IPENZ ENGINEERS NEW ZEALAND

ENGINEERING HERITAGE NEW ZEALAND

IPENZ Engineering Heritage Register Report

Rakaia Gorge Bridge, Windwhistle

Written by: Karen Astwood
Date: Last amended 10 June 2013

Rakaia River Bridge near Methven Battson Series 1 [n.d.]. Sir George Grey Special Collections, Auckland Libraries, Record ID: 35-R2136

Contents

A. General information

Name: Rakaia Gorge Bridge

Alternative names: Bridge 530 State Highway 77; Rakaia Gorge Bridge No.1**;** Rakaia Gorge Road Bridge; Rakaia River Bridge; S.H. 77 53/0.00 Rakaia Gorge #1 Bridge; Upper Rakaia Bridge

Location:

State Highway 77/Rakaia Gorge Road

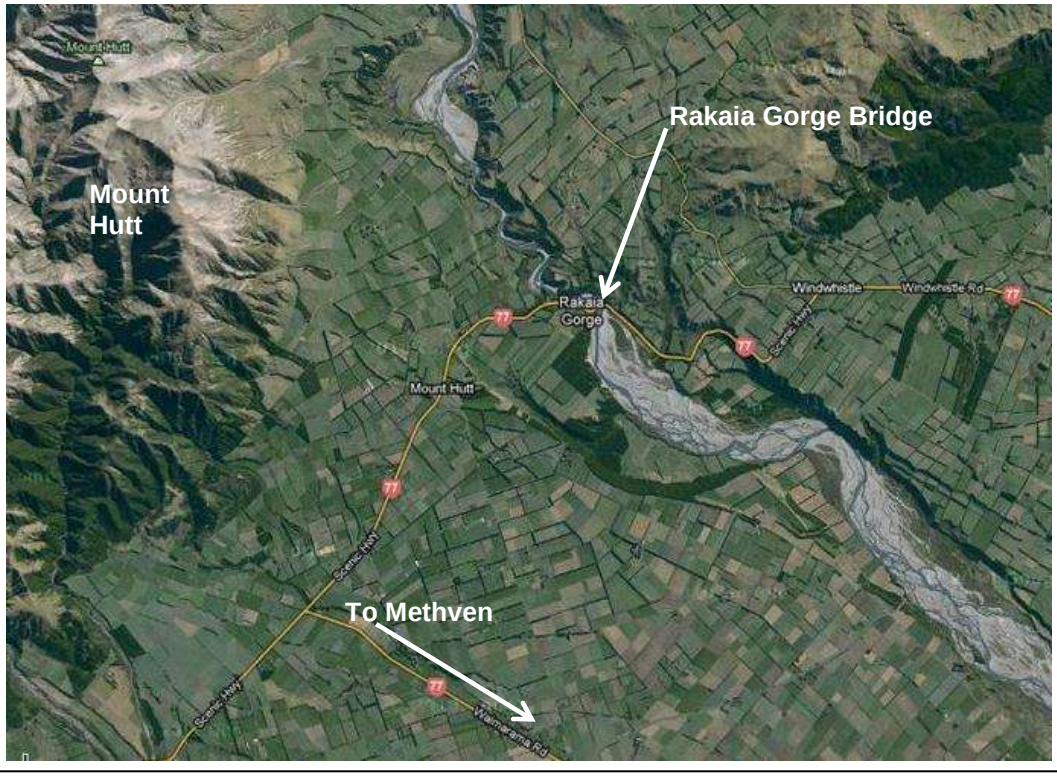
Windwhistle

Canterbury

Geo-reference: Latitude: -43.517, Longitude: 171.657

Legal description: Part legal road

Access information: State Highway 77/Rakaia Gorge Road branches off from State Highway 73/West Coast Road when travelling inland west from Christchurch. The bridge crosses the Rakaia River close to the base of Mount Hutt, and is between Windwhistle and Mount Hutt townships. There are car parking areas at each end of the structure.



Map courtesy of GoogleMaps

City/District Council: Selwyn District Council

IPENZ category: Engineering Work

IPENZ subcategory: Infrastructure – Bridge

IPENZ Engineering Heritage number: 2237

Date registered: 3 September 2013

Other IPENZ recognition: Plaque (heritage recognition)

Other heritage recognition:

- *New Zealand Historic Places Trust*: Old Rakaia Gorge Bridge, Category 1 historic place (Register no. 272)
- *Local Authority District Plan*: Selwyn District Plan, Part E, Appendix 3: Schedule of Heritage Items, Reference H114, Map 15

B. Description

Summary

Constructed between 1880 and 1882, the Rakaia Gorge Bridge is a wrought iron, single vehicle lane, mid-Canterbury bridge important in the local road network asset because it facilitates access to the surrounding farms and towns, as well as Mount Hutt ski field. Its deck truss has a unique design in relation to any other New Zealand bridge, and this dynamic looking bridge's design and construction involved several of the country's high profile late 19th century Public Works Department (PWD) engineers.

During the 1870s calls grew for bridges across Canterbury's biggest river, the Rakaia. While one had been built close to the river mouth in 1873, the increasing inland farming and service centre town population greatly desired a local access point. Such a structure promised to facilitate further population and economic growth. After various debates about the type of traffic the bridge would carry and its form, in 1877 it was decided to progress with a road bridge that could take rail if necessary.

This coincided with a period of upheaval among New Zealand's public service engineers when government was centralised in 1876, closely followed by the PWD's restructuring. Therefore, several well-known local and senior engineers were involved in the planning and construction of the Rakaia Gorge Bridge, including: Canterbury Provincial Engineer George Thornton (1828-1914), the PWD's first Engineer-in-Chief, John Carruthers (1836–1914), and William Newsham Blair (1841–1891), who became the South Island's PWD Engineer-in-Charge as a result of the restructure. In 1890 Peter Seton Hay (1852–1907), who would later become PWD Engineer-in-Charge, designed additional wind bracing for the structure.

At one time the Rakaia Gorge Bridge was believed to be one of only two remaining Bollman truss bridges in the world. Although similar, research has proven the Rakaia Gorge Bridge is not a Bollman truss bridge and it is thought to be unique. The 55-metre single span bridge, constructed by Oamaru's W. H. Barnes, features a timber deck and handrail atop its wrought iron plate girder and truss. This unconventional truss has no bottom chord and its ties fan out from the gorge's edge carrying the load forces to the bridge's anchors. The Rakaia Gorge Bridge also has significance as one of the oldest wrought iron bridges in New Zealand.

Historical narrative

The Rakaia Gorge is located near the base of Southern Alps' Mount Hutt in mid-Canterbury. This mountain, also known as Opuke, or Big Hill, stands as a "giant sentinel over the Canterbury Plains".[1] The Rakaia River begins in the Alps, being feed by melt from the Lyell and Ramsay Glaciers. After constriction through the gorge this braided river then fans out, making its way east across the plains before joining the Pacific Ocean near its namesake town in mid-Canterbury. The 145-kilometre-long Rakaia River is the largest of Canterbury's rivers.[2] It is amongst this dramatic landscape that the Rakaia Gorge Bridge was constructed in the late 19th century, connecting to the north side of the "high and precipitous"[3] Goat Island. On the island's opposite side is a flood channel, which was also initially bridged in the late 19th century.

In the early period of European settlement the river was called the Cholmondeley River, named after Charles Pitt Cholmondeley (1830–1891), one of the Canterbury Association's founders.[4] However, this name went out of common use relatively quickly.[5] European settlement in the Rakaia Gorge area is said to have earnestly begun when Robert Patton bought 200 hectares of land on the plains below Mount Hutt in 1869, naming the property Methven after his birthplace in Scotland. More and more people came to farm in the area during the 1870s, with growth between the Rangitata and Rakaia Rivers being of particular note.[6]

An inland Rakaia River railway bridge was first considered in the early 1860s when the route for the South Island Main Trunk was being scoped. However, despite concerns about the instability of the soil towards the mouth of the river that option was eventually chosen, resulting in the longest bridge in the Southern Hemisphere at the time.[7] However, local inland landowners were keen for a bridge to be constructed through the gorge in the 1870s.

---

[1] Gerry Power, *White Gold: The Mount Hutt story*, Christchurch, 2002, p.9

[2] John Wilson, 'Canterbury places - Mid-Canterbury ranges,' *Te Ara - the Encyclopedia of New Zealand*, URL: http://www.TeAra.govt.nz/en/canterbury-places/18 (updated 2 March 2009)

[3] 'Methven,' *Star*, 18 October 1884, p.3

[4] 'Some Local Names,' *Ashburton Guardian*, 18 June 1912, p. 7

[5] John Wilson, 'Canterbury region - Discovery and settlement,' *Te Ara - the Encyclopedia of New Zealand*, URL: http://www.TeAra.govt.nz/en/canterbury-region/6 (updated 2 March 2009)

[6] Power, pp.15, 17

[7] G. M. Jones, 'Rakaia Gorge Bridge – The truss that isn't,' *Proceedings of the 1st Australasian Engineering Heritage Conference*, Barton, ACT, Institution of Engineers Australia, 1994, p.52

However, there was debate as to whether it should be a pedestrian, road or rail structure. In 1875 Thornton proposed an iron bridge either side of Goat Island for light locomotive traffic. Thornton had been the Provincial Engineer for 14 years when the provincial system was abolished a year later in favour of central government. Rather than join the Public Works Department (PWD) he went into private practice with his former assistant engineer, H. J. S. Bull, as civil engineers, surveyors and land agents.[8] Thornton and Bull were based in Christchurch, seemingly specialising in water supply work.[9] Their company must also have been involved with construction because they were among the unsuccessful tenderers for the Rakaia Gorge Bridge project in 1880.[10]

After various proposals in the mid-1870s it was eventually decided that the Rakaia Gorge Bridge would be designed as a road bridge, albeit with capacity to take rail if required. This was forward planning in case the Main South Island Central Trunk Railway was created. The construction of this railway, which would have followed the foothills of the Southern Alps, did not progress and has been described as a "late fancy of the Vogel era".[11]

Once it was resolved to construct the Rakaia Gorge Bridge there was debate among engineers about what type of bridge it should be. John Carruthers (1836–1914), the PWD's first Engineer-in-Chief, suggested a bridge with a pier and creating an embankment to block off the flood channel. Thornton responded by saying "…that had he [Carruthers] seen the site I feel he would not have recommended either the pier or the closing of the flood channel".[12] The engineers involved in this planning process also discounted the feasibility of a suspension bridge. Carruthers believed the span would be too short "for the advantages of that style of construction to become available".[13] Another Canterbury engineer also thought that the wind conditions in the gorge would see a suspension bridge "blown clear away from the towers before six months were over".[14]

[8] F. W. Furkert, *Early New Zealand Engineers*, Wellington, Reed, 1953, pp.282-83; 'Oamaru-Naseby Railway Committee,' *North Otago Times*, 8 June 1877, p.2; *Press*, 16 July 1878, p.1

[9] 'Ashburton County Council,' *Press*, 17 October 1878, p.3; 'Oamaru-Naseby Railway Committee'; 'Borough Council, *Press*, 28 November 1877, p.1

[10] 'Interprovincial,' *Timaru Herald*, 8 November 1880, p.2

[11] Jones, p.53

[12] Quoted in Jones, p.53

[13] Ibid., p.52

[14] Ibid., p.53

The Rakaia Gorge Bridge is thought to be unique because of its truss. It is definitely the only such structure in New Zealand and has been described as Bollmanesque.[15] The 1850s and 60s were an important time for railways and bridge building in the United States of America (USA), and the Bollman truss was patented in 1852.[16] Approximately 50 Bollman truss bridges seem to have been constructed in the mid to late 19th century, with there now being a sole survivor at Savage in Maryland, USA.[17] The Rakaia Gorge Bridge's form references the Bollman truss, but acts differently in supporting the traffic using the bridge. The truss also shows some resemblance to a Fink truss.[18] All three have at least superficial similarities as they demonstrate a progressive refining of the Squire Whipple's (1804–1888) design principles.[19] Indeed, Wendel A. Bollman (1814–1884) and Albert Fink (1827–1897) were colleagues at Baltimore and Ohio Rail Road Company, so it is perhaps unsurprising that their trusses appear similar.[20]

In the Rakaia Gorge Bridge we see "what generations of New Zealanders have done…take an overseas idea, pick out the essentials and adapt it to their own country's particular needs".[21] G. M. Jones' late 20th century research showed that, contrary to stories that the Rakaia Gorge Bridge was designed in the USA or India, the structure was the work of the New Zealand PWD. However, Jones believed that Carruthers' North American experience during the 1860s influenced the appearance of the truss.

It is unclear exactly how central Carruthers was in the design of the structure. The first plans for the Rakaia Gorge Bridge were registered by the PWD in July 1876 with numerous tracings and lithographs up until 1880 of an 1877 plan first registered against the name Wood.[22] This coincides with a period of restructuring within the

[15] Jones, p.58

[16] Ibid., pp.53, 55

[17] Ibid., p.58; Caplinger, p.10

[18] Geoffrey Thornton, *Bridging the Gap: Early bridges in New Zealand, 1830-1939*, Auckland, Reed, 2001, p.130; Jones, p.58

[19] Jones, p.56; M. W. Caplinger, 'Bollman truss railroad bridge,' National Register of Historic Places Registration Form, United States Department of the Interior, National Parks Service, 1999, p.14. URL: http://www.nps.gov/nhl/designations/samples/md/bollman.pdf (accessed 7 May 2013)

[20] Caplinger, p.14. Fink's truss is described as a "refined version of Bollman's suspension truss concept." There was enough difference between Bollman's and Fink's suspension systems for Fink to be awarded a patent in 1854.

[21] Jones, p.58

[22] Public Works Department Register, 1876-1882, p.88. Archives New Zealand (ANZ), W16/2. The copies of the plans seem to have been resubmitted each time the contract was put out for tender. Various searches of available secondary and electronic (PapersPast and general internet searching) resources have not rendered any further details about Mr Wood. Therefore, it is unclear what his role in the PWD was or any further biographical details. Wood may have been the person Carruthers referred to when he stated to the Minister that plans for the Rakaia

PWD. Having held the position of PWD Engineer-in-Chief since the department was first established in 1871, Carruthers was not happy with proposed changes and resigned in 1878, apparently at the behest of the Government.[23] It is said that this was because he refused to take the offered demotion as Engineer-in-Charge of the North Island. Carruthers then left New Zealand, returning to England in 1879.[24] However, he retained a link to New Zealand as a consulting engineer for the Government.[25] While the 1877 plan recorded against Wood's name features Carruthers' signature, this may be a head of department approval sign-off rather than evidence of his role as lead designer for the bridge.

An outcome of the PWD restructuring was that William Newsham Blair (1841–1891) became the Engineer-in-Charge of the Middle Island (South Island), and in this role had a supervisory involvement in the creation of the Rakaia Gorge Bridge.[26] Blair was born in Scotland and immigrated to Dunedin in 1863 where he was quickly engaged in public works, becoming the local chief railways engineer by 1869. Blair moved through the PWD ranks to briefly become Engineer-in-Charge and Under-Secretary before his death at 50 years old. Described as an "indefatigable worker and a keen observer,"[27] Blair's career achievements include the creation of much of Otago and Southland's railways, counting the impressive wrought iron Wingatui Viaduct (completed 1886).[28]

Like the PWD restructuring, plans to construct the bridge did not progress without problems. In late 1881 Blair reported that the PWD had called for tenders twice since 1878 and not received any appropriate applications.[29] Therefore, it was resolved that the Rakaia Gorge Bridge would be constructed using day labour. However, upon

---

Gorge Bridge were with the draughtsman and would be completed by July 1877. Jones, p.53. This timeframe loosely matches the submission of plans registered against Wood's name. See Figure 4 for an image of this plan

[23] 'Telegraphic News,' *New Zealand Herald*, 2 April 1878, p.2; *Auckland Star*, 25 May 1878, p.2

[24] R. J. Noonan, *By Design: A brief history of the Public Works Department Ministry of Works, 1870-1970*, Wellington, Government Printer, 1975, pp.40-41

[25] George Mullenger, 'Carruthers, John - Carruthers, John,' from the *Dictionary of New Zealand Biography. Te Ara - the Encyclopedia of New Zealand*, URL: http://www.TeAra.govt.nz/en/biographies/2c11/carruthers-john (updated 30 October 2012)

[26] Blair's name appears on tender documents for the Rakaia Gorge Bridge and reporting on the bridge's progress to the Minister. 'Public Works, New Zealand, Tender for Rakaia Gorge Bridge, Contract No.1,' ANZ, W32 62/7996; *Appendix to the Journals of the House of Representatives, 1883*, D-1, p.55, URL: www.atojs.natlib.govt.nz

[27] 'Death of Mr W. N. Blair,' *Otago Witness*, 7 May 1891, p.16

[28] Furkert, pp.117-18; Trevor Williams, 'Blair, William Newsham - Blair, William Newsham,' from the *Dictionary of New Zealand Biography. Te Ara - the Encyclopedia of New Zealand*, URL: http://www.TeAra.govt.nz/en/biographies/2b27/blair-william-newsham (updated 30 October 2012); Thornton, p.133

[29] *Appendix to the Journals of the House of Representatives, 1881*, D-1, p.43, URL: www.atojs.natlib.govt.nz; *Otago Daily Times*, 15 May 1878, p.3

further advice the PWD called for tenders again in October 1880.[30] The specifications for the contract were prepared by Albert Duncan Austin (1839–1903). Austin had immigrated to New Zealand in 1855 and during the PWD restructuring he was made Canterbury's District Engineer.[31]

It was a matter of third time lucky, because this time the PWD found a contractor, W. H. Barnes.[32] Barnes was an Oamaru-based contractor who had recently been awarded bridging contracts on the Oamaru Borough Water Race project, and the Tuapeka County Council's Beaumont Bridge piers.[33] Tenders for Rakaia Gorge Bridge's ironwork were called in Britain in early 1878 and the material had arrived at Coalgate, near the bridge site, by September 1879.[34] Therefore, with a contractor on board the Minister of Public Works may well have expected the bridge work to be completed promptly, instead he soon admitted that "work is not progressing well".[35] The works took longer than the contracted period and Barnes was financially penalised as a result.[36] A contributing factor for the delay was probably two mid-1881 large slips that blocked access to the construction site, which Barnes' team had to remove in order to proceed.[37] It must have been with some relief that Blair could finally report that the bridge had been completed in November 1882.[38]

However, the bridging of the gorge was not finished until 1884 when the flood channel received its timber bridge. For two years previous the Rakaia Gorge Bridge had reportedly been solely used by pedestrians and only when the river level was low enough to walk across the flood channel. The completion of the gorge's bridges was described as:

> …a great boon to the travelling public, and will greatly facilitate the traffic between the districts on both sides of the river, as well as giving safe and

[30] *Appendix to the Journals of the House of Representatives, 1881*

[31] Public Works, New Zealand Acceptance of Tender for Rakaia Gorge Bridge. – Contract No.1. ANZ, W32 62/7996; Furkert, p.99

[32] 'Interprovincial,' *Timaru Herald*, 8 November 1880, p.2

[33] Public Works, New Zealand Tender for Rakaia Gorge Bridge. – Contract No.1. ANZ, W32 62/7996; 'The Waterworks,' *North Otago Times*, 24 October 1879, p.2; Tuapeka County Council,' *Tuapeka Times*, 9 October 1880, p.3

[34] Jones, p.57

[35] *Appendix to the Journals of the House of Representatives, 1881*

[36] Ray McCausland, *Unto the Hills: Methven and districts centenary, 1879-1979*, Methven, Methven and Districts Centennial Committee, 1979, p.30. McCausland cites the penalty as being approximately £1000, while Jones (p.57) notes it was just over £300

[37] 'Mount Hutt,' *Press*, 25 July 1881, p.3

[38] *Appendix to the Journals of the House of Representatives, 1883*, D-1, p.55

> easy access to the far-famed chasm where many of our local and other geologist delight to spend a day…[39]

The current concrete arch bridge replaced this earlier flood channel structure in 1945.

Figure 1: Rakaia Gorge Bridge (left) and the flood channel bridge (right), February 2007. Image courtesy of Lloyd Smith

The wind resistance of structures across the gorge was noted early on as a challenge and within a decade the Rakaia Gorge Bridge needed further work. In 1890 Peter Seton Hay (1852–1907) designed additional wind bracing for the Rakaia Gorge Bridge.[40] Now regarded as "one of the most brilliant engineers"[41] in New Zealand, at this time Hay was a rising star in the PWD's Wellington head office, where his role was "chiefly design work, and assisting the Engineer-in-Chief on difficult problems."[42] The repairs and bracing resulted from the Rakaia Gorge Bridge sustaining gale damage in September 1889.[43] Plans were only submitted in January, with the delay annoying local authorities and residents. For instance, the Ashburton County Council resolved to approach the Government to place the works under their control, in

[39] 'Methven,' *Star*, 18 October 1884, p.3

[40] 'Rakaia Gorge Road Bridge, Proposed Wind Bracing,' 1890. ANZ, PWD plan 16499

[41] Thornton, p.130

[42] Furkert, p.184

[43] 'Local and General,' *Star*, 13 November 1889, p.3

partnership with the Selwyn County Council.[44] However, the PWD seems to have "thoroughly overhauled and repaired"[45] the bridge by mid-1890.

Figure 2: Rakaia Gorge near Methven Battson Series 4 [n.d.]. Sir George Grey Special Collections, Auckland Libraries, Record ID: 35-R2137

It appears that no further interventions on this scale have been required at the bridge since the late 19th century, but it has been routinely maintained. As part of the national state highway system, the Rakaia Gorge Bridge is currently (2013) owned by the New Zealand Transport Agency (NZTA). Between 2005 and 2011 Opus International Consultants Limited, who hold the local NZTA Bridge Management Contract, undertook a number of inspections and subsequent maintenance works, including the replacement of some timber components.[46]

[44] 'Ashburton County Council,' *Press*, 5 February 1890, p.6

[45] 'Public Works Statement,' *Appendix to the Journals of the House of Representatives*, 1890, D-1, p.28. URL: www.atojs.natlib.govt.nz

[46] Pers. Comm. J. Waldin to K. Astwood, 30 May 2013. IPENZ; 'S.H. 77 53/0.00 Rakaia Gorge #1 Bridge Special Inspection Report 2010,' New Zealand Transport Authority (September 2010), pp.2-3

Social narrative

Bridges were of great importance around New Zealand as European settlement took hold as a means of mitigating the high death toll from drowning. Bridges achieved this by eliminating the need to ford or ferry across potentially dangerous waterways, such as Canterbury's flood-prone Rakaia River.[47] The Rakaia Gorge Bridge is the oldest remaining bridge across the river.[48]

This bridge's construction is indicative of local population growth during the 1870s and the construction of a bridge during this period was especially important to the burgeoning farming area.[49] One reason for the boost in population was the building of the Rakaia to Methven branch railway in the late 1870s. Correspondingly, good road infrastructure was required, including a way of crossing the Rakaia Gorge, in order to get goods to the terminus. Road infrastructure was the focus of the Mount Hutt Road Board upon its establishment in April 1879, and many of the area's main roads were laid out during the 1880s.[50]

While farming is still important to the local economy, the area is also seasonally popular as the location of the highly regarded Mount Hutt ski field.[51] As early as the 1880s people began coming to the area for recreational purposes; mostly climbers intent on scaling Mount Hutt and the adjacent mountains.[52] Plans for Mount Hutt ski field only earnestly began in 1969 and it was operational within a few years. The field's proximity to Christchurch was seen as a marketing positive.[53] The main access from Christchurch is State Highway 77, and within this the Rakaia Gorge Bridge has been an important link. The creation of the ski field was timely because in 1976 the branch railway closed, hitting the local economy hard.[54] Therefore, the road network gained greater local economic and social importance in the late 20th century.

---

[47] Thornton, p.15; Mike Scarsbrook and Charles Pearson, 'Water resources – Rivers,' *Te Ara - the Encyclopedia of New Zealand*, URL: http://www.TeAra.govt.nz/en/graph/18192/top-10-rivers (updated 14 November 2012)

[48] In 1869 a bridge was completed towards the mouth of the Rakaia River. However, this was replaced by the current concrete bridge in 1939. Thornton, pp.21-22

[49] 'Public Works Statement,' *Appendix to the Journals of the House of Representatives, 1882*, D-1, p.vi. URL: www.atojs.natlib.govt.nz

[50] H. W. R. Black, *The Mount Hutt District: Historical record of effort and achievement, 1879-1929*, Ashburton, Mount Hutt Road Board, 1929, pp. 5, 15

[51] Power, p.9

[52] Ibid., p.21

[53] Ibid., pp.25-28, 71-72

[54] McCausland, p.131

The heritage value of the Rakaia Gorge Bridge was recognised by the New Zealand Historic Places Trust in September 1985 when it was added to the Register as a Category 1 historic place.[55]

Figure 3: Rakaia Gorge Bridge [ca. 1921]. Image from Christchurch City Libraries, File Reference: CCL PhotoCD 12, IMG0020

[55] Old Rakaia Gorge Bridge, Category 1 historic place (Register no.272), URL: http://www.historic.org.nz/TheRegister/RegisterSearch/RegisterResults.aspx?RID=272 (accessed 7 May 2013)

Physical narrative

The Rakaia Gorge Bridge is said to be “a unique structure in New Zealand and possibly in the world”. [56] This is due to its strikingly unconventional form. Constructed over a two-year period from late 1880, the Rakaia Gorge Bridge is also significant as an early remaining example of a wrought iron New Zealand bridge.

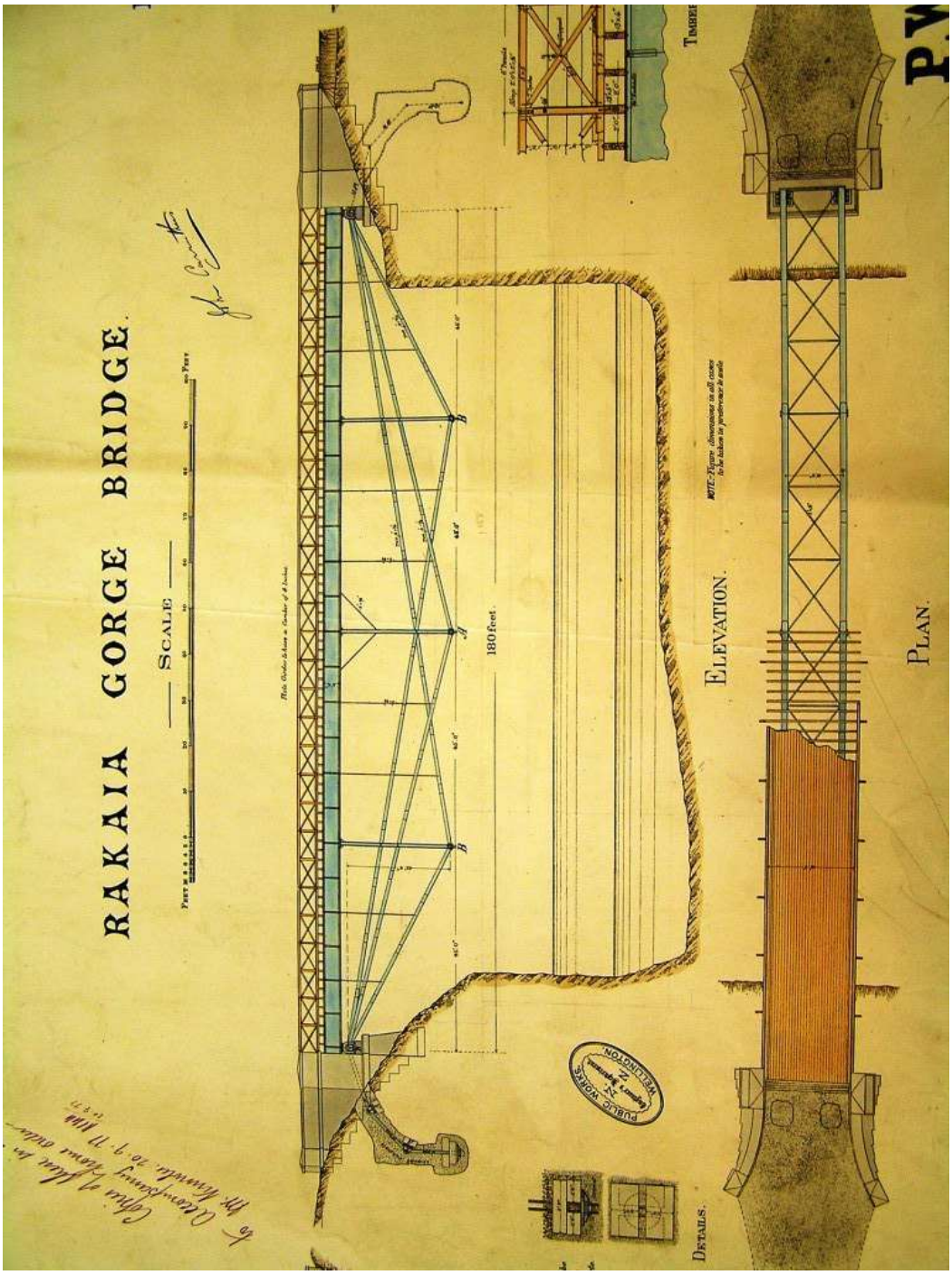


Figure 4: Rakaia Gorge Bridge, plan elevation and details of bridge, 1877, PWD 5361 [sheet 1 detail]. Archives New Zealand/Te Rua Mahara o te Kāwanatanga Wellington Office, ACHL 22541 W5/3026 5971

[56] Thornton, p.130

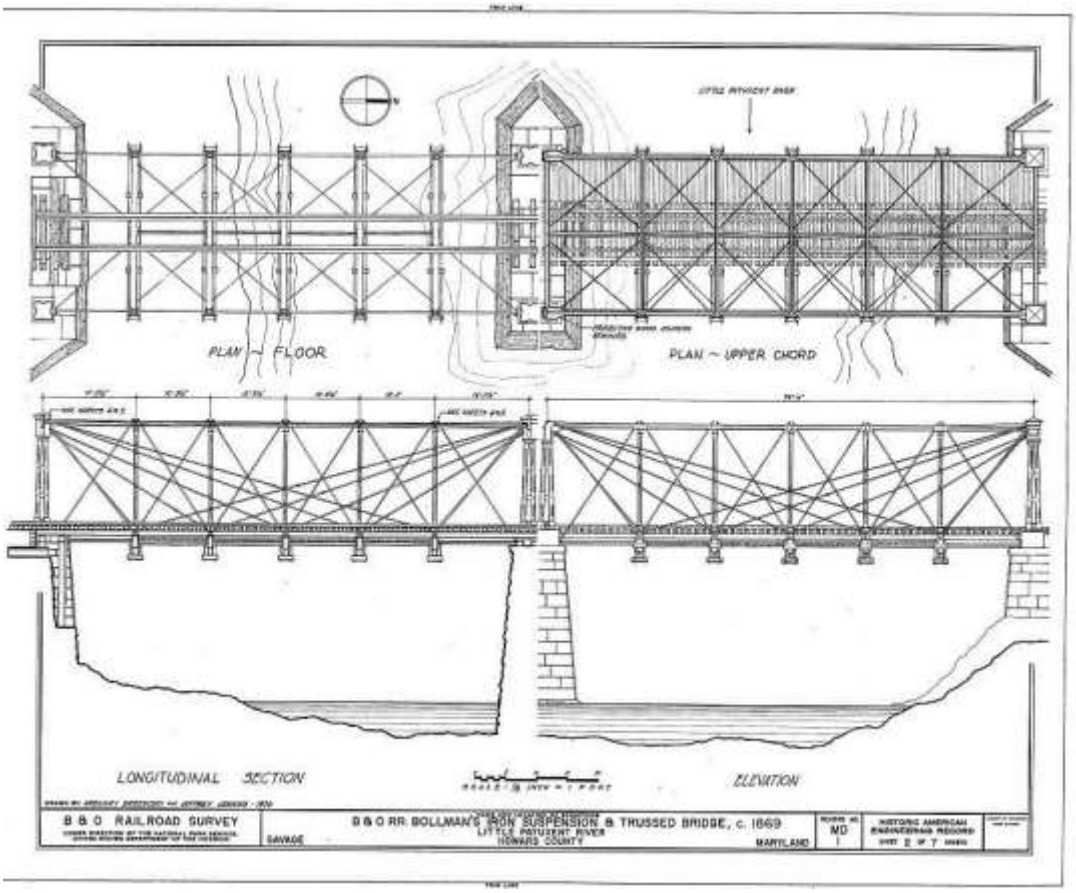


Figure 5: Baltimore & Ohio Railroad, Bollman Truss Bridge, Spanning Patuxent River, Savage, Howard County, MD, 1970. Library of Congress, Prints & Photographs Division, Historic American Engineering Record, Reproduction number HAER MD, 14-SAV,1-(sheet 2 of 7)

The bridge's single 55-metre (m) span, 4m-wide (single vehicle lane) deck truss has been described as Bollmanesque because while it may look like a Bollman truss it is not. Whereas the Rakaia Gorge Bridge is a deck truss constructed primarily of wrought iron the patented Bollman truss (see Figure 5 above) can generally be described as a through truss featuring a combination suspension and truss formation, constructed using wooden and wrought and cast iron structural members.[57] While the Rakaia Gorge Bridge may seem comparable geometrically to a Bollman truss the two also behave differently. The forces of thrust and tension are retained within the frame of a Bollman truss "resting the weight merely upon abutments or piers, without any anchors or other similar device".[58] Dissimilarly, the Rakaia Gorge Bridge features a wrought iron plate girder, has no bottom chord, and the forces are carried through a

[57] Jones, pp.57-58; Caplinger, p.14

[58] 'Wendel Bollman of Baltimore Maryland. Construction of Bridges,' Specification of Letters of Patent No.8,624, 6 January 1852. Available at 'Bollman Truss Railroad Bridge,' Historic Bridges.org, URL: http://www.historicbridges.org/maryland/bollman/patent.pdf (accessed 14 May 2013)

series of columns and ties to the concrete anchors tunnelled into the gorge's rock walls.[59]

Aside from its interesting design, the Rakaia Gorge Bridge is the oldest structure across the Rakaia River and one of the earliest remaining wrought iron truss bridges in New Zealand. Timber truss bridges were the dominant form in New Zealand's early colonial period. However, wrought iron bridges had been built occasionally since the mid-1860s, being either plate girder or truss structures. One of the first larger scale truss ones was the Rangitata River Bridge (1870–1872) near Geraldine, South Canterbury. However, this structure was demolished in 1978.[60] A wrought iron truss bridge completed a few years prior to the Rakaia Gorge Bridge, which is still in use, is the Taieri River Bridge, near Hyde in Central Otago.[61] This and the Rakaia Gorge Bridge are the earliest remaining wrought iron truss bridges in New Zealand. Wrought iron remained the main material used for New Zealand's metal bridges until the closing years of the 19th century when steel became a more economically viable option.[62]

An early recorded alteration to the Rakaia Gorge Bridge was in 1890 when repairs were undertaken and wind bracing added after a gale wind damaged the structure. This involved inserting horizontal metal crossed braces along the length of the plate girder.[63] Contained within the girder, this addition does not appear to have changed the look or fabric of the truss.

Subsequent 20th century alterations include replacing the timber elements, the deck and hand rails, on several occasions.[64] These were repaired and replaced again between 2005 and 2011 as a result of Opus International Consultants Limited inspections of the bridge. In 2010 the company also undertook geotechnical

[59] Jones, p.57

[60] Thornton, pp.49, 128

[61] Thornton lists several other New Zealand wrought iron truss bridges built prior to the Rakaia Gorge Bridge. However, out of these only the Taieri River Bridge appears to be extant. Thornton, pp.128-130; The Taieri River Bridge has been registered by the New Zealand Historic Places Trust - Bridge, Category 2 historic place (Register no.2251), URL: http://www.historic.org.nz/TheRegister/RegisterSearch/RegisterResults.aspx?RID=2251 (accessed 7 May 2013)

[62] Early examples include the Kopua Viaduct in Hawke's Bay and the Otago Central railway line's Taieri River Bridge. Thornton, pp.140-412

[63] 'Public Works Statement,' *Appendix to the Journals of the House of Representatives*, 1890, D-1, p.28; 'Rakaia Gorge Road Bridge, Proposed Wind Bracing,' 1890

[64] Jones, p.57

inspections of the gorge's rock walls which resulted in the north western rock face being bolted to improve its stability and that of the Rakaia Gorge Bridge.[65]

Key physical dates

1880–1882	Constructed
September 1889	Damage sustained in gale
Mid-1890	Repaired and additional wind bracing created
2005–2011	Deck, handrail, and transom timber components repair and replacement. Rock bolting north western rock face

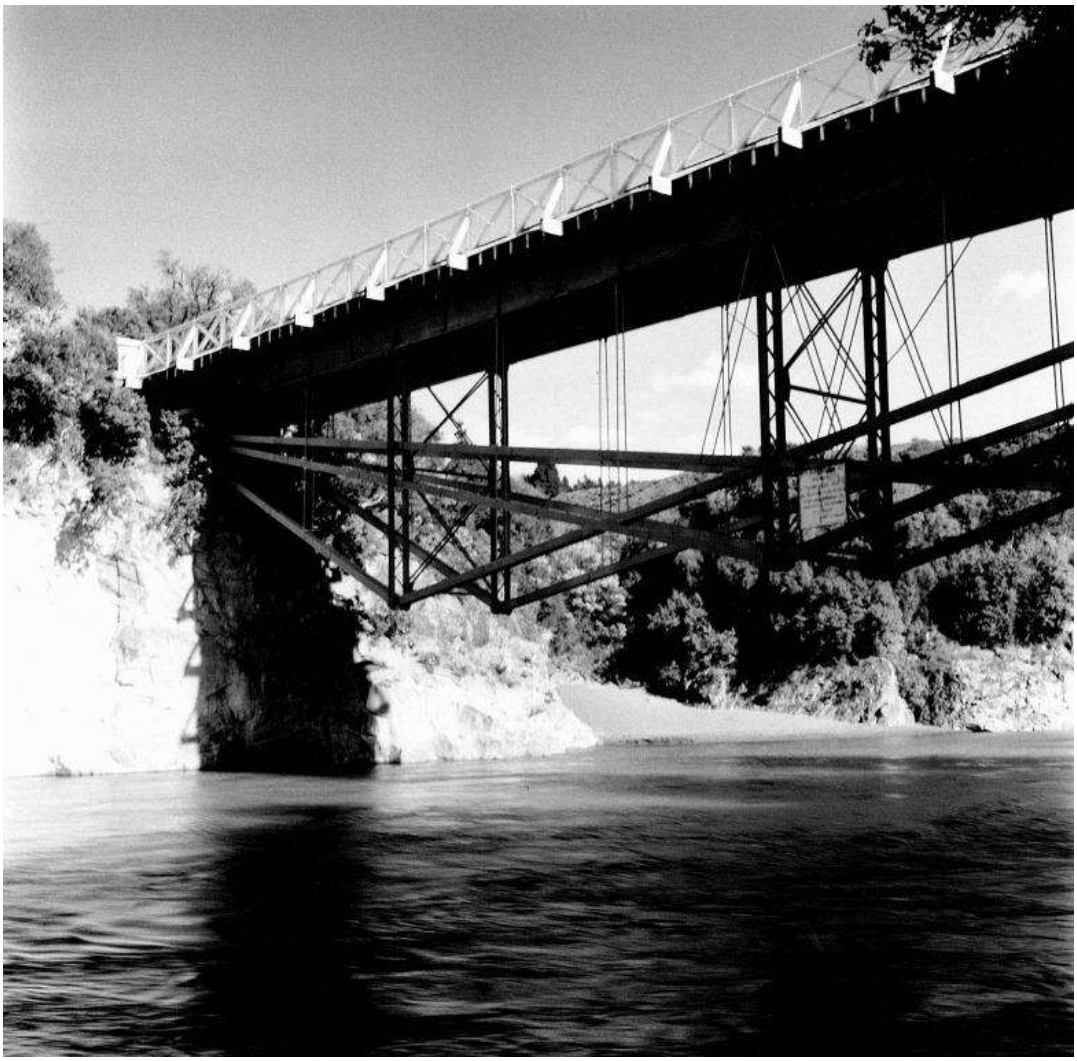


Figure 6: Rakaia Gorge Bridge, November 1997. Geoffrey Thornton Photographic Collection, IPENZ

[65] Pers. Comm. J. Waldin to K. Astwood, 30 May 2013. IPENZ; 'S.H. 77 53/0.00 Rakaia Gorge #1 Bridge Special Inspection Report 2010,' p.2

C. Assessment of significance

Completed in 1882, the Rakaia Gorge Bridge has special significance because it is the oldest bridge across Canterbury's largest river and one of the earliest remaining New Zealand wrought iron bridges. The structure has historic and social value because its construction was indicative of the growing local farming and service centre population in the 1870s, and subsequently as a key component in the local transport network. Therefore, it has facilitated social and economic activity.

Moreover, the Rakaia Gorge Bridge has outstanding engineering significance as a unique truss type in New Zealand, and probably the world. It is a creative New Zealand interpretation of important international developments, such as the Whipple, Bollman and Fink trusses. Planned during a turbulent time for New Zealand's public sector engineers, the Rakaia Gorge Bridge is significant because it is associated with several engineers who have had an impact in New Zealand history: John Carruthers, William Newsham Blair and Peter Seton Hay.

Therefore, Rakaia Gorge Bridge is of sufficient engineering heritage significance to merit inclusion on the IPENZ Engineering Heritage Register.

D. Supporting information

List of supporting information

‘Hay, Peter Seton (1852-1907),’ IPENZ Engineering Heritage Biography, URL: http://www.ipenz.org.nz/heritage/bio-detail.cfm?id=15 (accessed 7 May 2013)

Old Rakaia Gorge Bridge, Category 1 historic place (Register no.272), URL: http://www.historic.org.nz/TheRegister/RegisterSearch/RegisterResults.aspx?RID=272 (accessed 7 may 2013)

‘Thornton, George (1828-1914),’ IPENZ Engineering Heritage Biography, URL: http://www.ipenz.org.nz/heritage/bio-detail.cfm?id=53 (accessed 16 October 2012)

Bibliography

Electronic sources

‘Wendel Bollman of Baltimore Maryland. Construction of Bridges,’ Specification of Letters of Patent No.8,624, 6 January 1852. Available at ‘Bollman Truss Railroad Bridge,’ Historic Bridges.org, URL: http://www.historicbridges.org/maryland/bollman/patent.pdf (accessed 14 May 2013)

Caplinger, M. W., ‘Bollman truss railroad bridge,’ National Register of Historic Places Registration Form, United States Department of the Interior, National Parks Service, 1999, p.14. URL: http://www.nps.gov/nhl/designations/samples/md/bollman.pdf (accessed 7 May 2013)

Available from AtoJsOnline [*Appendix to the Journals of the House of Representatives*], www.atojs.natlib.govt.nz:

Public Works Statement 1881, 1882, 1883, 1890, D-1

Available from *Te Ara – Encyclopedia of New Zealand*, www.TeAra.govt.nz

Mullenger, G., 'Carruthers, John - Carruthers, John,' from the *Dictionary of New Zealand Biography* (updated 30 October 2012)

Scarsbrook, M. and Charles Pearson, 'Water resources – Rivers' (updated 14 November 2012)

Williams, T., 'Blair, William Newsham - Blair, William Newsham', from the *Dictionary of New Zealand Biography* (updated 30 October 2012)

Wilson, J., 'Canterbury places - Mid-Canterbury ranges' (updated 2 March 2009)

Wilson, J., 'Canterbury region - Discovery and settlement' (updated 2 March 2009)

Primary/archival sources

Available from Archives New Zealand, Wellington:

Public Works Department Register, 1876-1882. Reference: W16/2

Public Works Department plan 16499

Rakaia Gorge Bridge Contract, No.1, 1880-1880. Reference: W32 62/7996

Available from PapersPast, www.paperspast.natlib.govt.nz

Ashburton Guardian, 18 June 1912

Auckland Star, 25 May 1878

Methven Guardian, 18 October 1884

New Zealand Herald, 2 April 1878

North Otago Times, 24 October 1879

Otago Daily Times, 15 May 1878

Otago Witness, 7 May 1891

Press, 28 November 1877, 17 October 1878, 25 July 1881, 5 February 1890

Star, 18 October 1884, 13 November 1889

Timaru Herald, 8 November 1880

Tuapeka Times, 9 October 1880

Secondary/published sources

'S.H. 77 53/0.00 Rakaia Gorge #1 Bridge Special Inspection Report 2010,' New Zealand Transport Authority (September 2010)

Black, H. W. R., *The Mount Hutt District: Historical record of effort and achievement, 1879-1929*, Ashburton, Mount Hutt Road Board, 1929

Furkert, F. W., *Early New Zealand Engineers*, Wellington, Reed, 1953

Jones, G M, 'Rakaia Gorge Bridge – The truss that isn't,' in *Proceedings of the 1st Australasian Engineering Heritage Conference*, Barton, ACT, Institution of Engineers Australia, 1994, pp.51-59

McCausland, R., *Unto the Hills: Methven and districts centenary, 1879-1979*, Methven, Methven and Districts Centennial Committee, 1979

Noonan, R. J., *By Design: A brief history of the Public Works Department Ministry of Works, 1870-1970*, Wellington, Government Printer, 1975

Power, G., *White Gold: The Mount Hutt story*, Christchurch, 2002

Thornton, G., *Bridging the Gap: Early bridges in New Zealand, 1830-1939*, Auckland, Reed, 2001