Recommendations from 2008 Independent Review Team on light rail impacts on the I-90 floating bridge

The IRT concluded that all issues identified as impacting light rail installation can be addressed or mitigated provided that the IRT recommendations are followed. However, several issues could affect project cost estimates and schedules, and therefore should be resolved at the earliest stages of project design. One issue – A – deals with a required design element (expansion joint track bridge) that has no history of use on floating bridges, and therefore requires careful study and testing in the early stages of the project.

Following are the recommendations which the IRT rated being of high importance.

A. Track bridge/expansion joint design and performance criteria

a. No existing track bridge concept can be adopted for use on the floating bridge. Sound Transit has developed conceptual details for the track bridge. Since the track bridge will be a unique design, and must be successfully installed and operated. The IR recommends that

i. a prototype should be developed and tested before final design begins. This should be completed at least 2 years before light rail is installed on the bridge. *NOTE: Construction is scheduled for 2013 – 2019, so the prototype design and testing should be completed by 2011.*

ii. Track bridge noise should also be evaluated as part of prototype testing, as well as attachments and effects on the supporting structure.

B. Seismic vulnerability and retrofit of approach spans and transition span

a. The bridge was designed using a 475-year earthquake standard, but WSDOT has since adopted a new AASHTO 1,000 year standard for bridges.

i. The IRT believes a significant retrofit will likely be required for the approach spans

ii. WSDOT and ST have agreed that detailed seismic vulnerability studies will be undertaken as an early-start PE activity.

iii. Retrofit strategies and construction costs should be developed during preliminary design.

C. Stray current mitigation

a. IRT recommended several specific items be included in final design calculations, including resistance of the rails; degradation of insulating characteristics of the rail fasteners; and worst and intermediate case scenarios for failure mode calculations.

b. The stray current mitigation system must be capable to collect most of the stray current.

c. The monitoring system must set off an alarm when increased levels of stray current are detected or a collector mat has failed.

D. Stray current and cathodic protection system interface and compatibility

a. Cathodic protection systems on the existing bridge were installed to protect the anchor cables of both bridges. The current systems are deficient, with many anodes missing and not fully operational.

b. Stray current generated by light rail can impact the integrity of the anchor cables and the reinforced elements of the pontoons exposed under water. For cathodic protection systems to be effective, they have to be well monitored and maintained.
    i. IRT recommends upgrading the cathodic protection systems on both bridges.
    ii. IRT recommends resources and plans must be in place to operate, monitor and adequately maintain the cathodic protection systems

E. Rider comfort over expansion joints

a. IRT concluded the light rail vehicle will most likely be able to traverse the track bridge during normal conditions without undue discomfort to the riders but with reduced speed. IRT notes that ST has anticipated the need to traverse the track bridges at reduced speed, and has already taken this into account in its operations planning and evaluation studies.
    i. This conclusion should be revisited following final design and prototype testing of the track bridge elements, including the 3-link beam, track fasteners and centering mechanism.

F. Attachment of overhead contact system (OCS) supports to the bridge deck cantilevers

a. It's important that the OCS attachments not damage the bridge deck; they should not impact the structural integrity of the bridge and should not cause cracking on the deck.
    i. ST provided the IRT with acceptable conceptual details that minimize penetrations into existing cantilevers. ST will perform further analysis to prove concept during preliminary design. The IRT believes that the ST concept results in tolerable stress levels in the existing bridge.

G. Methods to locate rebar and post tensioning in the bridge deck

a. ST will have to drill into the existing bridge deck to attach the rails. Any penetrations must not damage the post tensioning embedded in the bridge deck, which could reduce its structural integrity. ST has evaluated several technologies to locate reinforcing steel in the deck slab.
    i. ST should investigate alternative attachment methods that minimize or eliminate penetrations into the deck. These alternative methods may be more critical for the approach spans due to "longitudinal post tensioning congestion" at the piers.

H. Median barrier relocation design, attachment, maintenance, drainage

a. IRT recommends that every effort be made to avoid relocating the existing median barrier
    i. The deck could be damaged in moving the barrier, and
    ii. Making new barrier attachments to the existing deck represent potential damage to the reinforcing steel and post tensioning in the deck.