#### 2010 CWPA Conference **Bridge Timbers Oct 2010**

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The B.C. Government has a long history of building timber bridges including log spans, timber trestles and trusses, and suspension bridge trusses. Until 30 years ago they dominated the provincial bridge inventory. In the last 40 years there has been a strong trend towards building with steel and concrete materials, for one or more reasons: robustness, improved road surface, cost, and at least perceived durability. Indeed it has been 30 years since the Ministry of Forests or the Ministry of Transportation built a glulam span. The Government's new initiative to build with wood has initiated a fresh look at timber bridges.

The Provincial Government's Wood 1<sup>st</sup> initiative is highlighted by legislation promoting the use of wood in public buildings. Bridges are not covered by the legislation. Government is however interested in building bridges with wood. The Ministry of Transportation and Infrastructure (MoT) initiated a Timber Bridge Initiative Program with construction starting in 2010.

A number of issues/challenges faced the ministry in restarting its timber bridge program. First, the last glulam bridge built was 30 years (a working generation) ago. To help address this, a working group (industry, government bridge staff, FP Innovations staff, retired MoF staff) met to relearn lessons from the past. The working group learned that a number of glulam spans built by forestry companies experienced durability issues which can be traced to weak fabrication quality control. This contrasted to better performing glulam bridges built directly by the Ministry of Forests with strong fabrication quality control procedures in place. Second while some timber structures have performed well durability wise, some components have had weaker durability performance. An example is timber caps which have not always had good durability due to due to penetration by steel pins post treatment. There is a prevailing view by Ministry staff and the consultant industry that timber bridges will not last as long as steel and concrete bridges and have poor life cycle costs. To deal with this we need to learn which timber details and concepts work well and which don't, and tailor future designs to use wood in ways that will enhance longevity. Third, it was unclear what the view of environmental agencies was regarding the use of treated wood in aquatic environments, or if in fact the agencies had a consistent view of this issue within their own organizations. To address this, MoT's environmental department has been developing a document with input by Department of Fisheries and Oceans (DFO) and environmental specialists. To support the timber bridge initiative program, action has been initiated to address the currently identified issues.

MoT's Environmental Section has researched environmental issues related to Wood Preservative use in aquatic environments. Input has been received from: Dr. Kenneth Brooks - Aquatic Environmental Services

Ted LaDoux – Western Wood Preservers Institute- Risk Assessment Procedures

Dr. Paul Morris- FP Innovations

Adam Silverstein and Ted Gooch- Habitat Protection and Sustainable Development, Dept. Of Fisheries and Oceans Pacific Region.

A draft MoT/MoF shared "Guideline for Use of Treated Wood in and around Aquatic Environments" document has been produced based on the research findings (excerpt below). A significant finding is that DFO approval is not required for use of treated wood in aquatic environments. Treated wood users themselves however are responsible to ensure that aquatic environments are not harmed.

÷	able 1. Choosing an Appropriate Preservative mand hear an Aquatic Environment.							
		Outside the wetted perimeter		Inside the wetted perimeter				
		Handrails	No Frequent	Freshwater Immersion		Saltwater		
			Skin Contact	Flowing	"Still"	Immersion		
	Creosote	No	Yes	Yes	RA	Yes		
	Penta	No	Yes	No	No	No		
	CCA*	Yes	Yes	Yes	Yes	Yes		
	ACZA	Yes	Yes	Yes	Yes	Yes		
	ACQ and CA	Yes	Yes	No	No	No		

Table 1: Choosing an Appropriate Preservative in and near an	Aquatic Environment <sup>1</sup>
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RA =Risk Assessment as per WWPI CCA \* Challenges with DFIR penetration Draft for discussion purposes only

While timber is not currently the material of choice in new bridge construction for the Ministry of Forests and Range (MOF), they commonly use wood in the upkeep of their existing bridge infrastructure components:

- timber decks
  - portable bridge deck panels
  - permanent continuous decks on steel girder bridges
- timber ballast walls
- timber caps and sills
- timber guide rails/curbs (also on concrete decks)
- all timber 6m long portable bridges

MoF has been using CCA to treat Douglas Fir decks but suppliers were not meeting and or had difficulty to meet the CSA 080 Specification. MoF developed a prescriptive detailed process methodology for CCA treatment of DFIR including 3<sup>rd</sup> Party independent inspection and confirmation of process. They are relatively satisfied with results. MoF is also evaluating alternative treatment types.

MoT has a significant inventory of timber trestle bridges which it continues to maintain and rehabilitate. Timbers needing periodic replacement include deck planks, ties and stringers and caps pilings, posts and timber truss members. Typically material is purchased by our maintenance contractors based on local practices, knowledge, and experience. Preservative treatment used is primarily a mix of CCA and ACZA. Creosote has mixed reputation, excellent performance, but environmental uncertainty, and some workers don't like to use it. MoT also has experienced problems with quality of treated wood products and is moving to the use of 3<sup>rd</sup> party inspection.

The 2010 Ministry of Transportation and Infrastructure timber bridge program is building 7 new bridges and rehabilitating 2 others. Canada infrastructure grants contributed to the success of the program. Outside this formal timber bridge program MoT and the province have funded CVRD's Kinsol trestle rehabilitation, rehabilitated a timber truss, and built a new glulam bridge in a local initiative. Some project highlights are illustrated below:

# A) Answer and Large Creek Bridges Vancouver Island

Answer Creek and Large Creek, identical bridges on Vancouver Island, were designed by Associated Engineering. Construction was in separate contracts resulting in different contractors, and suppliers.

The glulaminated girders were supplied by Structurlam Products and American Laminators, Penta Chloro Phenol treated by Stella Jones and JH Baxter respectively. The structures have non composite concrete decks. This is a new combination of materials for the B.C. Government.





Answer Creek Bridge

#### B) Nightingale Bridge Salmon Arm B.C.

The unique feature of this bridge was its delivery method. An initiative of a local ministry office the superstructure, deck and railings were purchased using a design fabricate contract. Equilibrium Engineering and Structurlam Products supplied a span with 7 glulam girders, transverse glulam deck panels and a glulam railing system designed and crash tested in the US and modified for this structure. Initially the running surface will be untreated planks. In the longer term it will be asphalt pavement.



Nightingale Bridge, Decking



## C) Carney Mill Bridge Salmo B.C.

This 21 m span, 2 lane span bridge was designed as an arch by Buckland and Taylor Engineering to address the low clearance available at the site. The result is a very attractive

structure. The glulam components supplied by Structurlam Products Ltd. were treated with penta chloro phenol by Stella Jones.



D) St Mary's Wycliffe Bridge Cranbrook B.C.



The rehabilitation of this timber deck truss bridge includes removal of two old queen post deck trusses and approach trestles on the ends of the deck truss and replacement with three spans of Glulam girders, the longest one being 30m.



## St Mary's Wycliffe Bridge under reconstruction

## E) Kinsol Trestle, Shawnigan Lake B.C.

This abandoned 600 foot railway trestle on land now owned by the province saw its last train in 1979. It will be rehabilitated and operated by Cowichan Valley Regional District (CVRD) as part of the Trans Canada Trail. The approximate \$7M cost is provided by the province, the Federal Government and private fundraising arranged by CVRD. Based on historical performance much of the new timber will be untreated except for locally at the joints.



Artistic Rendering of Proposed Kinsol Trestle Structure





Kinsol Trestle Rehabilitation in Progress October 2010

Other Projects MoT has underway for 2010 include:

- Reconstruction of two trestle superstructures on Oona Island near Prince Rupert. These
  structures will utilize creosote treated stringers and caps, and ACZA treated deck rails
  posts.
- Construction of Creosote treated longitudinal Glulam slab spans at Swan Lake Bridge near Dawson Creek. The posts for the railing will be AZCA treated.
- Replacement of Deserters and Sihwe bridges in the Cariboo region with glulam superstructures.
- Rehabilitation of Chehalis Bridge. The timber truss chords were strengthened with post tensioning, and the deck floorbeams were replaced with glulam. A new traditional cross tie and plank will also be built.



Oona River Bridges, Near Prince Rupert B.C.



Chehalis River Bridge Fraser Valley B.C.

The Ministry of Transportation and Infrastructure is looking at potential new directions for Treated wood bridges and bridge components. DFIR Parallam treated with CCA is being considered for slab bridges following successful applications by Ministry of Transportation Ontario. Hemlock glulam timber is being considered industry desire to sell more hemlock lumber. We are watching the research being undertaken by FP Innovations into pre-treated Pacific Silver Fir. Once the bridge industry relearns how to build bridges with wood MoT will look to standardize spans and details for efficiency, lower design and construction costs, and potential schedule improvements.



# Ministry of Transportation Ontario Parallel Strand Lumber Slab, with Composite Concrete Deck

The B.C. Ministry of Transportation and Infrastructure has launched into timber bridge construction building program funding the replacement or rehabilitation of twelve bridges in fiscal 2010. This was facilitated by government interest in timber bridge construction and Federal Government Stimulus funding. It is anticipated that more timber bridges will be built in the coming years.