

The Arahura Bridge



NZ TRANSPORT AGENCY
WAKA KOTAHI

KiwiRail 

Vital link for West Coast

During its 120 year history, the Arahura Bridge has provided a vital link for West Coast communities and local businesses to connect with each other and the rest of the country.

It is an essential link over the Arahura River both for State highway 6 and the Hokitika Branch railway line.

It is also the only direct route between Hokitika and Greymouth for road traffic and is a key connection for road and rail freight within the West Coast.

With the end of the working life of the original Arahura Bridge, a significant transport era is coming to a close. But the future certainly looks bright.

KiwiRail and the NZ Transport Agency have worked together alongside contractors HEB Structures and Downer EDI Works on the Arahura Bridge replacement project.

I am pleased the project is on track to be completed ahead of schedule in December 2009 and that work to date has gone ahead with a minimum of disruption to the local community.

I'm sure you will be pleased with the improvements the new bridge will offer.

Road and rail traffic are now separated, with the inclusion of a pedestrian path and cycle way, and improved flood protection measures have been put in place.

The new Arahura Bridge is set to be an example of how good transport connections play a strong role in New Zealand's future economic success by continuing to move people and freight in the most efficient way possible.

I would like to thank West Coasters for their patience and support during this project.



Hon Steven Joyce
Minister of Transport

Introduction

The Arahura Bridge is an essential link over the Arahura River, for both State Highway 6 and the Hokitika Branch Railway Line. It provides the only direct road route between Hokitika and Greymouth on the West Coast, with more than 3,500 vehicles crossing the bridge daily.

Recognising the importance of this transport link, in 2006 an agreement was reached to replace the original wooden single-lane structure built in the 1880s, with a modern bridge. KiwiRail and the NZ Transport Agency have shared responsibility for the \$25 million replacement project.

The new bridge, officially opened in December 2009, improves safety by separating road, rail and pedestrian / cycle traffic. The design also decreases the flood risk by raising the level of the bridge and through the construction of significant river guidebanks.

The concrete and steel bridge was designed by Dr Rob Park of Novare Design and constructed by HEB Structures, while Downer EDI Works was the contractor for the new road approaches to the bridge.

The bridge has ten sets of twin-bored steel reinforced concrete piles, supporting abutments and pier caps of post-tensioned concrete. This supports a super-structure of concrete pedestals carrying nine spans of concrete pre-tensioned hollow core beams that form the road and pedestrian / cycle carriageways. The rail bridge consists of steel through-plate girders with a steel floor and rail beam system, along with railway hardware.

Physical work began in May 2008 and the bridge was completed several months ahead of schedule in December 2009. Construction was carefully staged around the need to keep State Highway 6 open, and to manage the demands of both the whitebait and dairy dry seasons.

The first step was to build the bridge foundations. Concrete piles were installed on both sides of the original structure and topped with reinforced concrete pier caps beneath the old bridge.

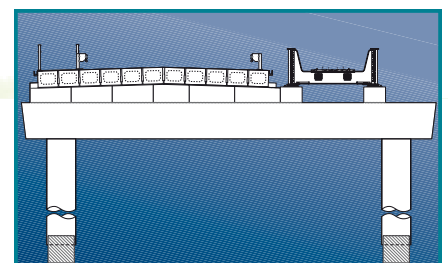
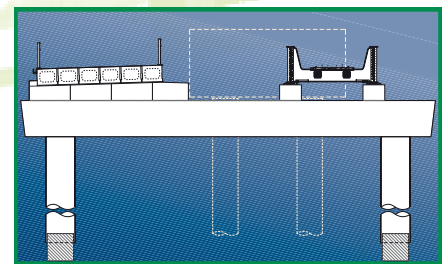
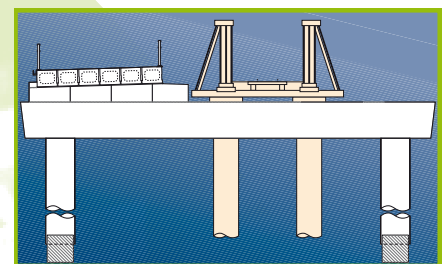
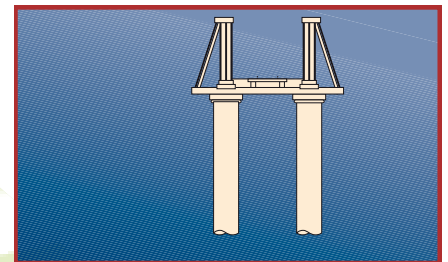
Pedestals were cast on the pier caps and road beams were then lifted into place to form the first of two road lanes. Road traffic was diverted to this new single lane while the old bridge was demolished. Demolition and subsequent installation of the new rail carriageway took place during the dairy dry season, between June - August 2009, when daily trains to the local milk factory were not using the line.

Both the concrete road beams and steel through-plate girders were railed to the site from Rangiora and Napier respectively.

Once the rail was re-opened, work continued on the second half of the road bridge, using a temporary 'Bailey bridge' which enabled post-tensioning and concreting of each span to be completed transversely, while traffic crossed on the temporary bridge above. This allowed grouting and concreting to cure without being affected by vibration.

Off the bridge itself, a new roundabout was built, with the rail line passing through the centre. Building the roundabout included the installation, for the first time in the southern hemisphere, of a rubber level crossing closed-flangeway system, which effectively creates a level surface for cyclists and motorists.

Once the new bridge was complete it naturally took centre stage, but the original bridge has not been forgotten. One of the 'Howe Truss' spans has been retained to feature in a heritage park at the southern end of the bridge.



The old bridge



The original Howe Truss span bridge was built between 1886-88. Initially intended for rail use only, the single lane bridge was shared with road traffic soon after opening. The timber and iron structure was based on a standard Public Works Department design and used seven 'Howe Truss' spans and seven smaller timber spans.



Driving piles

Physical work on the new bridge started with construction of its foundations. Concrete piles 25 metres deep were driven 20 metres into the riverbed on both sides of the original bridge. A concrete plug was lowered to the bottom of a steel-cased pile before an 18-tonne piling hammer was used inside the submerged pile casing to drive the plug down. A reinforcing cage was lowered into each pile then concrete pumped in to complete it.



New foundations

The concrete piles were progressively installed and topped with reinforced concrete pier caps beneath the old bridge, which remained in use while construction continued.



Concrete pedestals were cast on the pier caps before road beams were lifted into place to create the first, single-lane road carriageway, immediately downstream of the original bridge.



Building a road

The 99 road beams used in the Arahura Bridge were manufactured in Rangiora. They were railed directly to the site three beams at a time. Each 24 metre long beam weighed approximately 30 tonnes.

Using two 80 tonne cranes, they were lifted from the train onto the bridge piers.

The new single lane road deck was open to traffic on 25 May 2009.



The road approaches



As the new road lane took shape alongside the old bridge, road approaches were built for the new alignment. This included a roundabout at the southern end with the rail running through the middle.

The new roundabout created two new level crossings, both of which were fitted with a rubber panel system – the first time in the southern hemisphere that this technology had been used. The panels incorporate a closed flangeway system, providing a rubber section which compresses and rebounds as trains travel over the rails, but at other times giving road traffic and bicycles a flat crossing.



Removing the old bridge



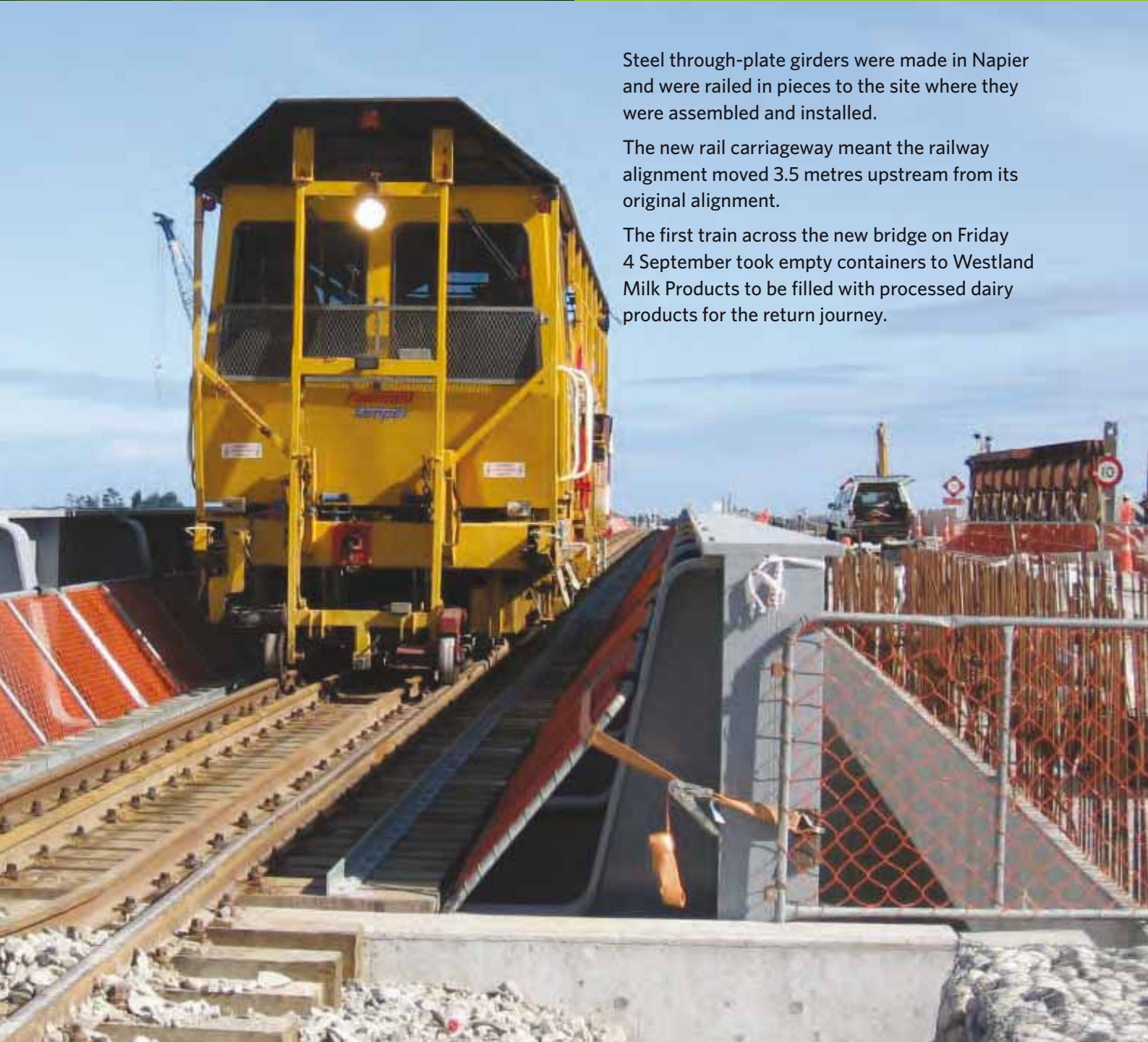
With the last train across the old bridge on 7 June 2009, work could begin to decommission it and install the new rail carriageway. There was a 13-week window in which the old bridge had to be demolished, and the new rail bridge rebuilt and re-opened.



One of the seven Howe Truss spans was kept on site to be used in a small heritage park at the southern end of the bridge.



Creating a railway



Steel through-plate girders were made in Napier and were railed in pieces to the site where they were assembled and installed.

The new rail carriageway meant the railway alignment moved 3.5 metres upstream from its original alignment.

The first train across the new bridge on Friday 4 September took empty containers to Westland Milk Products to be filled with processed dairy products for the return journey.



Finishing touches

The next step was the construction of the second road lane, with the last finishing touches completed in December 2009. During construction a temporary Bailey-type bridge was used to allow post-tensioning and concreting of each span of the new bridge underneath. The temporary bridge was moved from pier to pier as work on the spans was completed.

Significant river guidebanks were built out of gravel from the Arahura River and supported by rock from a nearby quarry. More than 60,000 tonnes of rock was quarried, carted and placed in the river during the course of the project. The guidebanks direct floodwaters under the bridge and away from its abutments and the Arahura village downstream.



Arahura Bridge construction

facts & figures:

- 220-metre-long road/rail bridge
- 3700 cubic metres of ready-mixed concrete, weighing 9000 tonnes
- 750 tonnes of reinforcing steel
- 16 kilometres of post-tensioning strand, weighing 125 tonnes
- 540 tonnes of structural steel on rail bridge
- 600 metres of new rail formation, ballast and sleepers
- 730 new timber sleepers on rail bridge
- 840 metres of rail required for length of rail works.



Thanks to the NZTA and KiwiRail staff and contractors involved in the Arahura Bridge project including:
Colin McKay, Chris Collins, Peter Petchey, Letticia Dodson, Andrea Jackson, Walter Rushbrook, Phil McVicar
Richard Keenan, John Greenfield, GHD, Beca



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