

# Jovo Creek Bridge Collapse



**Lessons Learned**

# Background: Contract

- Bridge design purchased by BCTS as part of Bill 28 reallocation
- Advertised under contract – tenders above Ministry estimate
- Entered into a purchase agreement with the Bill 13 contractor for TFL 25
- Purchase Agreement required agreement holder to provide a crossing assurance statement for an L165, 9m span, log stringer bridge

# Background: Implementation

- Purchase Agreement Holder subcontracted professional oversight of the bridge to an RPF => Coordinating Registered Professional (CRP)
- BCTS assigned EMS conformance duties to an Engineering Implementation contractor
- The Implementation Contractor expressed concerns about stringer sizes; these concerns were not clearly addressed
- The CRP signed-off on the completed structure



# Background: Implementation

- During TSL operations, the bridge failed on the grapple yarder's third crossing



# Background: Investigation

- BCTS conducted an EMS investigation into the collapse
- A number of factors likely contributed to the failure, however a primary factor was undersized stringers for the load imposed
- The CRP failed to maintain appropriate standards of practice
- WorkSafeBC issued orders against BCTS and also directly against two of its employees
- The Ministry engaged legal counsel and appealed the orders
- All orders were rescinded after a WorkSafeBC review board hearing involving several ministry staff and experts



# Key Lessons

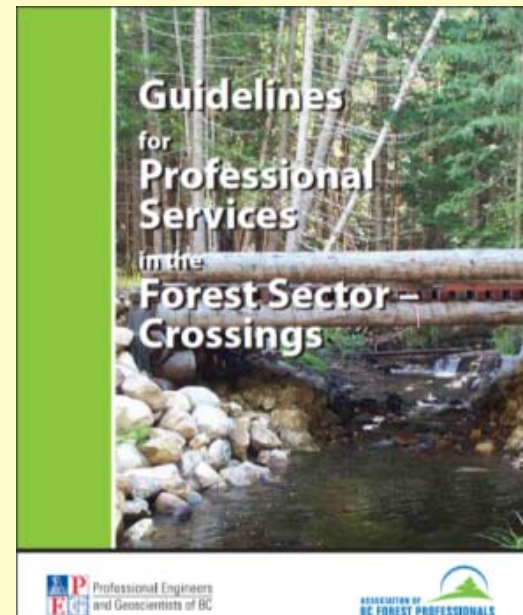
- Professional Reliance
- Construction Considerations
  - Design
  - Construction
  - Certification
- Safety Lessons in event of an incident
  - Actions in the event of a failure
  - Investigation in the event of a failure
- Legal Considerations
  - Contractual
  - Professional / personal

# Professional Reliance

- To ensure a professional is accountable
  - ▣ Project objectives must be clearly delineated
  - ▣ Transfer and acceptance of responsibility must be clearly documented ie. acceptance of the role of CRP and sealing of the Crossing Assurance statement and as built drawings
- Due diligence includes evaluating whether the engaged professional is qualified for the task
- Due diligence is an accepted defence against a charge of negligence
- Professionals will be held accountable for their actions as indicated by ABCFP discipline findings in this case

# Recommendations: Professional Reliance

- Document that engaged Professionals are truly qualified based on training and experience
- Ensure project objectives and the role of the professional are clearly identified
- Document the professional's acceptance of the projects objectives and their role as CRP
- Conform to the APEGBC/ABC FP Crossing Practices Guidelines
- Ensure dissenting professional opinions and their resolution are documented





# Recommendations:

## Design Considerations

- Ensure staff are aware of the resources available
  - ▣ Provincial Engineering Manual Chapter 4
  - ▣ Ministry specialists (e.g. Bridge Engineer)
- Where possible designate a ministry bridge engineer as the CRP
- At a minimum use Ministry bridge engineers to provide project guidance and review
- Have bridge designs reviewed by Ministry bridge engineers prior to commencement
- Design drawings must conform with the Provincial Engineering Manual and include specific design aids used

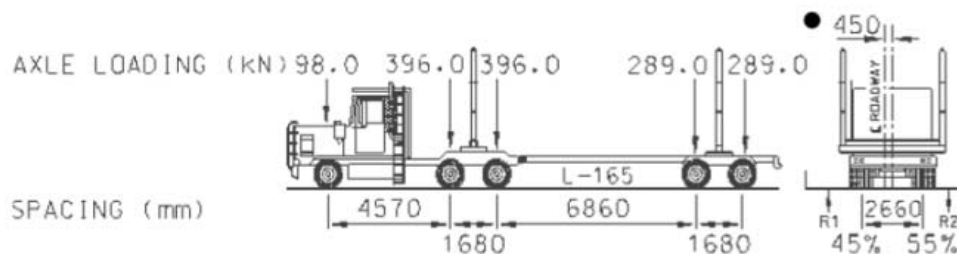
# Recommendations: Construction

- Any significant variation from the approved design during construction must be reviewed and approved by the MFR Contract Representative



# Recommendations: Construction

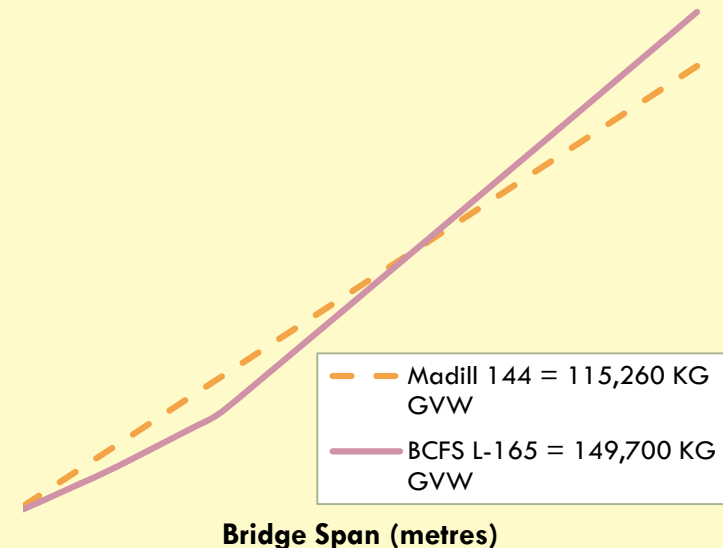
- Staff should familiarize themselves with Engineering Bulletin #1 describing the limitations associated with Structure Load Ratings



**L-165 (OFF HIGHWAY) GVW 149,700 kg**

## Bending Force Effects Vs Span for Madill 144 and BCFS L-165


Bending Force Effect (KN\*m)



Bridge Span (metres)

# Recommendations: Certification

- A CRP signed and sealed Crossing Assurance Statement must accompany the completed structure



## APPENDIX A

### CROSSING ASSURANCE STATEMENT

*(To be retained by the Coordinating Registered Professional and placed on file for the life of the structure.)*

IDENTIFY THE PROJECT COVERED BY THIS STATEMENT	
NAME OF CLIENT	
DATE (IF APPLICABLE)	PROJECT ADDRESS

This is to advise that I am the Coordinating Registered Professional for the above described crossing and I am a (check appropriate):

- Registered Professional Forester registered with the Association of British Columbia Forest Professionals (ABCFFP).
- Professional Engineer, registered with the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC)

I am responsible for the planning or design and field reviews required with respect to this crossing project. I have taken the appropriate steps as required under the Legislation for my profession, the Guidelines for Professional Services in the Forest Sector - Crossings and by good practice in order to sign and seal this Statement.

\*Field review\*, for the purposes of this statement, means such reviews of the work at the project site (and/or at the fabrication locations, if/as applicable) considered necessary, in my professional opinion, to ascertain whether or not the significant aspects of the work are considered to be in general conformance with the plans and supporting documents for this project.

Based on the results of the field reviews, I hereby give my assurance\* that, in my professional opinion, the significant aspects of the construction work, generally conform with the plans and supporting documents for this project, including all revisions.

Significant revisions to the plans and supporting documents have been documented and marked on the plans or described in documents, and have been noted on the as-built plans and documents.

NAME OF PROFESSIONAL ENGINEER/REGISTERED PROFESSIONAL FORESTER		ABCFFP and APEGBC LOGO
DATE OF CURRENTLY SUPPLEMENTAL DOCUMENT	DATE SIGN	
ADDRESS (SEE PAGE 2)		
PHONE NO.	FAX NO.	

(If the Professional Engineer or Registered Professional Forester is a member of a firm, complete the following.)

I am a member of the firm \_\_\_\_\_ and I sign this Statement on behalf of the firm.

\*Assurance means that a Professional Engineer or Registered Professional Forester has undertaken the work, but in his or her professional judgment, is considered necessary to ascertain whether the significant aspects of the crossing project are in general conformance with the plans and supporting documents.

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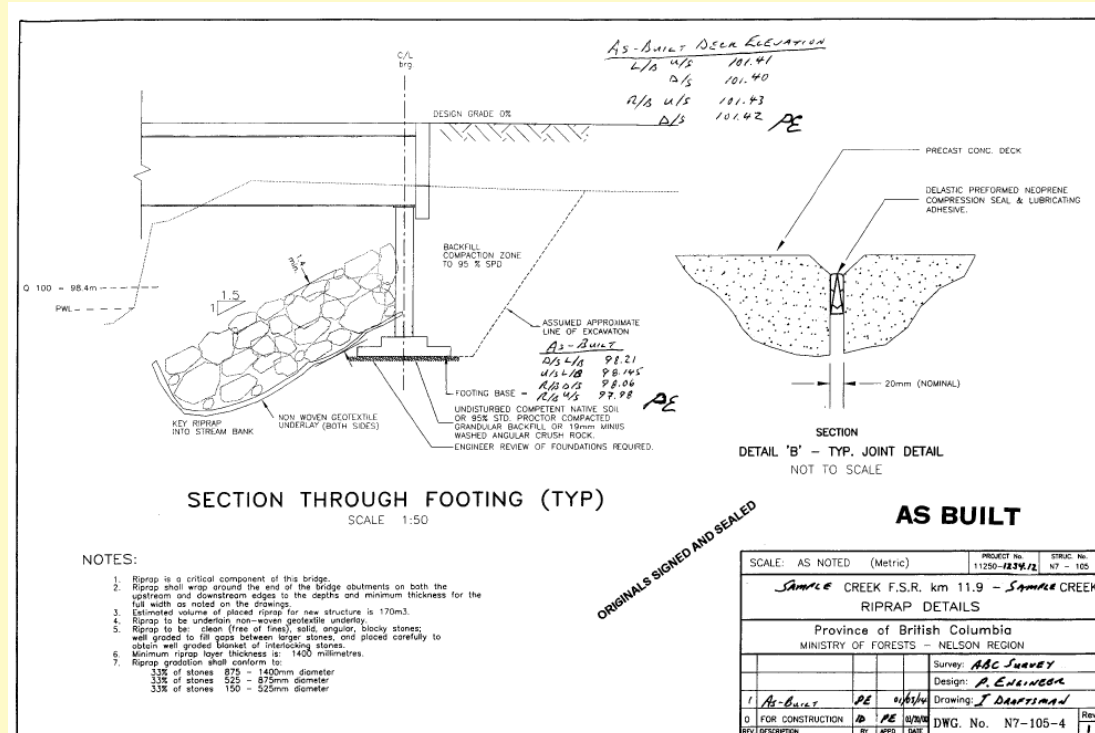
Guidelines for Professional Services in the Forest Sector - Crossings      APEGBC & ABCFP © March 2005/Revised September 2008

# Recommendations: Certification

- As built documentation includes:
  - ▣ As built drawings
    - signed and sealed by the CRP
    - amended to reflect design changes and modified to indicate variance from the original design for site conditions
    - Including the design aids that were used
  - ▣ Include construction records such as log stringer dimensions, pile driving records and concrete fabrication tests

# Recommendation: Certification

- As built drawings must:
  - ▣ show the as constructed locations, dimensions, and elevations on the general arrangement drawings
  - ▣ must be amended to reflect design changes and indicate where the original design is modified for site conditions



# Recommendation:

## Actions in the Event of Bridge Failure

- In the event of a bridge collapse WorkSafeBC and the Ministry must be notified by the following parties:

- **WorkSafeBC**



- The employer
- Road Use Permit holder
- Road Steward (BCTS or Operations Division)

- **Ministry of Forests and Range**

- BCTS or Operations Division – Provincial Safety Initiatives Manager Coordinator
- Engineering Branch, Field Operations Division – Chief Engineer
- Engineering Branch, Field Operations Division – Engineering Group Leader for the Region



# Recommendation:

## Investigation in the Event of Bridge Failure - Safety Investigation and Team

- Required under the Workers Compensation Act
- An EMS investigation is not sufficient to meet the Act requirements
- Must be conducted by
  - The tenure holder (RP or RUP)
  - The Ministry
- The Ministry investigation team must include a professional engineer familiar with the type of structure
- The report must capture the chain of events and facts relevant to the failure
- Prior to release, the Investigation Report must be reviewed by the Ministry Safety staff and the Chief Engineer
- Once approved the report will be released to WorkSafeBC by the DM or TSM





## Recommendation:

### Investigation in the Event of Bridge Failure – Management of the Site:

- Conduct works to ensure the safety of workers, the public and protect the environment
- Document the site conditions and failure with photos and observations immediately and throughout the process if the site is disturbed



## Recommendation:

### Investigation in the Event of Bridge Failure – Management of the Site:

- To facilitate evaluation of the reasons for failure provide an opportunity for the investigation team, including the professional engineer, to review the site with as little disturbance as possible
- If structural elements are moved
  - ▣ Set aside in a methodical way
  - ▣ Number components to allow reconstruction of the failed structure



# Legal Considerations: Contract Liability

- No matter what form of contractual relationship, WorkSafeBC will likely view the Ministry as the owner
- The WorkSafe investigation will review construction, inspection and maintenance practices prior to the collapse

# Legal Considerations: Employee Liability

- WorkSafeBC can / will make orders against ministry employees
- Workers cannot receive administrative penalties
- Workers can be prosecuted under the Criminal Code of Canada where negligence is evident
- The ministry will stand behind staff where they follow established safety protocols and practice within their responsibility and ability
- Employees are bound by the Indemnity sections of their collective agreements

# Wrap Up

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