AGC/WSDOT Structures Team Minutes
21 Sep 2007

Members

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Guests

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The meeting started at 09:00.

1. Constructability Review of Sound Transit University Link

The project team for the University Link light rail presented the Type, Size, and Location (TS&L) for a project to remove portions of existing cylinder walls approximately 30 to 50 feet below grade, and construct 4 pits for tunnel boring machine (TBM) work under I-5 as part of the Sound Transit's University Link Project. This work is within the ramps adjacent to I-5 in the vicinity of the Pine St and Boren Ave. bridges. The project constructs 4 access pits, 2 each side of I-5, as follows:

- Construct series of 3'-6" diameter tangent piles to create box-like walls for pits.
- Expose existing cylinder pile walls and create access openings through them by demolishing portions of the existing 10 ft diameter cylinder shafts and adding tiebacks.
- Backfill completed pits with CDF, restore pavement, and await arrival of TBM in subsequent contract.

Following the presentation, the project team provided the presentation as handout and asked the team to assist with a set of questions. Questions with team responses follow:

1. *Will the local construction contractor be interested in the project?* Yes, but the attractiveness is contingent on answers to subsequent questions.
2. *Will the prime contractor be a drilling form or a general contractor?* The team was unanimous in their view that the prime contractor would be a general contractor based on the level of work that accompanies the tangent pile and tieback work that will be the responsibility of a driller.
3. *In broad and general terms, what are the affects on construction schedule and cost if the ramps are closed for an extended period of time, or if 1 lane of traffic is required to be maintained?* Although there was considerable discussion, Contractors generally agreed that the proposed staging area was inadequate and that ramp closure would be required for several extended periods of time to reasonably accomplish the work and be safe, fast, and cost-effective.
4. *What is perceived to be the greatest risk?* Contractors disagreed on the single greatest risk, but discussed settlement of I-5 and adjacent structures, groundwater and surface water impacts, maintenance of traffic (MOT), and availability of labor if work windows are restricted to abnormal shifts.
5. *Is there sufficient room to accomplish the work?* No, closure of the ramp is required.
6. *What can be done to make the project more attractive to the contracting community?* Attractiveness will be increased by providing adequate access and staging for construction crews and equipment, allowing work within normal work windows or at off-peak times for an extended period of time (avoid continuously shifting work windows), address affects of groundwater and mitigate risk.
7. *How will tiebacks be installed 30 feet above the roadway surface?* Discussion centered on whether or not this work could be accomplished from above or below the level of tiebacks and associated available work space and right of way for the tiebacks under adjacent private property. Contractors generally agreed

that the drilling work would occur from the front face of the wall, i.e. below, and would require extended closure of the adjacent ramps to allow drill rig access.

8. *What obstacles does demolition of a 10 ft diameter concrete shaft with a 9 foot deep steel beam embedded in it pose?* Contractors requested that the project office investigate the condition of the existing shaft concrete, i.e. what is the strength and is there any additional reinforcing? If the concrete is normal strength, Contractors agree that typical demolition methods may be effectively employed. Members suggested that they might core drill to control the cylinder pile demolition process.

Action Item: No further action by the team.

2. Underwater Pile Driving Impacts

Rhonda Brooks and Jim Laughlin provided a handout and presented WSDOT research into methods to mitigate noise of pile driving operations in waterways for the purposes of minimizing adverse effects on salmonids, other fish species, marine mammals, and diving sea birds. The presentation described methods currently employed and compared their effectiveness as summarized in a 2007 study by Dr. Tom Carlson, Pacific Northwest Laboratories, entitled *Dynamic Pile Driving and Pile Driving Underwater Impulsive Sound.* Jim described how recent fish kills at WSDOT Ferry Terminals and at CalTrans bridge construction sites had increased the emphasis on this topic and had resulted in some reduced requirements based on increased knowledge about the necessary thresholds.

Jim further expressed WSDOT's interest to find improved mitigation methods and to better understand the effects of the various parameters in the pile driving process, i.e. hammer stroke length, number of blows, and consistency of the process.

Discussion included the following:

- Typical mitigation methods are:
  - i. unconfined bubble curtain using series of stainless steel hinged rings with holes and gasket at seabed
  - ii. confined bubble curtain using added secondary casing with bubbles between secondary casing and driven pile
  - iii. steel casing with sealed air void between driven pile and casing (results in approx 17 dB noise reduction)
  - iv. steel casing with foam attached (results in approx 20 dB noise reduction)
  - v. variation of pile driving cushions or caps
  - vi. dry coffer dams
  - vii. timing
  - viii. driving above MHHW line
  - ix. vibratory drive finished with impact to determine capacity
- Fish kill indicators include presence of dead fish or presence of predatory birds

- Typical noise reduction for mitigation methods is 15-20dB, where total pile driving noise can be up to 200 dB. However, this dB reduction (based on logarithmic scale) can be up to 50% reduction in energy transmitted into the water.
- Vibratory driving has peak of approx 180 dB. Impact has peak of approx 210 dB. WSDOT prefers vibratory driving due to lack of impulsive energy transmission.
- Diesel pile hammers have discrete fuel settings and are not infinitely adjustable.
- Upper limit on hammer energy is approx 60,000 ft-lb.
- Concrete piles with wooden caps have reduced noise, but increased number of blows and the net benefit is not well documented.
- Noise level drops approx 4.5 dB per doubling of distance away from the noise source in typical water conditions.
- Bubble curtain is preferred for smaller diameter (less than 30 inches) piles.
- Bubble curtains or foam-lined casing is preferred for larger diameter piles.
- Noise doesn't transmit in waters with depth less than 2 ft.
- It is predicted that new WSDOT standards will be thresholds of 187-193 dB.
- Team recommended use of theoretical (computational) models to evaluate alternative mitigation methods in conjunction with good field test practices.

Action Item: Team members are requested to provide recommendations to WSDOT for alternative mitigation techniques.

3. Constructability Review of George Sellar Bridge Widening

Kevin Waligorski, WSDOT North Central Region Project Engineer, presented an upcoming WSDOT project to modify the existing George Sellar Bridge, joining Wenatchee and East Wenatchee, by adding an eastbound lane and a designated pedestrian walkway to the structure. The existing structure has the following pertinent characteristics:

- Current bridge configuration is 4 ea 12 ft wide lanes and a 5 foot cantilevered sidewalk (no deck beneath) on both sides. The bridge has concrete approach spans and a center steel truss span, for a total bridge length of 1208 ft.
- The bridge was constructed in 1950 and is considered a historic structure with associated stewardship from the state historic preservation office (SHPO).
- Traffic volume is approx 55,000 vehicles per day.
- The bridge is 1 of only 2 access points into Wenatchee.
- This project is part of a corridor improvement that will add importance to completion schedule.

The construction for this project is scheduled to start in spring 2009 with 2 season duration and includes the following primary structural tasks:

- Both cantilevered sidewalks and rail will be removed and replaced with widened deck with concrete barrier and a new 10ft wide sidewalk on the south.

- Center span portal and sway frames will be modified and strengthened to increase vertical clearance and support widened structure.
- The end span fascia panel will be breached for the pedestrian path.

After thorough discussion of existing site conditions and preliminary design plans, designers posed the following questions to the AGC team:

- What are the cost, duration, and risk implications of keeping **four** lanes versus **three** of traffic open during construction?
    i. **Four** open lanes – lanes are 10 ft wide with no offset from sidewalk or barrier and construction activities occur within 12 ft wide lane.
    ii. **Three** open lanes – lanes are 11 ft wide with 2 ft offset from sidewalk and barrier and construction activities occur within 15 ft wide lane.
- What work shifts would be feasible to expedite the construction of this project, i.e. multiple daytime work shifts with multiple crews, night work, etc? Could the project be done in a single season and if so, what is impact to project cost?

Discussion included the following:

- Members felt that their construction activities were limited almost equally by 12ft width or 15 ft width, so the four lane width should be considered.
- Alternately, team members recommend use of movable (zipper) barrier to get 4 lanes open for traffic during peak hours and three lanes at other times to maximize construction space with minimized traffic impact. Adequate lane take could be from 7:00 pm - 6:00 am.
- Contractors strongly recommended using a standard shifting system, i.e. do all work at night or in daytime, but limit changing shifts. Skilled labor will be difficult to get at this location, particularly for the truss modifications, and that will be exacerbated if the work schedule is unattractive.
- Members considered this a 2 season project, particularly in light of the need to schedule adjacent construction projects based on the timeline for this work, i.e. early completion is possible, but should not be incorporated into a schedule for other activities.
- Recommend precast panels be evaluated for deck widening.
- Existing sidewalk is not rated for construction loads and could not be used for added lay-down or access. Members recommended expediting evaluating accelerated construction methods for north side to increase available lane widths during south side work.
- Sidewalk is designed for full vehicular live load to allow maintenance access and WSDOT inspection by Under Bridge Inspection Truck (UBIT). Team members questioned the effect on the edge girder of the sidewalk extension and recommended evaluation of reduced weight system, possibly prefabricated.
- Truck deliveries of materials to the bridge require width of 20ft to 24 ft, so neither proposed lane configuration is adequate for deliveries. Therefore, added lane takes should be planned and use of movable barrier becomes increasingly important.
- Team recommends monetary incentive for early completion and for making more lanes available.

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Action Item: No further action by the team.

4. WSDOT's New Project Management & Delivery Sytem – What Should the Construction Industry Expect?

Cathy Hastie, WSDOT Southwest Region Consultant Program Manager, presented an overview of changes occurring within WSDOT with implementation of recommendations from the Statewide Program Management Group (SPMG). Cathy focused her discussion on changes pertinent to Contractor interaction with WSDOT during design, bidding, and construction.

Discussion included the following:

- SPMG Goal is to train staff and improve software tools.
- New software will be deployed within WSDOT between 2007 – 2009, and all staff will have necessary training by 2010.
- Delivery budget for the state's capital improvement program (hwys, ferries, etc.) has tripled due to Nickel and TPA taxes to $15 billion over 15 years.
- WSDOT is updating software for critical path scheduling, earned value reporting, and use of electronic forms with associated validation and approval using electronic signatures.
- Entities working with WSDOT work will be required to use electronic forms. Those relevant to construction include Inspector's Daily Report (IDR), Change Order (CO), Requests for Information (RFI), pay notes, shop drawings, as-built drawings, and etc...
- WSDOT understand and intends these changes to also assist those working with the agency. Benefits to Contractors will include consistent management and reporting and more efficient review processes.

Action Item: No further action by the team.

The meeting was adjourned at 12:00.

The next meetings are scheduled for **19 Oct 07** and **30 Nov 07**.