American Society of Civil Engineers
Alaskan Way Viaduct Committee NEWS

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Professional Engineers Find Viaduct Retrofit is Not a Viable Option

SEATTLE – The American Society of Civil Engineers (ASCE) Viaduct Committee has found that that the retrofit proposal by the Viaduct Preservation Group (led by Victor Gray) is not a viable option for replacing Alaskan Way Viaduct. This group of professional engineers was asked by WSDOT to provide a technical review of the retrofit proposal submitted by the Viaduct Preservation Group.

The committee agrees with previous inspections of the viaduct which have uncovered a number of deficiencies. The major ones include:

- The viaduct was built in the 1950s when seismic design criteria did not exist. This means the viaduct has structural deficiencies that could lead to failure in the event of an earthquake. Furthermore, time has taken its toll on the structure and the deck is in poor condition.
- The soils underlying the viaduct are loose and will liquefy in a major earthquake.
- The seawall is in very poor condition and vulnerable in an earthquake. Failure of it would likely allow major movements of the soils behind it, which support the viaduct.
- The viaduct's lanes are narrow and the shoulders for disabled vehicles are limited.

The Preservation Group's proposal is to retrofit the existing viaduct structure using cross braces, dampers, and grade beams. This approach is likely to provide some improvement in the seismic performance of the main structure. However, the proposal does not go far enough to fix the viaduct's problems and leaves a structure that will still need to be replaced in 25 years, will be less reliable in an earthquake, and doesn't address the traffic safety issues of today's viaduct.

Highlights of the committee's findings are:

- There are several critical pieces missing from the proposal, which would be required to ensure the viaduct survives an earthquake of serious severity. This earthquake has a one in 10 chance of occurring over the next 50 years. These missing pieces are: inadequate steel reinforcement in the columns, deficient anchorage of the steel reinforcement at the cross-beams where they are connected to the columns at the upper and lower decks, bridge deck surface worn and badly deteriorated, inadequate foundations and insufficient piling.

- An incomplete approach to ground improvement would mean some of the more shallowly-embedded piles would move downward, causing differential movement of the viaduct.
- The proposal does not address the poor condition and vulnerability of the seawall. Failure of the seawall, either by collapse or soil liquefaction, will remove the lateral support of the viaduct foundation system allowing excessive lateral movement.
- The retrofit proposal would not change the existing load or lane restriction that presently applies to the earthquake damaged viaduct. The roadway would be limited to the narrow lanes and limited shoulders disabled vehicles. This creates a very hazardous and disruptive condition.
- The assumption about length of traffic disruptions during the retrofit is severely underestimated.
- The life of a retrofitted viaduct, even with all of the deficiencies addressed will have a much shorter design life than that of a new structure.

Using the retrofit plan proposed by T.Y. Lin International that addresses the deficiencies in the Viaduct Preservation Group's proposal, WSDOT provided the ASCE Committee with a cost estimate using the same assumptions as other replacement alternatives. This cost estimate was 80 to 85 percent of a new structure. Based on this information, the committee concluded that retrofitting the viaduct so as to make it safe and dependable would cost more than the benefits gained.

With all of the above factors in mind the committee concluded that the relatively narrow difference in costs between the choice of retrofit or rebuild weighs heavily in favor of rebuilding. The cost differential between the two choices is expected to narrow when considering the higher life cycle maintenance costs, more unknowns during construction, short life span and substandard operations geometry of a retrofitted structure. The committee therefore did not view the retrofit option as presented by the Viaduct Preservation Group a viable option.

Members of the ASCE Alaskan Way Viaduct Committee are:

- Adrian Arnold, P.E.
- Dave Baska, P.E.
- Ted Bell, P.E.
- Norman Jacobson, P.E.
- Jack Locke, P.E.
- Daniel Mageau, P.E.
- Doug Myhre, P.E.
- John Stanton, P.E.
- Loren Sand, P.E.
- Anne Symonds, P.E.
- Jack Tuttle, P.E.

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