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
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- All orders were rescinded after a WorkSafeBC review board hearing involving several ministry staff and experts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 i.e. 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 project objectives and their role as CRP
- Conform to the APEGBC/ABCFP 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.

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

- Madill 144 = 115,260 KG GVW
- BCFS L-165 = 149,700 KG GVW
Recommendations: Certification

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

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