



**MEMORANDUM**  
**ST. CROIX RIVER CROSSING**

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**TO:** Modjeski and Masters, Inc.  
**FROM:** TBM  
**DATE:** 09-09-05  
**SUBJECT:** MAINTENANCE REVIEW – 3 CONCEPT BRIDGES

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A maintenance survey of the three preferred concept bridges for the St. Croix VQM was conducted by Modjeski and Masters, Inc.. This task was included under Item No. 3.5.4 in the project scope of services.

The three concept bridges currently under consideration for the St. Croix crossing include the following:

- Hull – an extradosed bridge with outwardly inclined towers, single superstructure and trapezoidal shaped, split wall piers.
- Organic – and extradosed bridge with slightly curve towers, dual box section superstructure with crossbeams, and internally split piers.
- Portal – an extradosed bridge with a portal shaped above deck section at each pier location, single superstructure, and trident shaped, split piers.

At the current stage of the bridge study for the three concept bridges, specific details - such as connections, anchorages, and tower/superstructure and pier interfaces - have not been developed. The effort to date has been to select bridge forms, and size key components of the based on past experience, engineering judgment and preliminary analyses.

In addition, MNDOT has requested that the superstructure consist primarily of concrete construction, and that the bridge be jointless with no bearings from the Minnesota anchor pier to the Wisconsin abutment. This eliminates a significant number of routine maintenance items associated with typical bridge construction.

However, a maintenance survey of each concept bridge was conducted to identify potential maintenance concerns unique to each, as well as maintenance items common to all three. The survey is based upon the engineering review drawings as of Sept. 8, 2005 (copies attached).

### Maintenance Items Unique to Concept Bridge Types

For Hull, the outwardly inclined towers will make access from the roadway deck problematic (in terms of reach) for maintenance and inspection. Access to maintain and inspect the interior faces of the wall piers will be difficult, as a result of the wide superstructure, widening tower base and limited overhead clearance provided by the cables. The interface of the superstructure and hull tower base will need to be detailed to prevent moisture infiltration between the two.

For Organic, the non-structural concrete proposed to enhance the aesthetics of the pier legs may be a future maintenance concern depending on the method of connection to the structural portion of the pier, as well as its internal reinforcing details. The open slot between the split roadway decks will allow drainage and debris to collect on the crossbeams. The proposed crossbeam framing will increase the difficulty of inspection and maintenance access to the bridge.

For Portal, maintenance access to the top strut of the portal will be difficult. The relatively flat surface will likely be a debris collector. Access to the pier will also be problematic, due to the widening of the portal tower base, the overhead cables and out-to-out width of the portal frame.

### Maintenance Items Common to Concept Bridge Types

For all three concept bridge types proposed for the St. Croix Crossing, the following maintenance items will apply:

- Periodic deck geometry survey (creep monitoring)
- Periodic cable load verification
- Deck overlay
- Cables (protective tape wrapping and future replacement of an individual cable)
- Modular expansion joints (anchor pier and WI abutment)
- Bearings (anchor pier and WI abutment)
- Deck de-icing system (sprinklers, conduits, pumping station)
- Lighting (roadway, maintenance (box interior), aerial navigation, marine navigation, aesthetic)
- Utility ducts at modular joints
- Drainage system (scuppers, downspouts, drain runs – superstructure and pier shafts)
- Pedestrian walkway – debris and snow removal

Summary

At this stage of the bridge concept study, there is no clear advantage of any one concept with respect to maintenance. Since all the concepts are based on the extradosed bridge type, and the materials used for each are similar (ie, concrete construction), the anticipated maintenance requirements are therefore similar. The concepts with split configurations inhibit maintenance access the tower locations, but MNDOT's directive for a jointless bridge may likely require this pier type to accommodate temperature forces.

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