Kinsol Trestle

Shawnigan Lake, BC

KINSOL TRESTLE BRIDGE

Executive Summary

The History

The Koksillah River Bridge, more commonly known as the Kinsol Trestle, lies on British Columbia's Vancouver Island, near Shawnigan Lake. Its construction was completed in 1920 as part of the Canadian Northern Railway's attempt to connect Victoria to Nootka Sound to transport timber. The last train to cross this bridge did so in 1979 and the route was retired. Portions of the rail corridor were subsequently converted to a rail trail in the late 1990's as part of the Trans Canada Trail on Southern Vancouver Island, though a significant 8.5 km trail detour around the closed Kinsol Trestle crossing was necessary. The impressive Kinsol Trestle is 615ft long, 125ft high and was constructed entirely from Douglas fir. It is one of the largest wooden rail trestles built and most certainly is the highest standing in Canada if not the British Commonwealth.

The Challenge

Since the trestle's abandonment in 1979, this feat of Canadian engineering and construction skills endured vandalism, fires, and heavy decay in many of its timbers. Although part of the last mile of the TransCanada Trail, the bridge was unused and unusable for years and its lack resulted in a difficult 8.5 km detour on the Trail. The Cowichan Valley Regional District [CVRD] was charged with determining its fate – restoration or demolition. Due to public controversy over the issue, the CVRD decided to reassess and hosted a special meeting in mid 2007 A team of heritage consultants, engineers and timber restoration specialists was assembled including MMM Group and Cascade Engineering Group, and charged with providing a more detailed survey of the condition of the timbers; prepare a report with a restoration and rehabilitation strategy and budget. This report served as the basis for tendering the detailed engineering and design work to serve as contract documents for the construction tender. The team proposed that a conservation strategy to see the bridge resorted was a viable option contradictory to previous reports that had been completed advocating the demolition and construction of a new bridge. The MMM group provided great leadership navigating through the politics and team complexities common with a project of this nature.

The Engineering

The restoration process required a detailed understanding of the structure and how the pieces fit together. Macdonald & Lawrence Timber Framing Ltd. developed a comprehensive data sheet on each of the 6,000 timbers that make up the trestle. Cascade Engineering analyzed the key structural elements and determined what could be saved and what had to be replaced. This project fell under the jurisdiction of the Ministry of Transportation and Infrastructure. Ministry of Transportation and Infrastructure [MOTI] had a number of specific requirements. It was mandated that any load bearing structure must be designed to the Canadian Highway Bridge Code. All load bearing timbers must be new, not reclaimed timber, a multi-modal dynamic analysis had to be performed as part of the structural design

The Consulting Team developed a rehabilitation approach which brought together cost certainty, compliance with current bridge building codes and adherence to good conservation practice to design a methodology which retained significant portions of the original structure, inclusive of the Howe Truss system and blended new construction elements with the heritage aspects of the trestle. This innovative approach provided for the replacement of 17 of the 46 bents throughout the structure using all new wood for the load bearing elements of each of these 17 bents. Under slung steel trusses (Stantec Consulting) using HSS were custom built to "bridge" the active bents, thereby leaving the remaining 29

original bents left in place as unattached and non-load-bearing to the new pedestrian walkway constructed atop the structure. The team also performed a detailed design of the structural elements for both the new bents (which incorporated original timbers in sound condition as non-loading bearing elements) and repairs to the non-load bearing bents.

The Restoration

The inactive structure between the active bents was designed to be self supporting, withstand wind and seismic loads and have a collapse mechanism that would not impact the active structure. The goal was to retain as much historic fabric of the existing timber as possible while ensuring a significant service life. A detailed protocol of condition assessment was specified for this which included detailed surveys using resistography. Heritage specialists Macdonald & Lawrence Timber Framing carried out a very detailed condition assessment on many of the historic timbers, bents and the Howe trusses. This enabled the engineering team to determine the strength of the historic timbers and facilitated the retention of approx. 60% of the original timbers. This approach made it possible to complete the restoration of the bridge in accordance with the Standards and Guidelines for the Conservation of Historic Places in Canada.

The 95’ Howe trusses spanning the river were an integral part of determining the viability of the restoration project. In the overall structural system, these trusses are engaged only to carry the dead load of the inactive bents above. Detailed analysis and very detailed investigation of the timber conditions were required to ensure the viability of the trusses, their members and connections. The result of the analysis and condition assessment concluded that only a few critical connections required augmentation. Lateral bracing was reinstated with new lumber.

The Result

The Kinsol Trestle is an important part of local and provincial heritage: it remains an outstanding example of a time when there was no project too grand, or scheme too bold for us to achieve with hard work and ingenuity. The success of this project shows how community and innovation can come together to produce interesting wood projects that survive generations. Thus, the Kinsol Trestle supports the continued use of wood today and into the future. The above shows how the restoration of such an iconic project brings Canadian wood to the forefront of the world. Today the new bridge retains 60 % of its' historic timber and 100% of its heritage.

The Kinsol Trestle Bridge builds the wood culture by bringing together the community. The “Last Spike” driven on the rehabilitated historic Kinsol Trestle officially re-opened the trestle as part of the Trans Canada Trail and was done by former Duncan mayor-Mike Coleman on July 28th 2011. This ceremony was celebrated by over 1,000 in attendance that crossed the trestle for the first time in decades accompanied by the sound of bagpipes, including dignitaries, project funders and the general public. The bridge now carries pedestrians, hikers, horses and bikers, and allows all to travel sections of the Cowichan Valley Trail with ease. There has been much press about the bridge from television through to newspapers and blogs all of which promote the use of wood in British Columbia.

The confidence of all of the project stakeholders in wood as a building material with significant longevity has preserved this amazing piece of Canadian Industrial heritage for future generations. A more conservative approach of demolition and replacement would likely have resulted in a steel bridge and the loss of this historic bridge. The community has responded very positively to the restoration of the Kinsol Trestle which spans the years between childhood memories of this unique place and structure, and its present day and future use to cross the Koksilah River.

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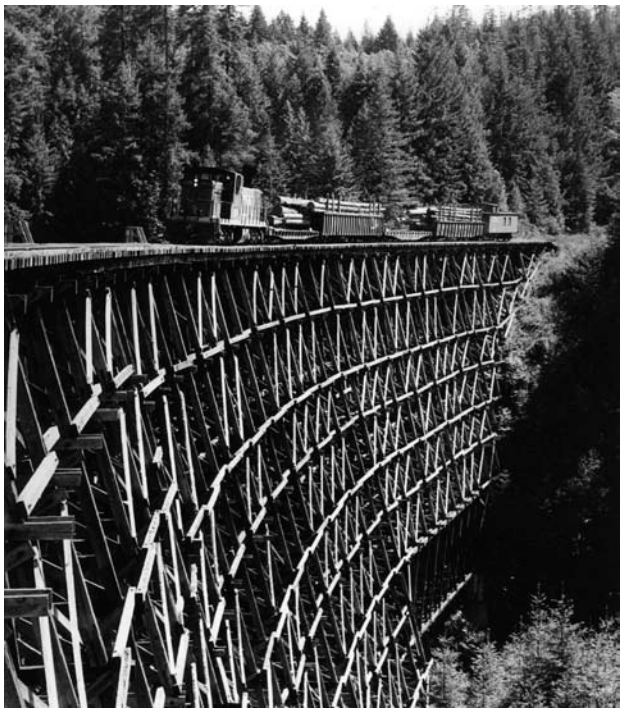
Full Project Description

The History

The Koksillah River Bridge, more commonly known as the Kinsol Trestle, lies on British Columbia's Vancouver Island, near Shawnigan Lake. Its construction was completed in 1920 as part of the Canadian Northern Railway's attempt to connect Victoria to Nootka Sound to transport timber. The last train to cross this bridge did so in 1979 and the route was retired. Portions of the rail corridor were subsequently converted to a rail trail in the late 1990's as part of the Trans Canada Trail on Southern Vancouver Island, though a significant 8.5 km trail detour around the closed Kinsol Trestle crossing was necessary.



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The Challenge

Since the trestle's abandonment in 1979, this feat of Canadian engineering and construction skills endured vandalism, fires, and heavy decay in many of its timbers. Although part of the last mile of the TransCanada Trail, the bridge was unused and unusable for years and its lack resulted in a difficult 8.5 km detour on the Trail. The Cowichan Valley Regional District [CVRD] was charged with determining its fate – restoration or demolition.

The province previously offered $1.5 million to dismantle the 187-metre-long trestle and another $1.6 million towards building a new bridge for the trail crossing. There was strong local support for the preservation of this proud structure as evidenced by the 12,000-name petition tabled in the Provincial Legislature; however, in December 2006 the CVRD announced its decision to demolish the historic bridge, and to construct an imitation trestle with different

geometry and from pressure-treated timber with an estimated cost of $4 million.

Due to public controversy over the issue, the CVRD decided to reassess and hosted a special meeting in mid 2007 A team of heritage consultants, engineers and timber restoration specialists was assembled including Joost Meyboom from MMM Group and Cascade Engineering Group, and charged with providing a more detailed survey of the condition of the timbers; prepare a report with a restoration and rehabilitation strategy and budget. This report served as the basis for tendering the detailed engineering and design work to serve as contract documents for the construction tender.

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The Engineering

The restoration process required a detailed understanding of the structure and how the pieces fit together. Macdonald & Lawrence Timber Framing Ltd. developed a comprehensive data sheet on each of the 6,000 timbers that make up the trestle, and obtained a complete set of documents (working drawings, correspondence, and engineers' assessments) from CN (Canadian National). Cascade Engineering analyzed the key structural elements and determined what could be saved and what had to be replaced.

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The Structural System

The Consulting Team developed a rehabilitation approach which brought together cost certainty, compliance with current bridge building codes and adherence to good conservation practice to design a methodology which retained significant portions of the original structure, inclusive of the Howe Truss system and blended new construction elements with the heritage aspects of the trestle. This innovative approach provided for the replacement of 17 of the 46 bents throughout the structure

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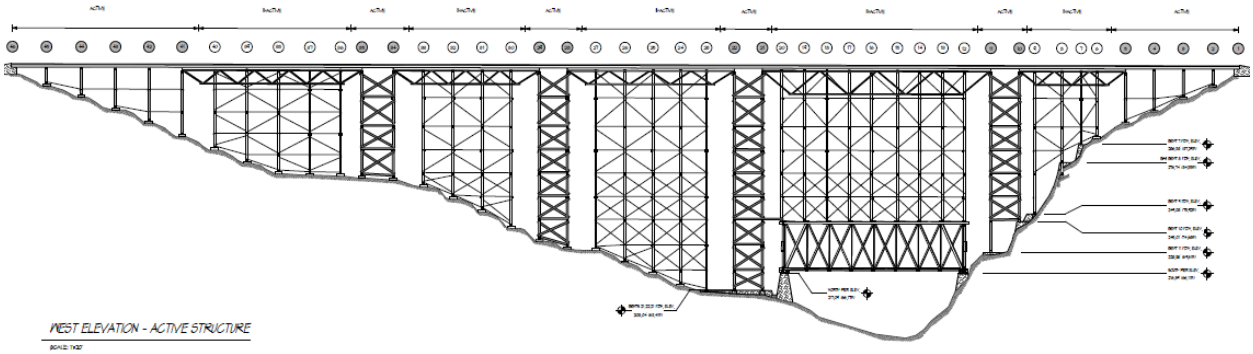
Design of the steel superstructure was under a separate contract with Stantec Engineering Ltd. Stantec was contracted to provide analysis and design for the steel trusses that span between rebuilt trestle bents, as well as the new deck and railing assemblies. Deck and trusses were designed for pedestrian loads as well as a maintenance vehicle. Although the truss configuration appears to be uniform careful coordination during design was required as each truss had a different length and was required to fit within the remaining trestle structure. Railing assemblies were configured to reflect the geometry of the trestle as well as make use of re-sawn timber salvaged from existing bents. The design team worked together on the design solution and to ensure that the two structural components worked together. The ultimate design engaged braced pairs of bents retaining the historic geometry with upgraded connection detailing and foundations. The upgraded connections were high strength steel connectors employed in a manner to limit their overall visual impact while identifying themselves as a modern intervention in restoring the structure.



The Restoration

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Resistography is a method of wood condition assessment based on the measurement of density variations through timber sections by means of an electronic drill that measures and records resistance to drilling. Heritage specialists Macdonald & Lawrence Timber Framing carried out a very detailed condition assessment on many of the historic timbers, bents and the Howe trusses. This enabled the engineering team to determine the strength of the historic timbers and facilitated the retention of approx. 60% of the original timbers. This approach made it possible to complete the restoration of the bridge in accordance with the Standards and Guidelines for the Conservation of Historic Places in Canada.

The Howe Trusses

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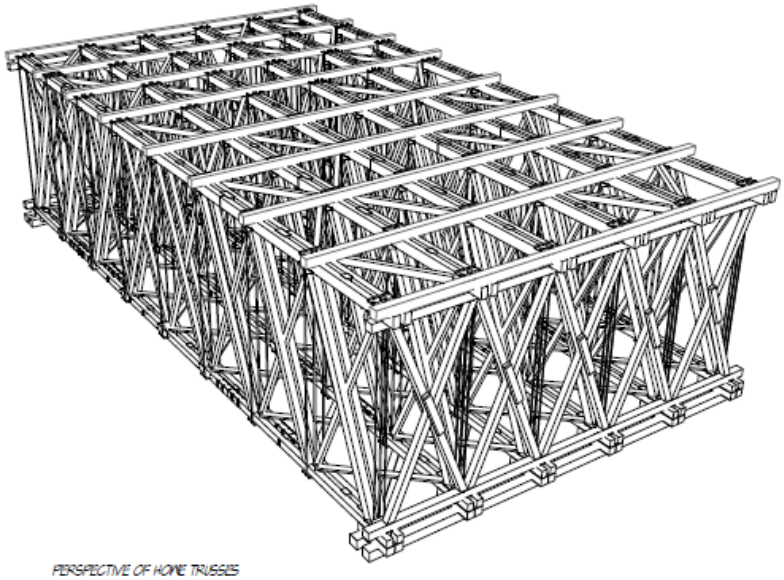

PERSPECTIVE OF HOWE TRUSSES

The Result

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DANGER KEEP AWAY


DANGER
CONSTRUCTION AREA
AUTHORIZED PERSONNEL ONLY
SAFETY ORIENTATION REQUIRED
BEFORE ENTERING THE WORK AREA