bridges in the US and Canada and it is not unusual to get over 100 years service from them despite being built from untreated pine. Why, given Australia's harsh climate we never adopted covered bridges I cannot understand. But there is nothing light about these bridges' construction. Light timber trusses that are nailplated together frequently become unsafe as the nailplates generally work out over time due to the effects of wetting and drying. The holding power is half when the plate has come out 2mm!



Clifton Bridge near Bristol UK



Szechenyi bridge in Budapest

The aluminium truss featured above is an excellent example of construction in that material but, if aluminium has a weakness; it is the high cost to do well with stiffness that complies with the bridge code.

The engineer who designed the above bridge indicated that a replacement bridge would probably be in the order of \$1m. (Sadly the manufacturer is no longer in business). I have not been impressed with some kit aluminium bridges due to stiffness issues. Gangways are not footbridges and should not be purchased to serve as such.

Our preference is for a fully welded structure, either in aluminium or steel, with a splice if necessary for transport. This does away with bolted

connections and gives a far more rigid structure. A span of 22m can usually be carted in one piece with a "cab over" prime mover. Obviously a long fully welded steel truss is not going to fit into the galvanizing vat so we use a hi-tech high corrosion resistant paint system called Ameron PSX700 for corrosion resistance. This also gives us excellent graffiti resistance at the same time. Beyond 25 metre span OSA would be supplying a "walk through truss" which is connected and braced at the top

Suspension, cable stayed and truss bridges must all be above the flood level.

While we believe that OSA provides the best kit steel framed bridges on the market I have to con-



320 metre suspension bridge in Japan with timber decking by OSA

ness our love affair with timber. New generation timber products add a completely new dimension to what is now possible in a long span bridge.

Our arrangements with Wood Research and Development now give us access to timber products not available in Australia. We can supply very long span bridges in advanced timber products that the writer of my grandfathers book could never have imagined, treated laminated beams, Kevlar reinforced and with cyclical delamination resistant glues. The life of these bridges in the US is rated at 75 years against 50 for concrete.

The advantages of the laminated timber bridges are:

- Light weight on a strength-to-weight basis greater than steel or concrete.
- Long lasting as the timber components are incised to provide for greater treatment uptake and pressure treated with Pentachlorophenol with an uptake of up to 7 kg/m³ or refusal which exceeds anything else currently available in Australia.
- All machining of bolt holes, end cuts, daps, kerfing, easing of edges etc is completed before treatment and the components go together easily on site.
- The high strength fibre reinforced bridges are very resistant to fatigue caused by vibration loads often seen in bridges.
- The high strength fibre reinforced bridges are very resistant to impact loads from traffic.

- The laminations are manufactured with a high degree of quality control and are completely resistant to cyclic delamination which is not the case with most Australian hardwood glulams.
- The high strength fiber laminates utilized in conjunction with the glue laminated wood laminations are six times the strength of steel and are often connected together at nodes to provide for strong light weight connections that span many times further than steel and most certainly longer than any forms of reinforced concrete.
- Besides being stronger than steel and concrete on a weight for weight basis, high strength fibre reinforced glulam bridges are way more carbon friendly, in fact 22 times more carbon friendly than steel and 16 times more friendly than reinforced concrete. The wood utilized to manufacture the fibre reinforced glulams is manufactured from regenerated softwoods from the highest CO₂ conversion zones in the world. The bottom line Fibre Reinforced Glulams are carbon friendly, environmentally sound, lower cost, aesthetically pleasing and faster to install. Most jobs install in the time of a reinforced concrete job and lots of job involve light weight crane capacity for long reach.
- Due the light weight nature of the high strength fibre reinforced glulam bridges the bridges can often be helicoptered into remote locations such as bush walking tracks to ac-



Cable stayed bridge by OSA at Berrinba Wetlands, Logan



52 metre span Aluminium Bridge, Jindalee



40m span bridge Brisbane



OSA Standard Warren Truss with a 22m span, Ipswich



Sawmill Creek Covered Bridge, New Brunswick, Canada built 1905
Image courtesy of Wood Research and Development.

commodate quick placement of access bridges.

- Differential drop in deflection for reinforced glulam girders is 1/8th that of reinforced concrete
- Differential stringer deflection under load is 1/6th that of reinforced concrete stringers.

In summary fibre reinforced glulam bridges are the new trend in bridge manufacture and are in the process of reclaiming the bridge business lost to concrete over the last 30 years.

A large part of this recovery of market has been the identification of actual maintenance costs that are much higher than first considered and longevity that has been witnessed to be much shorter than originally thought at the advent of reinforced concrete bridge construction in the early 60's.

In steel bridge construction the longevity issues are really taking a toll with recent failures occurring frequently on a worldwide basis such as the great loss of life caused by the Minnesota steel bridge failure which is just one of such failures in recent years. These escalating maintenance costs, shortened longevity and recent failures have caused bridge builders to step back and reconsider the materials of choice for their bridge construction needs. In this vacuum has grown the fibre reinforced glulam bridge market.

These high strength fibre reinforced glulam bridges are a very different product to the laminated beam bridges that we have seen in Australia, where to my knowledge, the hi tech glues are not used. The image above shows how we had to protect a standard H3 treated pine beam from the elements to prevent delamination. Even with this protection we would not use a standard beam above Rockhampton.

We are finding the price of our Australian timber and steel footbridge superstructures which frequently run at only \$900 to \$1100 per m2 on short spans are better priced than the US product. On longer spans it is certainly not the case.

Some recent prices are:

89m clear span x 1.3m wide quoted at \$1.38M

120m clear span x 4.0m wide estimated \$3-3.2M

Speak to us about your long span bridge needs.

Links

Sherman's Creek Railway Bridge C1880

<http://www.outdoorstructures.com.au/docs/timber-railway-bridge-design.pdf>



Long span laminated timber bridges images courtesy of Wood Research and Development

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 [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 2010 Newsletter](#). Refer to the May OSA Newsletter when assessing the suitability of quotes.

Steel Bridge Quotation Request Form

http://www.outdoorstructures.com.au/bridge_request.php?Mode=st

Timber Bridge Quotation Request Form

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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