# ADSC/WSDOT Joint Meeting

May 4th, 2017, 8:30 A.M. - 11:30 A.M.
WSDOT Lakewood Maintenance Facility

## Meeting Minutes

| Attended | Member | Company | Phone | E-mail |
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| X | Aldrich, Brian[1] | WSDOT – HQ | 360-705-7828 | aldricb@wsdot.wa.gov |
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| X | Dinneen, Molly | DeWitt | 360-576-8755 | molly@dewittconst.com |
| | Ellis, Susan | FHWA | 360-753-9412 | Susan.Ellis@dot.gov |
| X | Frye, Mark | WSDOT | 360-709-5469 | fryem@wsdot.wa.gov |
| X | Gaines, Mark | WSDOT | 360-705-7827 | gainesm@wsdot.wa.gov |
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| | Lehman, Debbie | FHWA | 360-753-9482 | Debbie.Lehmann@dot.gov |
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| X | Topham, Dale | Snohomish Co. | 425-388-6668 | dale.topham@snoco.org |
| | Tuttle, John | Sinclair | 661-212-1223 | jtuttle@sinclairwp.com |

1 Team co-chair

## Guests

| | | | |
|---|---|---|---|
| Jim Zammataro | Pile Dynamics, Inc. | 216-470-2291 | JZammataro@pile.com |
| Kevin Dahl | WSDOT | 360-538-8506 | dahlk@wsdot.wa.gov |
| John Romero | WSDOT | 360-538-8502 | romeroj@wsdot.wa.gov |
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| Brian Maythaler | Kiewit | 360-953-7551 | Brian.Maythaler@kiewit.com |

## 1. Welcome/Review of Agenda

Mark Gaines opened the meeting and provided a quick review of the agenda. There were several guests in attendance so introductions were quickly made. Mark asked if there were any further agenda items to add, but none were suggested.

## 2. Membership update

Amy Leland is a new team member representing the WSDOT Bridge Office and replacing Anthony Mizumori. Anthony was recently promoted to the Concrete Specialist position within the WSDOT Bridge Office. The responsibility of maintaining the Bridge Design Manual Chapter 7 (Substructure Design) has been transferred from Anthony to Amy.

Jerry Moore will be a new team member representing the WSDOT HQ Construction Office. Jerry is serving as a rotational Assistant State Construction Engineer and was formerly the Port Angeles Project Engineer. He is replacing Marco Foster.

Following this meeting, Brian Aldrich from the WSDOT HQ Construction Office will be replacing Mark Gaines as a new co-chair of the ADSC/WSDOT Joint Meeting with Tom Armour. Brian Aldrich has been the Concrete Specialist in the WSDOT Bridge Office and is the co-chair of the AGC/WSDOT Structures Team. Mark will continue to participate as time allows.

## 3. S. Lander Street Constructability Update

This City of Seattle project was reviewed at the previous ADSC/WSDOT meeting. After the last meeting, the project team provided additional questions which were subsequently answered by the ADSC team members via email. These answers were reviewed with the team. The questions and associated answers were as follows:

*1. What are the construction concerns/risks for the proposed shafts at this project site?*

- The shafts are deep and pushing the edge of the equipment capabilities.

- Adequate protection being provided for the existing sewer and storm mains. The design team needs to address the supports for the oscillator (and other shaft installation equipment) and include in their design.
- Train frequency and BNSF restrictions.
- Traffic plan and access.

*2. Please review and comment on our proposed permanent casing and our requirement for contractor design of the casing thickness.*

- The 1¼" minimum thickness and contractor design requirements indicated in the plans are fine.

*3. Please review and comment on our selected method for allowing 80 ksi reinforcing bars in the drilled shafts. Does this add any value?*

- Added value of less permanent casing.
- Added values from a quality perspective by allowing larger rebar cage windows for a "freer" flow of shaft concrete through the cages.
- Added value by reducing cage weights allowing potentially smaller crane and safer cage picks.

*4. What is the preferred method of testing – Crosshole Sonic Log (CSL) or Thermal Integrity Profiling (TIP). Why?*

- CSL. More local experience with CSL testing. Proven method in this deep of shaft. Less expensive and more reliable.
- Due to the shaft cages being spliced, we won't have the luxury with TIP testing to pull the cage to repair faulty wires.

*5. What is the approximate procurement time needed for the permanent casing?*

- 12 to 16 weeks from approved shop drawings.

*6. What is reasonable construction duration to assume for the four drilled shafts adjacent to the BNSF tracks?*

- 16 to 20 working days depending on the BNSF construction requirements and limitations.

Mark also relayed that he and Tom had some further discussions with the project team with respect to the work windows associated with the railroad track. Initially, the railroad (BNSF) is only allowing two-hour work windows. Mark and Tom both emphasized that this would be unworkable for the Contractor. This might provide enough time to mobilize in and out, but no time for actual drilling work. The project team is going to pursue establishing longer work windows as part of the contract.

Action Items: No action needed.

## 4. Contractor NDT of Drilled Shafts

Jim Zammataro from Pile Dynamics, Inc. presented on Thermal Integrity Profiling (TIP) and CSL testing. WSDOT recognizes both CSL and TIP as appropriate methods for non-destructive testing and acceptance of drilled shafts. Each method has its pros and cons, but both have proven through research and experience to be reliable methods for post-construction shaft evaluation. WSDOT accepts either method for acceptance as part of the Contractor's shaft testing program. TIP and CSL testing both have advantages and limitations.

Advantages of CSL testing include: Long established, available from numerous companies & testing firms; Checks concrete quality inside cage by depth and by quadrant; Tomography available for complicated cases. Limitations / Disadvantages include: Needs access tubes, steel tubes preferred; Wait min 3 days prior to test, 7 days preferred; Cannot evaluate concrete cover; De-bonding, bleed-water channels and other false positives can lead to inconclusive tests and unnecessary coring; Requires time onsite for testing.

Advantages of TIP include: Checks concrete quality inside and outside cage by depth and by quadrant; Test early after casting, which speeds construction and helps cut costs (12 to 72 hours depending on mix design and diameter); Evaluates concrete quality, cover & cage alignment; Avoids false positive issues, no unnecessary coring. Limitations include: Use on wet-cast Drilled shafts, augercast piles; Newer technology, not as many firms doing testing yet; Needs thermal wires; Can test only during early curing; Lack of acceptance criteria until now.

TIP hardware has been updated, including stronger wire, main unit hardware upgrades for faster processing and a new thermal wire test box. Wireless data collection and cloud based access are coming. TIP software is improving as well with addition of a mid-shaft adjustment feature as well as soil layering and landmark info with 3D view of shaft.

The group asked if there is any thermal data on any repairs? Jim was aware of only one case.

The group asked if TIP is being used on WSDOT projects. The consensus is that CSL testing continues to be used instead of TIP. It was mentioned the SR16 HOV Connectors project will be using CSL testing.

Jim asked the group what is holding us back from using TIP? A concern was raised with having to splice cages and thermal wires and that the thermal wires are vulnerable to damage. A more robust thermal wire was recommended.

Jim mentioned that thermal wires can be tested immediately after installation to ensure they are working properly. The new more robust wires have a high success rate.

Pile Dynamics, Inc. is a supplier and can provide names of local operators upon request.

Action Items: Jim will provide additional information to Mark for distribution to the Team.

## 5. SR 107 Chehalis River Bridge Constructability

Jed Bingle from the WSDOT Bridge Design Office presented on this project. The south timber trestle approach for this bridge will be replaced with precast prestressed concrete girders on shaft supported piers. The bridge is located on SR 107 south of US 12 in Montesano, WA. Typical timber span lengths are 19 feet. Piers consist of timber piles that are battered in the plane of the pier, perpendicular to bridge centerline.

The current plan is to construct six new piers adjacent to and underneath a portion of the superstructure that will accommodate one traffic lane. One shaft for each pier would be drilled between the timber bents, and the other would be drilled 2.5' clear from the edge of existing superstructure. Existing superstructure overhead clearance ranges from 18 to 24 feet and lateral clearance between timber pile bents is approximately 16 feet. At Pier 6, there is only about 20 feet horizontal clearance to the top of the riverbank slope. Shafts are anticipated to be 8 to 10 foot in diameter.

The soil profile consists of three main types: Alluvium at the top ranging from 10 to 45 feet; deep, dense, well-graded glacial gravels below that; and very weak siltstone below that. Groundwater is at the surface.

*Question 1: Is 16 ft. between existing timber pier sufficient to construct shafts centered between piers?*
Answer: This is most likely an oscillator job. The 16 foot horizontal clearance is acceptable for shaft construction. However, it would be easier to move both shafts outside of the bridge footprint.

*Question 2: Is 2.5 ft. clearance between edge of shaft and existing timber structure sufficient to construct shaft?*
Answer: The 2.5 foot clearance is acceptable for shaft construction.

*Question 3: Is 20 ft. from the centerline of the shaft to the existing river bank slope sufficient to construct the last pier shaft?*
Answer: No this is not sufficient. The project should allow for driven piles to extend a work platform.

*Question 4: Work trestle or platform?*
Answer: A work trestle or causeway will need to be constructed (approximately 50 feet wide). Causeway pad thickness will have to be determined using a geotechnical engineer.

Action Items: No action needed.

## 6. Constructing a secant pile wall without a fascia

This item was withdrawn from the agenda.

## 7. Elwah River Bridge shaft construction

Chris Bruning (WSDOT Port Angeles Project Engineer) and Thomas Daker (Lead Designer) presented this project which will replace the SR101 bridge over the Elwha River (bridge number 101/334) due to scour caused by dam removal. The new bridge would be located to the north of the existing bridge. They are considering a design with two piers in the river (Alternative A), and another with only one pier in the river (Alternative B). The new bridge piers are estimated to consist of 2 columns at each pier, one column (6 to 10 feet diameter) per shaft with an estimated shaft size between 8 and 12 feet in diameter to accommodate column construction. The currently anticipated embedment into bedrock is 50'.

The WSDOT Geotechnical office conducted a limited subsurface investigation (Borings) to determine conditions below the two existing in-water piers. On the date of the borings it was determined that the west pier has a variable subsurface profile consisting of 4 to 8 feet of sand/gravel (lake deposit) over 6 to 11 feet of cobbles/boulders with basalt encountered 19 feet below the base of the pier seal. The east pier has 3 to 4 feet of sand/gravel (lake deposit) below the base of the pier seal where basalt was encountered.

The following questions were presented and answered by the Task Force:

*Question: Will access be required from both sides of the river or can the equipment traverse across the river in low flows?*
Answer: Access would be required from both sides for the two pier alternative (Alternative A). Access from only one side is acceptable for the one pier alternative (Alternative B).

*Question: Depending on water level, during low flows, would you use crane mats to access? If permits allowed it, would you look at the option of traversing through areas of low flow to cross the channel to dry land where the shafts are located?*
Answer: Crane would most likely be disassembled and reassembled on the other side rather than crossing through the river. It may be possible to traverse across the river if the flows were very low, but it is unlikely that a Contractor would attempt to move a crane or drill rig across the river in this manner.

*Question: What type of working platform would be required for the shaft excavation? Approximate dimensions?*
Answer: If a work trestle is chosen, it will need to consider a potential large debris load from the river.

*Question: Fish window constraint will limit in-water construction to an approximate 2-month period (July 15- September 15). What construction methods are available to achieve pier construction within this period?*
Answer: The team indicated that a 2 month construction window is risky but possible. More information on shaft design is necessary to make a determination. Alternative B with only one pier in the river would be less risky. The team indicated that it may take 2 months just to construct the access and drilled shafts. A work trestle or causeway would also needed for the column/crossbeam construction and girder erection. This will likely require a second work window. Could consider use of precast substructure elements. Could also consider on contract to construct the shafts with a second contract to complete the remainder of construction.

*Question: Can two shafts be drilled simultaneously? Assume 24' shaft center to shaft center at each pier location.*
Answer: Probably not. This would create too congested of a worksite.

*Question: How available is this equipment and is it possible to work on 2 piers simultaneously?*
Answer: This could be possible, but it probably wouldn't add much to the efficiency or reduce the schedule appreciably. While shafts are being constructed at the first pier, access and additional preparations could be completed at the second pier.

*Question: What is the estimated drilling speed for a moderately hard basalt? Will two drilling machines operating simultaneously at each pier be required to meet the proposed schedule?*
Answer: Approximately 1 foot per hour.

Mark encouraged the project team to bring this forward for further review once the design plans are more complete.

Action Items: No action needed.

## 8. Action Items;

### a. OSU study of high-strength bar as shaft reinforcing

As discussed at previous meetings, this project focuses on performance of shafts with high-strength steel reinforcing and permanent casing considered as providing structural capacity. This project is being handled as a collaborative project with contributions from the drilled shaft contracting industry. OSU is reducing the data now. A draft report is scheduled for October and a final report for December.

It was mentioned from the group that there are additional cost and time savings with the reduced number of splices/couplers required.

Action Items: Brian will keep this topic on the agenda for an update at a future meeting.

## b. Providing Grade 80 rebar as an alternative

The WSDOT Bridge Office is investigating providing separate details for using standard 60ksi bars or high strength 80 ksi bars for shaft reinforcing cages. By providing both details on several projects we can determine which option is most economical and is preferred by industry. The Bridge Office is looking for a trial project(s).

Action Items: Amy Leland will find a trial project(s) to include this.

## c. FHWA/Texas A&M base grouting

No new updates. In previous meetings, Tom said the field work is done and the report is being completed. Tom will update at the next meeting. Something is coming in the next few months.

Action Items: Mark will keep on the agenda for the next meeting.

## d. Force Account Obstruction removal rates and cost/time

This item was carried over from the last meeting. The ADSC has not discussed FA rates yet, but they will work on this. Mark also noted that he has not made any progress on how working days are not awarded until the FA dollars are expended. He still has this on his to-do list, but has not made progress on it yet.

Action Items: Brian will include this on the agenda for the next meeting.

## e. Discuss and Review BDM Shaft Section

Several updates to BDM 7.8 Shafts and 7.10 Concrete-Filled Steel Tubes were discussed:

- Designers are instructed to locate the top of in-water shafts above the water line when it simplifies construction.
- Hot dipped galvanized centralizers may be used.
- Casing can be used as a structural element.

The team asked if details using the casing for the shaft reinforcing can be included in projects as an alternate design. It was pointed out that some sort of reinforcing frame may still be necessary for shaft testing equipment, but perhaps not all shafts need be tested.

Amy Leland asked if it would be acceptable to delete the shaft barlist from the plans. The team stated that they like to have it, but it is not necessary. The team members indicated that they calculate this information themselves anyway, but it is good to have the plan barlist quantities there as a check.

Amy Leland asked if it would be acceptable to delete shaft information (such as tip elevation, casing location, etc.) from the Special Provisions when it is already shown in the Plans. This would be to avoid duplication of information. The team was supportive of this idea.

Amy mentioned that there is a new centralizer being considered for approval (Cagecaster by Foundation Technologies, Inc.) and provided a sample. The team indicated that the attachment would likely be the weakness for using it. A "U" bolt was suggested.

The Bridge Office asked if a track changes version of the BDM sections 7.8 through 7.9 can be sent to the team for review and comment.

Action Items: Amy and Brian to circulate BDM revisions for ADSC team review and comment.

## 9. Select future meeting dates

Future meeting date: June 15th.

# ADSC/WSDOT Joint Meeting

September 21st, 2017, 8:30 A.M. - 11:30 A.M.
WSDOT Lakewood Maintenance Facility

## Meeting Minutes

| Attended | Member | Company | Phone | E-mail |
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| X | Aldrich, Brian[1] | WSDOT – HQ | 360-705-7828 | aldricb@wsdot.wa.gov |
| | Allen, Tony | WSDOT | 360-709-5450 | allent@wsdot.wa.gov |
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| | Bauer, Mike | WSDOT | 360-705-7190 | bauerm@wsdot.wa.gov |
| | Bickford, John | DBM | 253-288-1402 | john.bickford@dbmcontractors.com |
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| | Cuthbertson, Jim | WSDOT | 360-709-5452 | cuthbej@wsdot.wa.gov |
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| | Tuttle, John | Sinclair | 661-212-1223 | jtuttle@sinclairwp.com |

1 Team co-chair

## Guests

| | | | |
|---|---|---|---|
| Chase Chappelle | DMI Drilling | 206-793-4471 | chase@dmidrilling.com |
| Jim Close | Con-Tech Systems | 253-381-1847 | jclose@contechsystems.com |

## 1. Welcome/Review of Agenda

Brian Aldrich opened the meeting and provided a quick review of the agenda. Every one introduced themselves. Brian asked if there were any further agenda items to add, but none were suggested.

## 2. Approval of Minutes

The members had no further comments or edits for May 4th meeting minutes.

## 3. Shotcrete Phase 1 Report Update

Phase 1 presents a comparison of shotcrete mix design to concrete mix design. Next phase is to do a comparison test of when shot.

Test results showed reduced shrinkage with longer water cure times and shrinkage was low when using curing compound. The groups question was on curing process. Which surfaces of the shotcrete samples was the curing method applied, was it all surfaces or just the face? Were the same surfaces cured by both methods on the test samples?

In the future, there will need to be a comparison of shrinkage test methods for developing acceptance testing, a durability test to compare cure method for shotcrete, and testing to compare shotcrete to concrete performance.

Thoughts and Comments for Phase 2

- Look at impacts of joints
- Look at cold joints of layers of shotcrete. There is some advantage to place the outer layer separately when the surface included architectural features.
- Look at east and west side differences. East side typically has crushed rock for shotcrete while the west side has round rock.
- Steel fibers are not desirable. They are hard on equipment and there are constructability issues.
- Water cure is problematic environmentally. Utilization of curing compound eliminated this problem. Contractors want the curing compound option.
- The City of Seattle has done some shotcrete testing already, including cold joints

Action Items: No action needed.

## 4. High Strength Rebar Presentation – Con-Tech Systems

Jim Close gave a presentation on the utilization of high strength rebar on drilled shafts.

High strength rebar is used on the east coast and used in San Francisco in the building industry.

Some of the benefits are:

- Larger spaces or openings between rebar which allows easier flow of concrete to the outside of the cage.
- The rebar is stiffer. This reduces or eliminates interior bracing of the rebar cage.
- The rebar cage is stiffer. This reduces the number of pick points when lifting the rebar cage.
- The rebar is threaded the entire length. This allows mechanical rebar splices at any location and the fastening of a steel lifting/template ring rigidly at a specific location.
- The rebar cage is lighter.
- The threaded rebar with mechanical splices allows assembling of cage sections in a shop, shipping the sections to the job site, and easy and quick splicing of the sections in the field.
- The rebar cage is comparable in price. The steel is more expensive but the cage fabrication labor is less.
- Because the rebar cage is lighter, stiffer, and has fewer pieces of steel to assemble, it is safer to use.
- The rebar meets A706 requirements.

Jim also noted that Con-Tech has hollow rebar for CSL and TIP testing. They hold the patent on this product.

A question was asked: does the coupler meet the 150% strength test? What is the strength test requirement? Jim said it does meet the strength test requirements. Brian noted that WSDOT spec requires the coupler meet 125% of the yield strength of the rebar.

A question was asked: does the spiral rebar have to be grade 80? No, grade 60 rebar is acceptable in this application.

Action Items: No action needed.

## 5. Previously Listed Action Items

### *a. OSU Study of high-strength bar as shaft reinforcement*

The OSU paper has been forwarded to the group. There is more value in having the paper presented to WSDOT, (Bridge and Structure Division).

There is a test study happening on four drilled shafts installed in Oregon.

Final Report coming October 17th.

Action Items: Brian will keep on the agenda for the next meeting.

***b. Providing Grade 80 rebar and CFST as an alternative.***

An earlier presentation discussed the benefits of using grade 80 rebar. The question was asked: will the Department be designing shafts with grade 80 instead of grade 60? Will the Department have a grade 60 rebar shaft design with a note to use X number of grade 80 rebar as a alternative? Will the threaded mechanical splice couplers (as presented earlier) be an issue? WSDOT has two projects going to Ad in the next few months that will allow either Grade 60 or Grade 80 reinforcement for the shaft longitudinal reinforcement. This is done with a note. Lap splices must be verified for adequacy with either grade option, or be double dimensioned. Requirements for mechanical splices are covered in 6-02.3(24)F of the Specifications.

Can one mix and match rebar, that is to build some shafts with grade 60 rebar and others with grade 80? There is currently nothing to prohibit the contractor from mixing the rebar grades as long as the requirements for each grade are met. Efficiency most likely will keep this from occurring.

Action Items: No action needed.

***c. FHWA/Texas A&M Base Grouting***

The study and report are complete and sent to FHWA. The study will be sent out in a couple of weeks. The study looks at the advantage and disadvantage of base grouting as well as feasibility. There have been some test on drilled shafts.

Action Items: Brian will keep on the agenda for the next meeting. Tom will send an early draft to Brian for distribution.

***d. Force Account Obstruction Removal – rates and cost/time.***

The group has not met and are not ready for a presentation.

Action Items: Brian will keep on the agenda for the next meeting. Mark Gaines will continue to investigate the time component.

## 6. Nondestructive Testing of Shafts

Brian noted that WSDOT has made some recent changes to the nondestructive testing of drilled shafts. The new specification transferred the quality assurance (QA) testing to the Contractor and WSDOT does quality verification (QV) testing.

The question was asked: if WSDOT would do the same type of testing as the Contractor? WSDOT only has CSL testing equipment. The TIP test method does not allow for QV because testing would have to be done at the same time and space limitation at the site. WSDOT only does CSL testing per Section 6-09.3(6)A.

There were no other comments on testing experience or issues.

Action Items: No action required.

## 7. AGC/WAPA Feedback on Cost Escalation

Brian did a brief overview of cost escalation comments we have received from AGC/WAPA from the Cost Escalation Summary Sheet. Brian solicited additional comments or thoughts from the team.

One comment was drilled shafts are completed early in the project. Yet they have to hold a bond for retainage or have retainage dollars withheld until the end of the project. This bonding cost is included in their bids that adds no value to the project. If the retainage requirement for drilled shaft work could be released from the prime Contractor, once the shaft work is complete, the Contractor could release the requirement retainage bond for the subcontractor's work. This would lower bids. They realize the retainage bond is a form of insurance.

The team agreed with the cost escalation comment that prices are higher when bid questions are not answered.

The team recommended minimizing phase construction. Multiple mobilizations cost money. Look at ways to reduce mobilizations.

Action Items: No action required.

## 8. 2018 Standard Specifications

Brian informed the group that the 2018 Standard Specification will likely be the last printed version of the Standard Specifications.

Action Items: No action required.

## 9. Select future meeting dates

Meetings will typically be scheduled every 6 weeks and will be canceled if there is not enough to talk about.

There is a need reach out to Design-Build project teams for project reviews.

Future meeting dates: November 2nd
January 11th
February 22nd
April 5th