

Bridge Study Working Group

November 12, 2008

Meeting Summary

Attendees:

WRBAC Members – Bob Durgan, Pat LaCrosse, Rick Saito

Consultant Team – David Knowles, Steve Litchfield, Miguel Rosales, Paul Silvestri (NCG), Semyon Treyger

Technical Staff – Kenny Asher, Teresa Boyle, Troy Doss, Brett Horner, Kaitlin Lovell, Jamie Snook, Mark Turpel, Bridget Wieghart

TriMet – Rob Barnard, Steve Barrett, Sean Batty, Ann Becklund, John Fall, Diane Goodwin, Karl MacNair, Neil McFarlane, DeeAnn Sandberg, Claudia Steinberg, Dave Tertadian, Dave Unsworth

Meeting Goal:

To validate the viability of the draft “few” bridge types.

Key Discussion Points:

- Vertical clearance is not fundamental to determining bridge type, so there is still work to be done on vertical clearance during Preliminary Engineering.

NCG – Report out on Risk and Constructability

- Rob Barnard introduced Paul Silvestri of National Constructors Group (NCG).
 - Graduate of Stanford
 - 39 years of experience in the execution of major heavy civil engineering projects
 - Founded NCG in 1991
 - 13 years of experience advising transportation agencies on construction of major infrastructure projects
 - Numerous awards of excellence from public agencies
 - Published articles in Civil Engineering; Construction Methods; ENR; ASBI
 - Representative projects
 - Woodrow Wilson Bridge, WA DC
 - Maumee Bridge, Toledo, OH
 - Dames Point Bridge, Jacksonville, FL
 - San Francisco to Oakland Bay Bridge, east span replacement, CA
 - I70, New Mississippi Bridge, St. Louis, MI

- Alameda Corridor, Los Angeles, CA
 - I405, Seattle, WA
 - Gerald Desmond Bridge, Long Beach, CA
- Paul Silvestri's team created a constant pier construction methodology for all bridge types to avoid/minimize environmental impacts and accommodate the in-water work window (July 1 to October 31). The conceptual construction method includes:
 - Installing a temporary access way (trestle) out to each pier location
 - Trestle fabricated from pipe piles at about 100 feet on-center.
 - Floor beams are installed between the pipe piles.
 - Precast concrete planks are supported from the floor beams to create a work platform.
 - Pier construction
 - Install a cofferdam constructed of sheet piles.
 - Fill cofferdam with sand to isolate work area – create a sand island.
 - Install piles using a rotary method instead of driving.
- Benefits from using this conceptual method:
 - Minimize use of barges to reduce disturbance of river bed (contaminated media) caused by their anchorage systems (spuds).
 - Sand island significantly reduces noise and vibration during pile installation.
 - Sand island reduces the need for continuous dewatering.
 - Rotary pile installation significantly reduces noise and vibration during pile installation compared to pile driving.
 - Rotary pile installation accommodates unforeseen subsurface geological conditions, such as boulders, and minimizes schedule impacts compared to pile driving.
 - Method minimizes added labor costs for working on the water (Jones Act/Longshoreman Workman's compensation rates add approximately 10%) .
- Bob Durgan asked about how much staging area might be needed for the construction. Paul thought about 4 acres would be ideal. Sean Batty said the current LPA estimate has about 10 acres for staging.
- Bob Durgan reminded staff that as of 2010 the river in this area needs to be capped because of contamination and no one is supposed to touch it. TriMet and DEQ need to get together to discuss this issue ASAP.
- Paul Silvestri commented that three separate people went over these bridge types independently and then came together with their opinion on risk, constructability and cost.
- Paul went over his team's findings:

Cable Stay 4 pier

- This bridge type has been built numerous times in the US and they are familiar with it.

- Paul is suggesting building this bridge with 2 piers. Sean Batty remarked that there are other reasons to have 4 piers.
- Shortest duration for construction (by a month or two) (30-33 months)
- Reduced volatility for superstructure because there are no steel plates.
- Work both sides of the river at the same time to help with schedule.
- Estimated using a balanced cantilevered method and form travelers instead of building from falsework. The reduced clearance for the travelers will need to be coordinated with river users and the US Coast Guard.
- The hollow tower above deck is needed for access. Providing this access has challenges but methods to address them is well known.

Cable Stay 2 pier

- Estimated using a balanced cantilevered method and form travelers instead of on falsework. The reduced clearance for the travelers will need to be coordinated with river users and the US Coast Guard.
- Side cantilevers can cause construction problems when located outside of stay cable anchorage location.
- Takes longer to build (33-36 months).
- Estimated using a balanced cantilevered method and form travelers instead of from falsework. The reduced clearance for the travelers will need to be coordinated with river users and the US Coast Guard.
- The hollow tower above deck is needed for access. Providing this access has challenges, but methods to address them are well known.

Through Arch

- Foundations and access trestle remain the same
- Build the back spans cast-in-place
- Use falsework to build v-piers
- Three options are available for construction of the superstructure. Build from falsework in the river, build from falsework near the rivers edge and float into place, or build on adjacent land. NCG estimated the river falsework method.
- Problems with volatility of the arch material (steel)
- More exposure to river when building arch on site (might be other options to explore).

Wave Frame

- Foundations and access trestle remain the same
- Initial concept for construction of the bridge superstructure was balanced cantilever – similar to the cable stayed but using barges.
- NCG did not agree with the erection scheme and recommended building it from falsework
- Miguel Rosales and Paul Silvestri need to discuss the different erection schemes and come up with a common understanding of how to best construct this bridge type.

- Paul's team believes using falsework is the safest and fastest approach and benefits the design of this structure.
- Building from falsework would eliminate 60% of complex and highly specialized field welds and reduces labor costs by limiting the 10% adder for work on the water (Jones Act Longshoreman Workman's compensation rates).
- There are concerns about how the superstructure is held in the correct alignment during construction. It might need a temporary tower to maintain the cantilever in the correct horizontal, lateral and vertical position.
- This bridge type uses high performance steel, which is available from only one supplier in the US. Price is very volatile and well beyond normal escalation considerations. Schedule risk is high – high performance steel is a special run. The steel plates are 4-inches thick which is the maximum thickness produced and allowed by current US code. Welding 4-inch thick high performance steel plates together into box girders is very time consuming and requires highly skilled labor. Discussion about steel market in general and how volatile it is at this point in time. Steel in Through Arch is grade 50 and less volatile than the high performance steel.
- This bridge also uses a cast in place concrete beam on each side of the roadway. The concrete "T" beam to wave frame girder connection is very complex. Issues associated with shrinkage, creep, conflicts between the mass concrete cooling ducts, post tensioning ducts, reinforcing steel, temporary form traveler hanging rods and connection to the cantilevered sidewalk need to be addresses. The concrete placing approach for the superstructure is extremely complex and prone to schedule slippage and long-term maintenance requirements.

NCG – Report out on Cost Estimates

- NCG generated cost estimates using a contractor method. They generated labor rates, permanent and temporary construction material costs, equipment rates, crew sizes and production rates.
- The Working Group went over the cost estimate matrix, defined all the various components and reviewed the risks/costs associated with constructing each bridge type. Rob Barnard asked the Working Group to keep in mind that the costs were received yesterday from NCG and they are still under review. Paul Silvestri and Miguel Rosales still need to discuss the Wave Frame construction methodology, verify quantities and baseline assumptions.
- The current budget for the bridge is \$82,302,000 (1,720' long by 66' wide by \$725/SF). All bridge types except the Cable Stay 4 pier ended up over budget in the initial cost estimate.
- Teresa Boyle has requested the mitigation line item for the budget and Sean Batty has agreed to send that to her.
- There is a list of items that are not included in the NCG estimate which still need to be incorporated into the cost of the bridge.

- Teresa Boyle feels like the desire to add path width should not be on the same list as utility relocation. It should be listed as a betterment as opposed to a risk.
- Bob Durgan brought up a west side greenway cost that would be likely because of future plans in this area. Sean Batty agreed that there is a likely unaccounted for risk in both the Wave Frame and the Cable Stay 4 pier for the 3 to 1 cut in top of bank.
- Miguel Rosales took an opportunity to speak about the process Phillip Wenger's team with Schlaich Bergermann undertook to better understand the Wave Frame. Their cost estimate was half that of NCG's and that is a huge difference. Although it was not generated from the ground up like NCG's construction style estimate, they need to better understand the construction methodology and other assumptions used. They came to the conclusion that the Cable Stay and the Wave Frame would cost about the same to construct. Miguel talked to the people who have built other Wave Frames before. They feel like the cost per square foot NCG came out with is extremely high. The two differences of opinion need to be reconciled. The biggest issues are steel production, availability, welding, etc and the construction methodology, and perhaps labor cost as well.
- Steve Barrett reminded the group that the other wave frame bridges that have been built are not the same as the one proposed. The proposed bridge is a totally different structure type and one of a kind and has never been built before.
- Bob Durgan recommended not showing the cost estimates to the WRBAC if both Miguel Rosales and Paul Silvestri disagree fundamentally about the Wave Frame cost estimate. More time is needed to review and refine the cost estimates.
- Bob Durgan has an issue with the Design Contingency percentage difference between the Wave Frame and the Cable Stay bridge types. He believes that the difference is too great.
- Teresa Boyle also believes that the cost estimates should not be shown to the WRBAC tomorrow. There are still many questions left to answer.
- Bob Durgan reminded the Working Group that the bridge is but one part of a much larger project. The bridge cannot go over the budget in order for the project to move forward.
- Dave Tertadian agreed that is why we need the estimate to be accurate.
- Teresa Boyle understands that the Wave Frame has more risk than other bridge types, but the cost estimate does not show those risks accurately.
- Rob Barnard explained that materials, equipment and labor were the basic categories used to determine the quantity based construction cost estimate.
- Ann Becklund stated that another WRBAC meeting could be scheduled and the report out tomorrow could discuss risk and not the actual cost estimate numbers.
- Troy Doss said this process has been fast, but very thorough and transparent. He feels confident that the bridge type that is selected will be one he can stand behind – whether it's his favorite or not – because of a solid democratic process.
- If only one bridge type is selected, then the public process is different. If the process results in only one bridge type being viable for the needs of this crossing, there are many items that public input will be needed on.
- The Working Group discussed the best way to move forward with the WRBAC and the narrowing process from here forward.

Next Steps:

- Paul Silvestri and Miguel Rosales need to discuss the Wave Frame construction methodology.
- Consultants and staff need to do further analysis on the cost estimates and report out on that analysis at the December 11 WRBAC meeting.
- Teresa Boyle has requested the mitigation line item for the budget and Sean Batty has agreed to send that to her.

SUMMARY

- Rob Barnard went over proposed presentation for the WRBAC meeting tomorrow. He introduced Paul Silvestri and Paul went over his risk, constructability and cost analysis.
 - Foundations
 - Paul explained how his team normalized the pier construction across bridge types using access trestles and cofferdams.
 - Materials
 - Discussed risk associated with high performance steel (few suppliers, one U.S. roller, volatile global price and schedule).
 - Fabrication
 - Discussion about on site construction of superstructures and field welds vs. off site construction and transportability
- Paul Silvestri's team did not address risks of navigational and environmental permitting, both schedule and mitigation requirements.
- The balanced cantilever methodology was not viewed as the safest, so the NCG team decided to build some of the superstructures using falsework.
 - There would be several months of a 150 feet horizontal clearance on the river while constructing some of the bridge types. This has implications to river users and the environment (because of temporary piers).
 - Cost of falsework is less of an issue now because there is sizable falsework available.
- Rob Barnard went over the cost analysis/estimates. These will not be shown tomorrow at the WRBAC meeting. They are in draft form and need further analysis by staff.
 - Design contingency still has some questions surrounding it.
 - David Knowles asked why the design contingency is so much higher for the Wave Frame than any other bridge type?
 - Paul Silvestri explained that the Wave Frame is a prototype bridge and there are erection and connection issues.
 - Neil McFarlane asked about construction schedule. Paul Silvestri and Rob Barnard said the construction schedule for the cable stayed four pier is around 30-33 months plus 5 months of design and 3 months of procurement.
 - Miguel Rosales restated his surprise at the cost estimate figures and looks forward to having a detailed discussion with Paul Silvestri about his team's assumptions.

- Neil McFarlane emphasized that the process needs to be transparent. We all need to fully understand the numbers and agree that the numbers are based on fact – even if there is a difference of opinion.
- Rob Barnard suggested that the WRBAC meeting should change from a recommendation of the “few” to an update on the process so far and the risks associated with each bridge type as well as some constructability information.
- Troy Doss suggested putting the two arch bridge types on the table tomorrow. They didn’t rank well on most categories, they have extra cost because of utility relocation, and they have thicker decks with greenway implications and four piers in the water versus two.
- The WRBAC most likely won’t feel comfortable eliminating any bridge types without cost information, but let’s wait and see what the committee decides.
- Ann Becklund suggested decoupling the Open House and the WRBAC meeting on December 11th in order to discuss the cost information and come to a final recommendation.