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Stantec

March 14, 2012
File: 1123-11041

City of Victoria
#1 Centennial Square
Victoria, BC

Attention: **Dwayne Kalynchuk, Director of Engineering and Public Works**

Dear Sir:

Reference: **Johnson Street Highway Bascule Bridge**
Issues Relating to Rehabilitation

As per your request, this letter outlines the issues relating to possible rehabilitation of the Johnson Street Highway Bascule Bridge. The issues identified are based on work Stantec Consulting Ltd. has previously completed for the City of Victoria relating to the bridge, and draws upon the personal experience of senior structural engineer Andrew Rushforth, P.Eng. who has been monitoring the condition of the bridge's steelwork for over 35 years. This monitoring includes major repairs and strengthening undertaken around 1978 and 1999.

There are four major categories that relate to the consideration of a long term rehabilitation of the bascule portion of the bridge, all of which have significant cost implications.

- Condition of the steelwork
- Painting
- Mechanical systems
- Seismic upgrade

Condition of the Steelwork

The main issue pertaining to the steelwork of the bridge is that the majority of the truss work is made up of relatively thin plates or bars, thus the loss of material through corrosion on both faces is more significant than with thicker materials. The replacement of severely corroded material is made difficult by the fact that connections were all riveted, which individually are more difficult and expensive to remove than the replacement bolts.

In some of the trussed box members, and in the much larger plated members near the main bearings, access for inspection, cleaning and painting is difficult and in some cases, impossible.

Currently, Stantec is monitoring of the condition of the steelwork on an ongoing basis. Repair work is being undertaken as required, but as a temporary measure only until the structure is demolished. This repair work is proving relatively costly, primarily due to the problem of removing old lead paint to allow welding to take place. In spite of this monitoring and cleaning, bits of rust scale have reportedly fallen on traffic.

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Painting

The existing bridge was last fully repainted around 1980 when the older coats of lead based paint were overcoated with the blue coat. Touch up has since primarily been done within reach of the deck and to repaired and strengthened areas (around the year 2000).

It can be seen that the paint system is failing and total repainting is required to protect the steelwork. Additional overcoating is not appropriate as bonding failures occur within the underlying coats. Removal of the lead paint is an environmental hazard, requiring sections of the bridge to be encapsulated for the work to be undertaken (similar to ships at Point Hope Shipyard are seen to be repaired). It is probable that periods of total closure of the bridge would be required to conduct this work where work areas are adjacent to traffic.

Where access to confined spaces is not possible, it may be that members such as the operating struts be removed and replaced with new all welded box sections. Where the inaccessible areas are adjacent to main bearings (and which have not been inspected in detail, nor painted since built) the problem is more difficult to resolve, although a robotic arm solution would be ideal.

Mechanical System

The present operating equipment condition has been reported on by others. Replacement in kind or with a new mechanism is possible.

Seismic Upgrade

A concept for seismic upgrading of the existing bridge was addressed in our peer review dated June 10, 2010. Further analysis of this concept was not undertaken following the City's decision to replace the bridge rather than rehabilitate it.

This seismic upgrading concept supported the main span/counterweight loads by transferring the loads to a new structure on the north and south sides, which in turn were supported by a total of 8 columns, 1.8 metres (6 feet) in diameter.

To facilitate a seismic upgrade, the tops of the old piers would have to be severed from their lower portion (which lower part may then have to be removed). Note that the masses involved that require restraint are approximately 1870 tons (steel and counterweight) and 3900 tons from the pier itself.

If further work is to be undertaken on this analysis, new information on the properties of the soils (drilling not yet completed due to the fibre optic cable), potential for liquefactions, etc., would need to be included and the solution may yet prove impractical, but certainly the upgraded bridge will look substantially different from the present.

Respectfully,

STANTEC CONSULTING LTD.

14 March 2012

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