TIMBER RESTORATION SYSTEMS PTY LTD

Newry Island Bridge Retrofit

For:

Bellingen Shire Council

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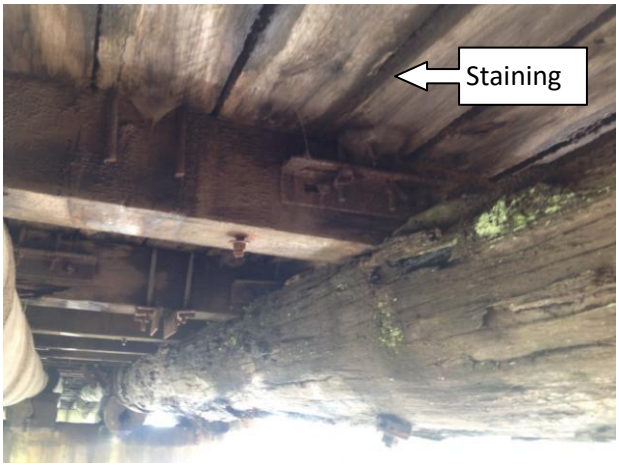
The Newry Island Bridge is a single lane 6 span bridge totaling just under 62 meters in length which crosses the Kalang River north of the city of Urunga, New South Wales, Australia. Newry Island Bridge is a vital crossing as it is the only bridge servicing the small community on Newry Island. The bridge consists of a transverse plywood deck with asphalt running surface laid over a longitudinal plank sub-deck, which is laid over timber girders and corbels. The bridge super-structure is supported by concrete pile bents and caps. Concerns over the structural conditions of the structure led Bellingen Shire Council, who oversees maintenance of the bridge, to restrict traffic crossing the bridge to vehicles under 10 tons gross vehicle weight. Bellingen Shire Council then contracted TRS to complete a visual and physical inspection of Newry Island Bridge.

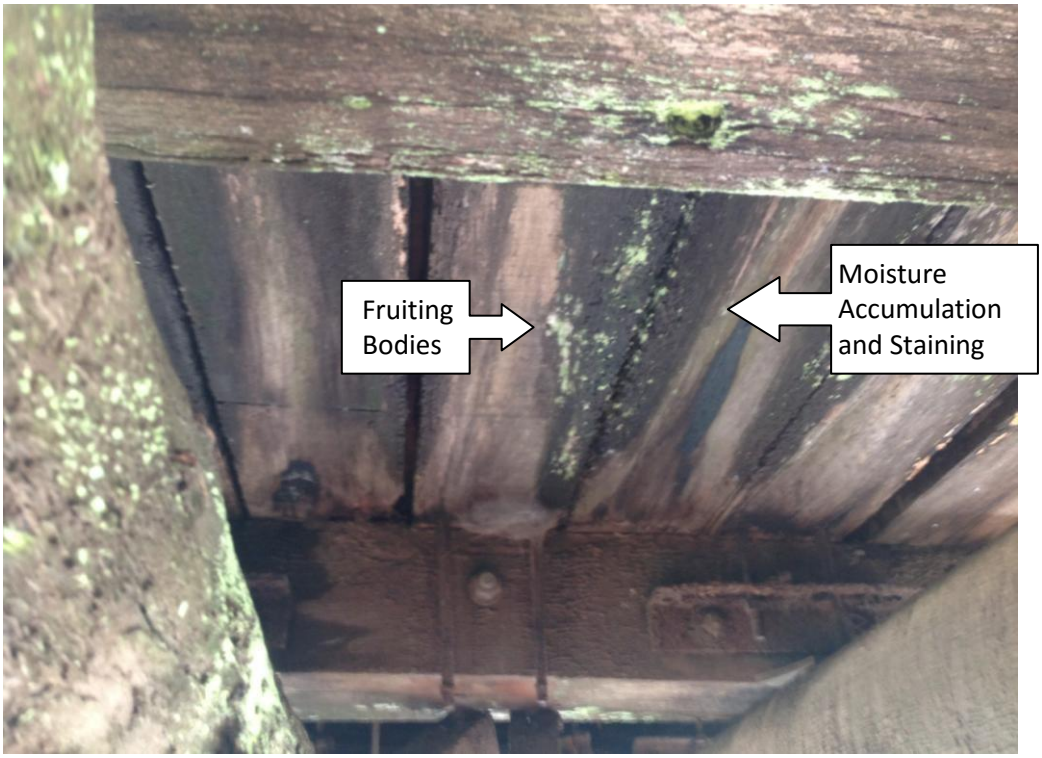
EXISTING STRUCTURE

The existing Newry Island Bridge had been restricted to vehicles under 10 tons.

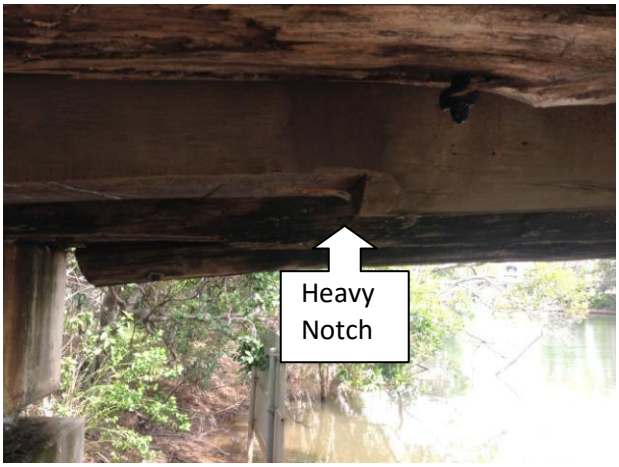
Utility pipes are connected to the side of the bridge.

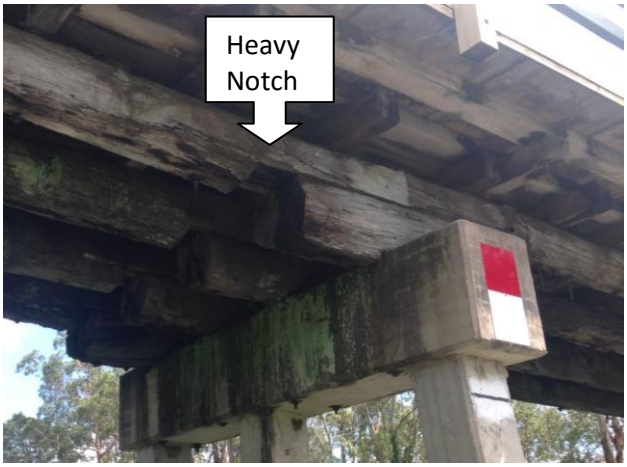
The asphalt running surface is showing signs of wear, and has completely come away from the underlying plywood deck in places.





The above photographs show the result of excess moisture leaking down onto the substructure. Notice the vertical through-bolt extending through the bottom of the girder (left photo). Vertical through-bolt type fasteners accelerate timber decay by creating a path for moisture to run down and accumulate inside of the timber element (girder, corbel, etc.). The staining on the underside of the timber deck panels is a sign of moisture coming through the deck and draining onto the sub-structure (right photo). The accumulation of moisture has led to fungus (fruiting bodies) growing on the bottom exterior of deck planks (bottom photo).





Corbels throughout the structure have been heavily notched, resulting in horizontal cracking and failure of the timber element.

The above photograph show a corbel with a heavy notch, and the resulting horizontal crack and failure. Notice the vertical through-bolt extending through the corbel. This bolt most likely allowed moisture to collect inside the corbel, weakening the timber element.

The above photograph illustrates the end result of vertical through-bolt type fasteners. Vertical through-bolts accelerate timber decay by allowing moisture to run down the bolt and accumulate inside of the timber element. Eventually the timber element will fail completely and collapse similar to the above example.

Various fasteners throughout the structure were found to be in poor condition, with some completely detached from the structure. The visual and physical inspection conducted by TRS technicians found multiple areas of concern. The deck panels and railing system were found to be in poor condition and were recommended to be replaced. Girders and corbels were found to be excessively decayed and ready to collapse. Nearly all of the fasteners in the sub-structure are excessively decayed from the salty environment and require replacement. In order to repair the structure and achieve the 44 ton rating required by the council, TRS recommends a complete replacement of the bridge super-structure including deck panels/planks, kerbs, guardrails, girders, and corbels with new Penta treated glulam beams and deck panels.

RETROFIT

Once site security and traffic controls were in place, a crane was used to install scaffolding around the bridge.

TRS technicians then removed the guardrails, and then cut and removed the utility pipe from the side of the bridge.

The crane was then used to remove the kerbs from the deck.

Once the asphalt was removed, the full extent of the deterioration of the deck system was evident.

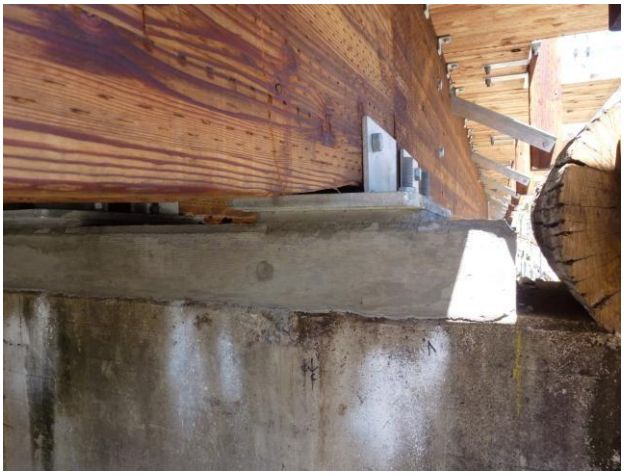
TRS technicians then cut the deck system, girders, and corbels into pieces, which were then removed via crane.

Once the deck system and girders were removed, the crane was used to install new Penta treated glulam girders. This was done one side of the bridge at a time in order to allow technicians use of one half of the original deck for access.

Once one half of the girders were installed, the other half of the original deck system was cut and removed.

TRS technicians the utilized the crane to install the remaining glulam girders.

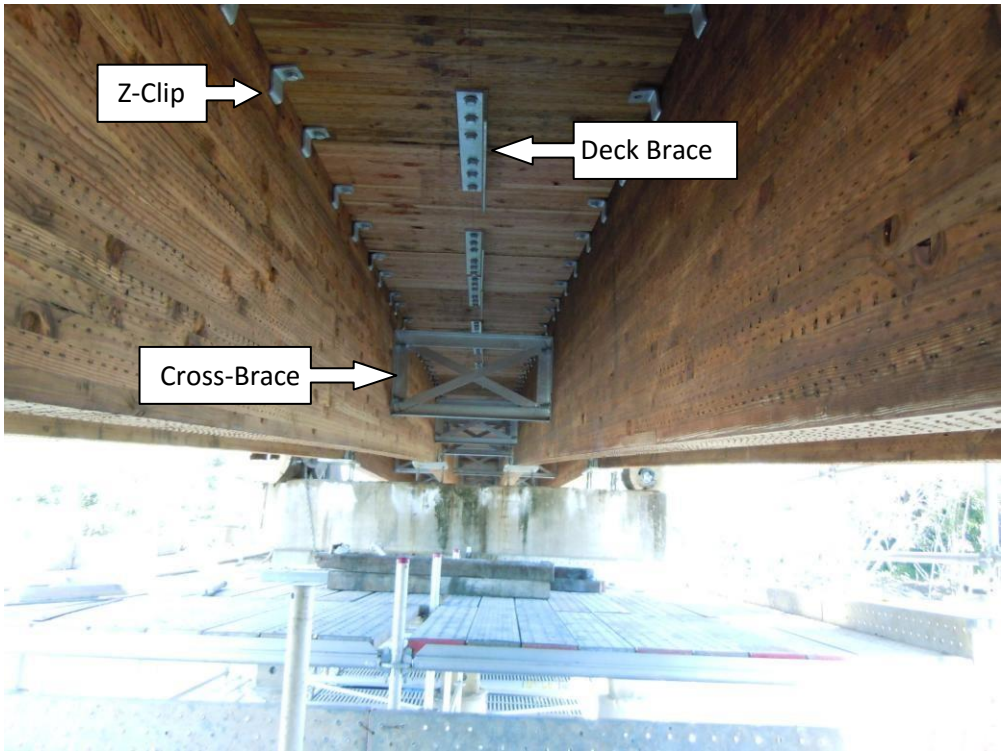
The glulam girders are anchored to the concrete caps using specially fabricated jack-posts.

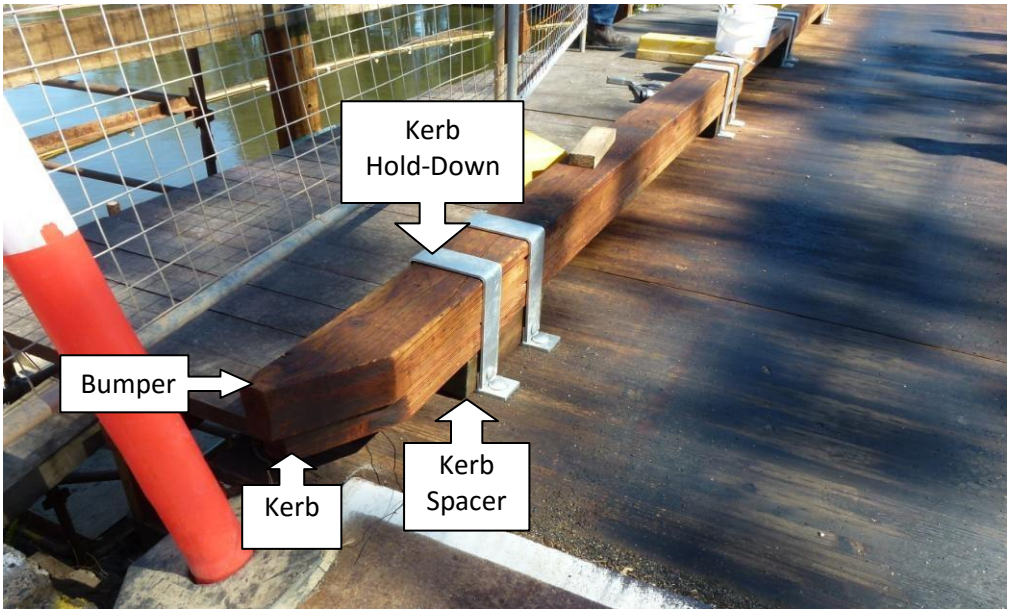
The area between the bottom of the jack-post and the top of the cap is filled with concrete for added strength.

Glulam girders completely installed.

New Penta treated glulam deck panels are laid over the recently installed girders.



Steel cross-bracing are installed between each girder. Deck panels are secured to the girders using steel z-clips, and stabilized using deck bracing between each panel.



Penta treated glulam kerbs, spacers, and bumpers are installed on-top of the deck panels. These are secured to the deck using kerb hold-down fasteners which extend through the deck panels.


A new timber guard-rail system is installed (left photo). The guardrails are braced using steel cross-bracing running from the guardrail post to the bottom of the adjacent deck panel (right photo).


Back wall panels are installed at the abutments between each girder.

Technicians install a new utility pipe to the exterior of the structure.

New utility pipe.

Finished Deck.

Finished kerb and approach.

Finished walkway and approach.

Finished side view.