2009 AASHTO VALUE ENGINEERING AWARD APPLICATION

(required for each entry)

Applicant Information

Contact Name: Blane Long, CVS
Name of Agency: Washington State Department of Transportation
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E-mail: LongB@wsdot.wa.gov

Project Name: I-5, Columbia River Crossing

Award Application Category (check one):

- **X Pre-Construction Engineering (>$75M)**
- ☐ **Pre-Construction Engineering ($25M to$75M)**
- ☐ **Pre-Construction Engineering (<$25M)**
- ☐ **Construction (VECP/CRIPS)**
- ☐ **Improved Process**
- ☐ **Improved Performance**

Participating Parties (Contractors, Consultants, Agencies, etc.):

HDR, WSDOT, ODOT

Briefly Describe Project/Process & Significant Value Engineering Changes (125 word limit):
The mission of the VE teams was to verify or improve upon the proposed alternatives. The project was divided into four logical segments to perform value engineering (VE) and qualitative risk assessments. Each team applied the principle and practices of the VE job plan, as well as reviewed previously defined risks and risks identified during each study. Each study team evaluated the alternatives against a set of predetermined performance attributes. Improvement opportunities were based from a value index of performance/cost for each alternative as it related to a baseline of performance attributes. The primary objectives for these studies included:

- Conducting a thorough review and analysis of the key project issues and conceptual design using multidiscipline, cross-functional teams.
- Applying principles and practices of the job plan, as well as reviewing previously defined risks and risks identified during the study.
- Evaluating the alternatives against a set of predetermined performance attributes.

Basing improvement opportunities on a value index of performance/cost related to the performance attributes.

The basic functions of the project were determined to be “Relieve Congestion”.

Implementation of the VE Study recommendations resulted in total potential project cost savings of approximately $550 million to $665 million.

Contact Information:
Richard Jaffe, AASHTO Value Engineering Technical Committee
New Jersey Department of Transportation, Telephone (609)530-5643

Send Completed Award Application Package to both:
Mr. Richard Jaffe at richard.jaffe@dot.state.nj.us and Mr. Blane Long at LongB@wsdot.wa.gov

ALL ENTRIES MUST BE RECEIVED NO LATER THAN MARCH 31, 2009

Introduction

This project overview is submitted to the AASHTO Value Engineering Technical Committee as application for a 2009 Value Engineering Award for Pre-Construction Engineering in the project cost category of "Greater than $75 million". The Interstate 5, Columbia River Crossing (CRC) is a superb example of the value engineering process at its best.

The reconstruction and improvement of Interstate 5 (I-5) and its surrounding infrastructure between Washington State and Oregon is a project that will affect millions of people. Covering over 5 miles, the $4.2 billion project will present WSDOT and ODOT with major challenges in funding, construction sequencing, and maintenance of traffic. But before these challenges can be addressed deciding what should be constructed needed to happen first. This generated one of the largest and most successful VE studies in recent history.

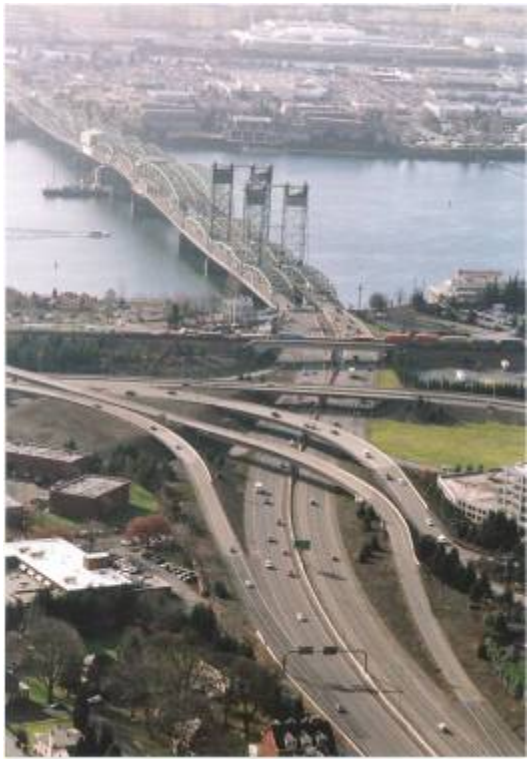
Project Issues

I-5 is the only continuous north/south interstate highway on the West Coast, providing a commerce link for the United States, Canada, and Mexico. In the Vancouver-Portland region, I-5 is one of two major highways that provide interstate connectivity and mobility. I-5 directly connects the central cities of Vancouver and Portland. Interstate 205 (I-205), a 37-mile-long freeway that extends from its connection with I-5 at Salmon Creek to its terminus with I-5 near Tualatin, provides a more suburban and bypass function and serves travel demand between east Clark County, east Multnomah County, and Clackamas County.

Operation of the I-5 crossing over the Columbia River is directly influenced by the 5-mile segment of I-5 between SR-500 in Vancouver and Columbia Boulevard in Portland. Known as the I-5 Bridge Influence Area (BIA), this segment includes eight interchanges, including connections with four state highways (SR-14, SR-500, and SR-501 in WA and SR 99E in OR) and with several major arterial roadways and provides access to downtown Vancouver, two international ports, industrial centers, residential neighborhoods, retail centers, and recreational areas.

The existing I-5 crossing of the Columbia River consists of two side-by-side bridges that have lift spans. They were built four decades apart and the cost of each was financed with bridge tolls. The eastern bridge (serving northbound traffic) was built in 1917 and the western bridge (serving southbound traffic) was built in 1958. The two-bridge crossing, which served 30,000 vehicles per day in the 1960s, now carries more than 125,000 automobiles, buses, and trucks each weekday. While many of these trips are regionally-oriented (average trip length is 16 miles), it is estimated that 70 to 80 percent of trips using the I-5 crossing actually enter and/or exit I-5 within the 5-mile-long I-5 BIA.

A second interstate, Interstate 205, river crossing is located 6 miles east (upstream) of the I-5 crossing. It opened in 1982, carries approximately 140,000 vehicles per day and is reaching its peak-hour period carrying capacity. This bridge has a fixed span. No other river crossing options in the metropolitan area are available between the two states; the closest bridges for automobile use are located in Longview, Washington, 46 miles to the west, and in Cascade Locks, Oregon, 40 miles east of the I-5 Bridge crossing.



Value Engineering Recommendations

The mission of the VE Teams was to verify or improve upon the proposed alternatives. The project was divided into four logical segments to perform value engineering (VE) and qualitative risk assessments. Each team applied the principle and practices of the VE job plan, as well as reviewed previously defined risks and risks identified during each study. Each study team evaluated the alternatives against a set of predetermined performance attributes. Improvement opportunities were based from a value index of performance/cost for each alternative as it related to a baseline of performance attributes.

The four studies were:

Team No. 1–Transit - May 21-25, 2007

Team No. 2–River Crossing - May 21-25, 2007

Team No. 3–Washington Approaches – June 4-8, 2007

Team No. 4–Oregon Approaches - June 4-8, 2007

Team No. 1 & No. 2 met at the same time and location, as did Team No. 3 & No. 4 a week later. The focus of this award application is on the River Crossing Team's interaction with the Transit Team during the week of May 21-25, 2007.

VE Team No.1 – Transit

Due to limited public transportation options, a number of transportation markets are not well served. The key transit markets include trips between downtown Portland and the City of Vancouver and Clark County; trips between north/northeast Portland and the City of Vancouver and Clark County; and trips connecting the City of Vancouver and Clark County with the regional transit system in Oregon. Current congestion in the corridor adversely impacts public transportation service reliability and travel speed. Southbound bus travel times across the bridge are currently up to three times longer during parts of the a.m. peak compared to off-peak times. Travel times for public transit using general purpose lanes on I-5 in the BIA are expected to increase substantially by 2030.

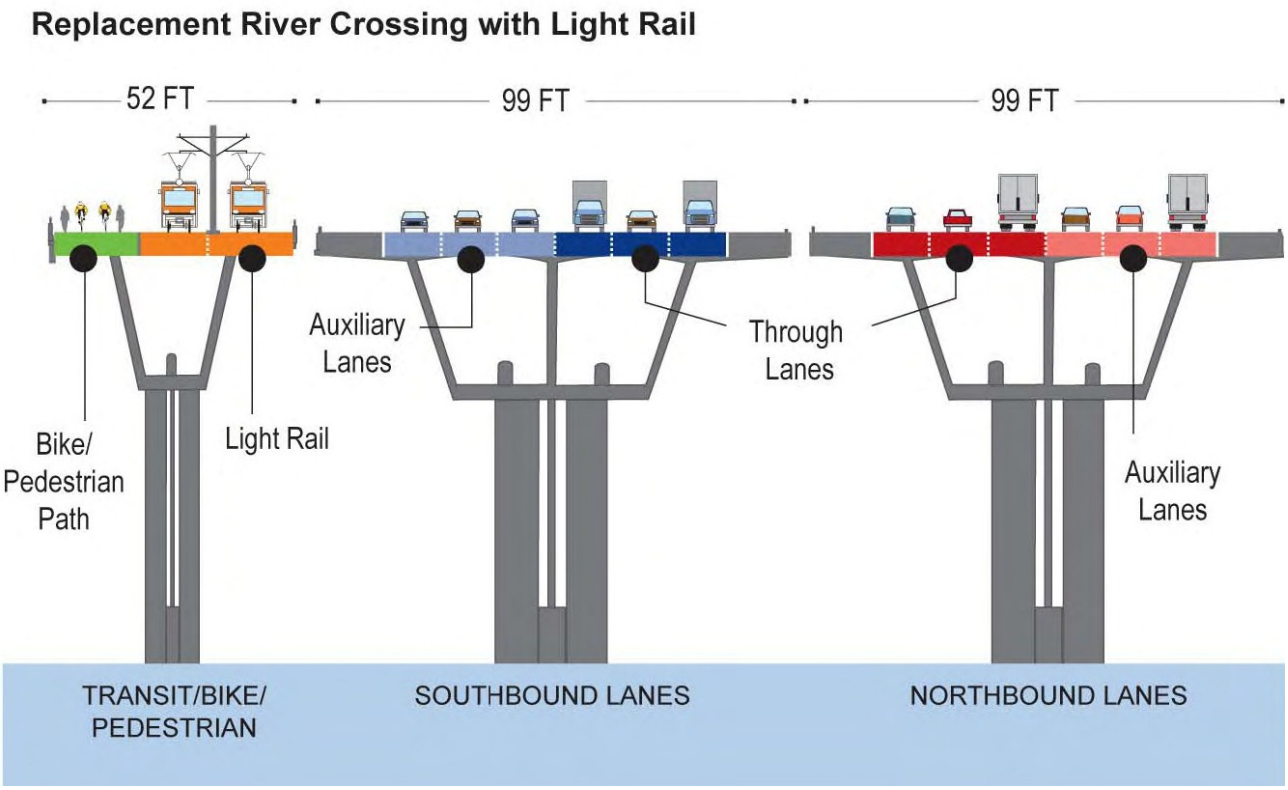
VE Team No. 2 - River Crossing

The project as presented to the VE Study Team consisted of four alternatives: No Build, Replacement Bridge Downstream, Replacement Bridge Upstream, and Supplemental Bridge Downstream. The need to incorporate High Capacity Transit (Light Rail or Bus Rapid Transit) was stressed during the project team's presentation. The project team's baseline showed a third river crossing for this purpose.

The objective of the river crossing team was to verify or improve upon the proposed alternatives for the following focus areas:

- Structural type
- Foundations
- Construction staging
- Seismic retrofit (supplemental option)

As part of the study, foundations and structure type for the river crossing were evaluated by location: Oregon approaches, Washington approaches, Columbia River Crossing, and Oregon Slough crossing.

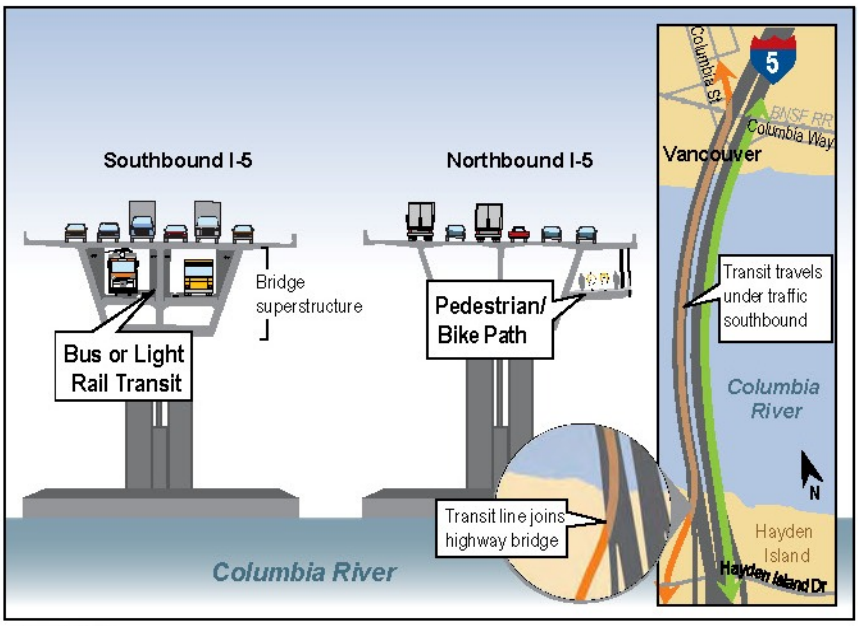


At the same time and in the same conference room that the River Crossing VE study was being conducted the Transit VE study was also taking place. Sometime Wednesday afternoon while the teams were taking a break in the action some of the River Crossing Team was conversing with some of the members of the Transit Team when this idea was born….

VE Recommendation – Transit in Box

Place light rail transit (LRT) inside the cells of the southbound bridge and hang the bike-pedestrian pathway under east cantilever of the northbound bridge. This will eliminate the need for a separate High Capacity Transit bridge.

Conceptual Design of Stacked Transit/Highway Bridge Design



The current year estimate of the transit/bike-pedestrian structure was $146 million. By incorporating the transit within one of the mainline boxes and hanging the bike-pedestrian pathway under the cantilever of the other bridge, a savings of approximately $100 million could be realized.

Advantages	Disadvantages
• Eliminates High Capacity Transit bridge	• Transition spans required at end
• Shortens overall construction time	• Ventilation and lighting costs
• Travelers (formwork) for box girders now same for both bridges	• May require some transverse PT in bottom slab of mainline boxes
• May reduce ROW takes	• Restricts choice of box configuration to 2-cell box
• Bike-pedestrian path sheltered from rain	• Transit patrons in box for whole crossing
• View from bike-pedestrian path to Mt. Hood un-obscured	• Buses not accommodated; must use mainlines

Summary

CRITERIA 1: Cost Savings as Compared to Original Design

- Total Dollar Amount Saved – In addition to the river crossing and the transit the total of the four teams efforts was a $550-$650 Million in savings
- Reduced Life Cycle Cost or Impact on Future Maintenance – one less 3,000' structure to maintain will drastically reduce the lifecycle costs for this project

CRITERIA 2: Project Improvements as Compared to Original Design

- Innovative Approach to Accomplish Purpose & Need – Extremely innovative "in the box idea"
- Technology or Materials New to Agency (to better accomplish functions) -New technology and concept for the United States, has been done in Europe, Asia and Australia.
- Environmental, ROW & Stakeholder Impacts – less ROW and environmental impacts to the river and improved visual over the baseline project.
- Safety (Collision Costs) and Traffic Operations (Level Of Service) – no change over baseline
- Other Improvements or Efficiencies – Stakeholder acceptance

CRITERIA 3: Constructibility

- Reduction of Construction Schedule and/or Impacts to Users in Work Zone – constructability recommendation were made by all four teams to reduce impacts during construction and to optimize schedule and improve the ability to Construct the Project.