Washington State Department of Transportation

AGC Associated General Contractors of Washington

AGC/WSDOT Structures Team – Meeting Minutes
January 21, 2022

Attendees

[1] Team co-chair

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Agenda

1	**Welcome / Review of Agenda**	Cuthbertson/Moore
2	**Approval of Previous Meeting Minutes**	Cuthbertson/Moore/All
3	**Project Reviews** A) SR-112 Jim Creek Landslide Repair- Structure concept discussion and steel procurement (rolled sections -vs- rebar). Deep French drain construction option discussion. B) SR-534 Unnamed Trib. To Carpenter Ck-Artesian pressures and dewatering. C) Puyallup River Bridge Truss Demo (ADDED ITEM)	Gabe Taylor Donald Anderson Geoff Swett
4	**Team Membership Changes** Kiewit Bill Binning → Dave Stegeman FHWA Debbie Lehman→ Loren Wilson	Cuthbertson/Binning
5	**Review of 2021 Accomplishments and the Plans for 2022**	Cuthbertson/Moore/All
6	**Bracket Loading on WF Girder Webs** Anthony Mizumori and Rick Brice of Bridge would like to revisit bracket loading on WF girders	Mizumori/Brice
7	**Soldier Pile Backfill**	Cuthbertson/Sargent

Future meeting dates: Mar 4, Apr 15

1 Welcome / Review of Agenda

Cuthbertson started the meeting and went over the agenda. Geoff Swett asked to add a topic to the agenda to discuss the demolition of the Puyallup River truss that was replaced years ago in Olympic Region. This topic was added to the agenda after the project reviews.

2 Approval of Previous Meeting Minutes

Cuthbertson asked for comments and edits to previous minutes. None were offered.

3 Project Reviews

A) SR-112 Jim Creek Landslide Repair- Structure concept discussion and steel procurement (rolled sections -vs- rebar). Deep French drain construction option discussion.

Gabe Taylor an Engineering Geologist from the Geotechnical Office presented a number of solutions they are considering to stabilize a landslide on SR-112 at Jim Creek.

View of landslide on SR-112, structures would be constructed down slope and to the right side of the photo.

Gabe is seeking advice regarding material availability, costs, and constructability so that they can select an alternative for the repair. Options they are considering include:

- Reinforcing with vertical elements to provide shear resistance
    - 22, 5-ft diameter shafts with 10-ft spacing, 80 ft deep
    - 30, 3.5-ft diameter shafts with 7-ft spacing, 80 ft deep
    - 41, H-piles with a 2.5-ft diameter grout column around them, 80 feet deep
- Deep drainage trenches

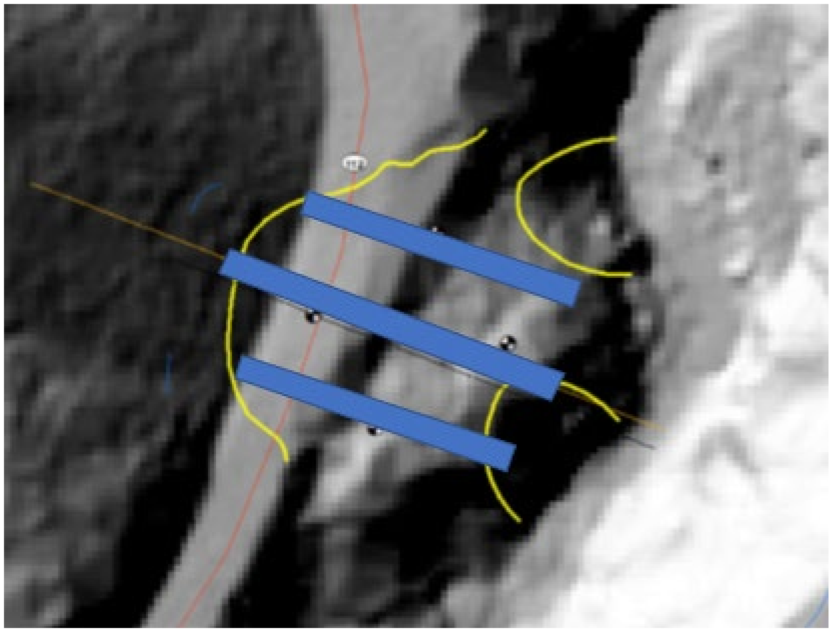
Geoff Swett stated that the Bridge Office could check on availability of rolled sections with some of the local suppliers. He thought that 80-ft piles would need to be spliced and that there would be fabrication time required. Ryan Thody at DBM, thought piles would be available locally and would probably take two weeks to procure and another two weeks to fabricate. He thought the rebar cages would be much faster to fabricate. Ryan also stated that generally wide flange sections are more readily available than H-pile sections.

For construction, Ryan thought the shaft sizes are not different enough that they would influence the machine selection. Any shaft sizes from 2.5 to 5 feet could be drilled with the same piece of equipment. Reach is limited for most drill rigs so they would probably need an access road and work bench to construct the shafts. Plan on a 30 ft wide work bench near horizontal. The flatter the better.

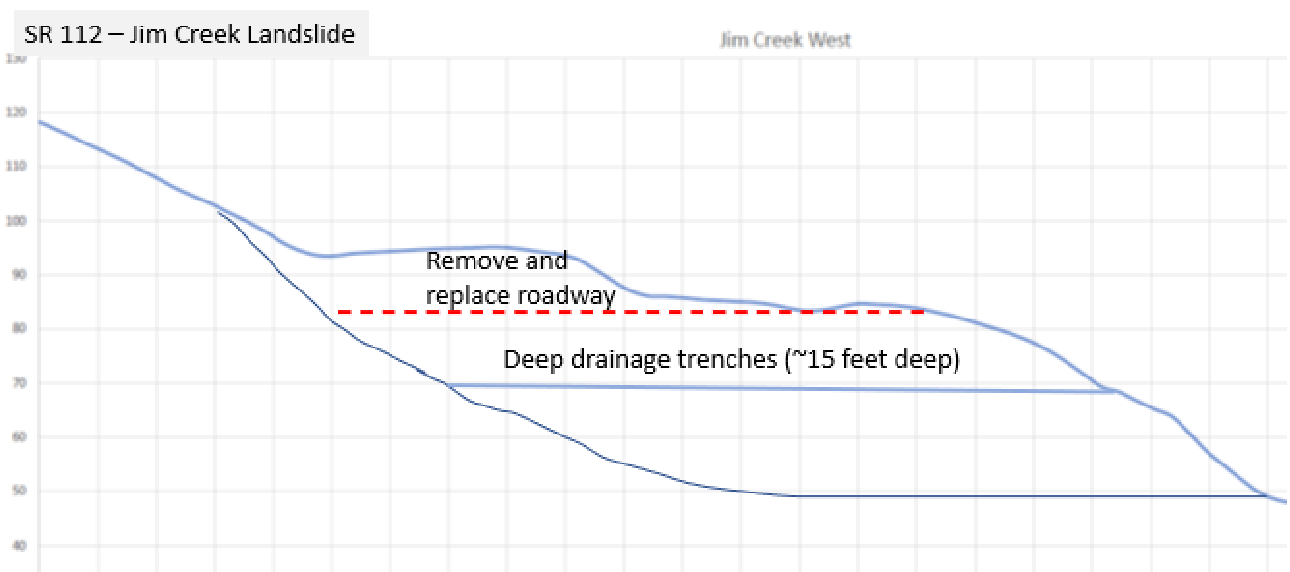
Gabe asked if one structure option or another would have less cost. The team thought the smaller shafts may be quicker even though there are more of them to construct. It was suggested to put both cage and rolled section options in the plans and let the contractors select based on best pricing and availability.

Cuthbertson mention that this would probably be an emergency contract and wanted a gut feel as to if there was more than 30-days worth of work with any of the three structure options. The consensus was it would be right around that 30 day mark.

The drainage option consists of three French drains or rib drains that run perpendicular to the roadway and down slope. They would be roughly 15 feet deep after removing some of the roadway and slide debris.



Plan view showing rib drain concept



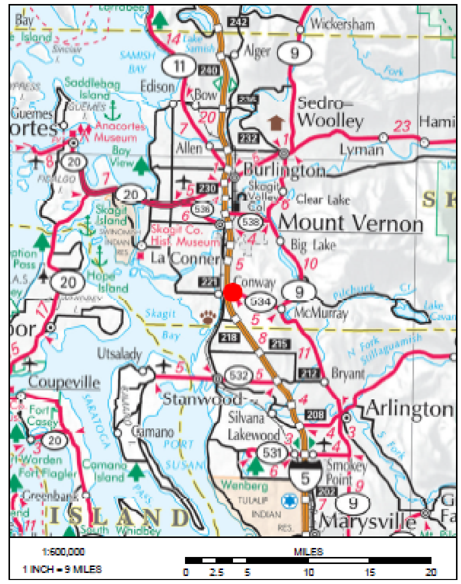
Cross section showing the roadway removal down to the red dashed line, then bottom of trench as the solid blue near horizontal line.

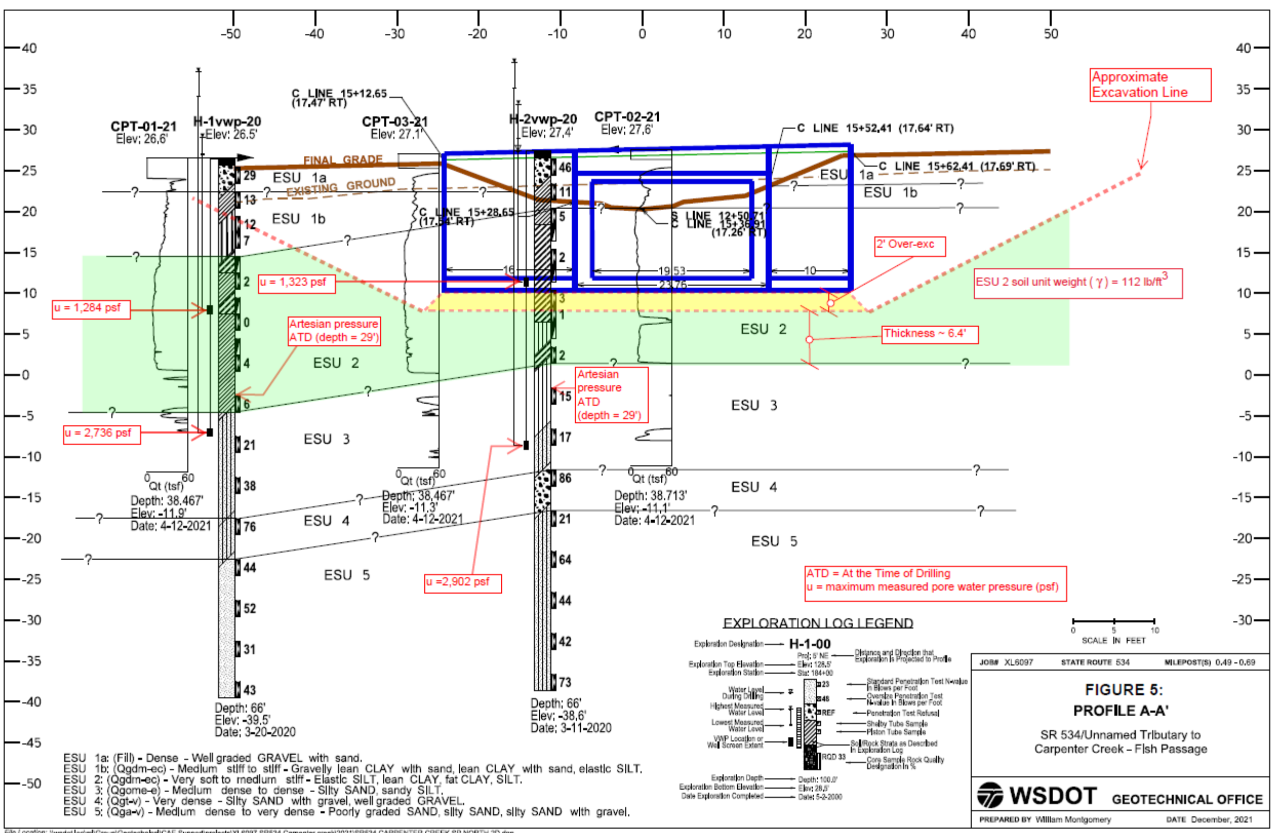
The concept for drains would likely require stacked trench boxes due to the depth of excavation and the slide debris not being expected to stay open and stand especially in a 15 ft deep excavation. Gabe was thinking the trench width would be about the width of a bucket, 3 to 4 feet. Gabe was thinking a long reach excavator would be used to excavate these. The team stated that using a long reached with a stacked box configuration would be difficult. The long reach excavators have less power to drag the boxes when extended. Cuthbertson asked if Gabe had considered using the drilled shaft rig to excavate a series of secant shafts and then backfill those shafts with drain rock to construct the drain. The trench length is roughly 120 feet, with 5 ft diameter shafts, that would be 24 shafts at say 20 feet deep, for 480 lineal feet of excavation. For three trench lines that would be 1,440 ft of drilling. The structural shaft options were, 1,760 ft

– 5 ft shafts, 2,400 ft – 3 ft shafts, and 3,280 ft – 2.5 ft soldier piles. The team thought that the shaft rig constructed drain would be feasible and faster than the other structural options. Based on the feedback Gabe thought that this last option may be the best to pursue.

B) SR-534 Unnamed Trib. To Carpenter Ck-Artesian pressures and dewatering.

Donald Anderson a Geotechnical Engineer from the Geotechnical Office presented on this project which is located south of Mount Vernon. The project will construct a fish passage under SR534. The structure will have a hydraulic opening near 20 ft in width depending on the alignment at which the structure crosses SR534. The skew could increase or decrease this slightly. The right of way along SR534 is not much wider than the existing roadway. There is a historic home about 120 feet west of the crossing and the upper 30 feet of the site soils are soft to medium stiff elastic silts and lean clays. Below the softer near surface soils, there is medium dense to very dense sands and silts, but those soils have measured artesian pressures. The head is as much as 12 ft above the roadway surface. The near surface fine grained soils are providing a cap to the artesian pressure and the structure excavation will remove all but about 6 feet of that capping material. The artesian pressures are significant enough that there is a concern that the bottom of the excavation will not remain stable without depressurization. Dewatering is a concern due to the proximity of the historic structures and the fine-grained nature of the soils.



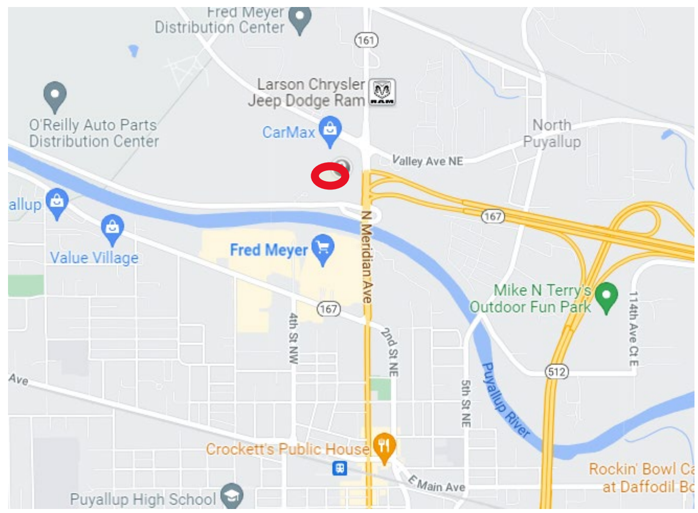


Cuthbertson asked if the geotechs had completed any pump tests at the site. He pointed out that the dewatering system design would likely be the responsibility of the contractor and that they needed to know some basic information like hydraulic conductivity and the potential discharge volumes so they could plan on adequate containment, treatment, and disposal of the discharge. A pump test would also let the geotech assess drawdown and the cone of depression to assess potential risks to the historic structure. Depending upon the hydraulic properties of the site the designer needs to manage effective stress changes at the building. To do that they may need re-injection wells or cut-off walls. Those are expensive and the design team needs to know if they may be needed to adequately estimate the project and contractors need to know that if they are going to adequately bid the project.

Neil Hunt asked Donald why they didn't use an alternate structure like secant pile wall abutments with a lid. A structure like that might not require dewatering construction. Donald stated he thought the right of way constraints may be an issue along with speed of construction. There are no good detour routs so minimizing the road closure duration is a key element. Neil pointed out that dewatering and maintaining the roadway as operational may be an issue. To depressurize the center under the road, you may not be able to do that from the shoulder or edges using angled well points. Other structural options discussed could be combo wall abutments with sheet piles between them for scour protection, or sheet pile abutments. Neil warned about the presence of cobbles and boulders affecting sheet installation. Hamid Nouri also warned about pile driving vibrations affecting the structure.

C) Puyallup River Bridge Truss Demo (Added Agenda Item)

Geoff Swett of the Bridge Office presented a project he is working on. When Olympic region replaced the Puyallup River bridge where SR-167 and SR-161 meet, they removed the old truss and placed it in the NW corner of the interchange. WSDOT hoped that the truss could be repurposed, but nobody seems to want it. Now WSDOT is looking to demo the truss. There is about 380 tons of steel most with lead paint on it. The truss is roughly 60 feet tall at the crown and 370 feet long and 25 feet wide. The deck has been removed, but the floor system and stringers remain. Geoff wanted information regarding demo to help plan the work. Things like crew size, crane size, haul loads, scrap locations, and what may be needed for containment systems associated with lead abatement during cutting.



Truss and aerial truss view.

Geoff asked if the steel would be scrapped in Seattle, and Kevin Cucchiara said he thought there were other facilities closer to the site. Kevin asked if the State would consider the use of shears to cut the truss. That way they could avoid the lead abatement issues associated with torch cutting. Geoff didn't think we would object to that. The pieces would be cut into manageable sizes for trucking and to maintain legal weights. Geoff was wondering if flatbeds or dumpster style truck would be used. Kevin thought that flat beds generally have greater weight capacity, 60,000 lbs upper end, so more dumpster style trucks would be needed, but either would work. As the pieces are cut the shear can handle some of the pieces without support equipment, but there would probably be a need for forklifts and a support crane too. Stuart Moore thought that a demo contractor could come in with a couple of long reach excavators, demo it, and have it removed in about one week.

4 Membership Changes

Bill Binning of Kiewit will be retiring soon and Dave Stegeman will be taking his place on the Structures and ADSC teams. Loren Wilson will be replacing Debbie Lehmann as the FHWA representative on the team.

5 Review of 2021 Accomplishments and the Plan for 2022

AGC WSDOT

STRUCTURES TEAM

2021 Year Accomplishments

- **Constructability Reviews**
  - ✓ **Marsh Rd to 2nd St Widening**
  - ✓ **Montlake Grid Deck Replacement**
  - ✓ **Wishkah River Bridge Mech. Rehab**
  - ✓ **Clallam Co - Tumwater, Lees & Ennis Cr**
  - ✓ **NSC Spokane River O/C – twice**
  - ✓ **SR-9 Snohomish Riv. Br.**
- **Specifications and Issues to Address**
  - ✓ **6-02.3(25) Prestressed Conc. Girders**
  - ✓ **6-02.3(26) PT Concrete**
  - ✓ **AIT Composite Arch GSP**
- **Briefings**
  - ✓ **Standard plan buried structures**
  - ✓ **Dextra CSL Tubes**
  - ✓ **Bridge Scour Policy**
  - ✓ **Sheet Pile Abutments**

Focus Areas for 2022

- **Continue Constructability Reviews**
- **Specifications and Issues to Address**
  - – **Geofoam fill GSP Development**
  - – **Girder erection and stability**
  - – **6-20 Precast Structure Procurement (FP)**
  - – **Add Dextra CSL tubes to 6-18**
  - – **Discuss ways to simplify design and expand the use of GRS-IBS in WA**
  - – **Review NDT requirements for Shafts**
- **Briefings**
  - – **Fiber reinforced bridge deck**
  - – **Shotcrete bond properties (Phase 3)**

2021 Summary

Constructability reviews:

The team provided constructability advice on the identified projects which resulted in the design offices making significant changes to their projects to improve constructability, reduce risk, save time, and potentially reduce project costs.

Major Spec Revisions:

The Team suggested revisions to 6-02.3(25) Prestressed Girders to addresses concerns with girder stability and sweep during construction, pushing span limits, and providing more girders with larger span / depth ratio. The Team also suggested revisions to 6-02.3(26) Cast-In-Place Prestressed Concrete to line up the requirements with the latest PTI specifications, and the Team helped develop a GSP for AIT Composite Arch. The GSP specifically allows AIT composite arch for buried structures.

Briefings:

Standard Plans for Buried Structures – Bijan gave a presentation regarding the work they're doing to standardize precast buried structures, including headwalls and wingwalls

Dextra CSL Tubes – Email review to see if primes would be interested in using these CSL tubes. Lightweight. Push-fit technology. Less workers to install into rebar cage. Specs are currently written around schedule 40 pipe in Division 9.

Bridge Scour Policy - Bridge Scour Policy was reviewed with the Team.

Sheet Pile Abutments – Nucor Skyline Steel has been working to expand the use of sheet pile abutments nationwide. They have the potential to be a valuable tool that WSDOT can use to help deliver the Fish Passage Program.

<u>2022 Plan</u>

- **Continue Constructability Reviews –** Based on past successes
- **Specifications and Issues to Address**
  - **Geofoam fill GSP Development –** A need for this GSP has been identified
  - **Girder erection and stability –** Continue the discussion especially about installing overhang brackets before picking and setting.
  - **6-20 Precast Structure Procurement (FP) –** Continue discussion on ways to streamline and make procurement easier and faster.
  - **Add Dextra CSL tubes to 6-18 –** Need to suggest revised spec language to allow their use.
  - **Discuss ways to simplify design and expand the use of GRS-IBS in WA –** GRS-IBS could be useful in helping deliver the Fish Passage program. The Team would like to make GRS-IBS easier to do.
  - **Review NDT requirements for Shafts –** Non-destructive Testing for shafts particularly on DB projects needs to be streamlined. The Team will make suggestions regarding RFP language modifications.

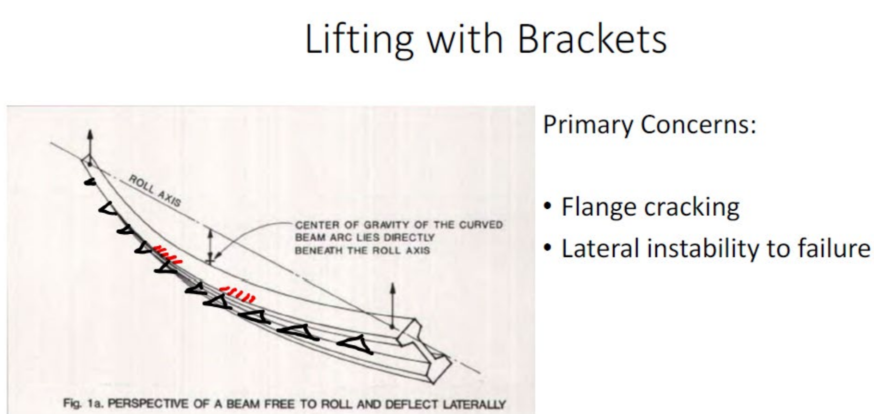
Briefings

Fiber reinforced bridge deck – BSO Anthony Mizumori stated that the Bridge office has two pilot projects identified. Each project has a pair of bridges. The plan is to use fiber reinforced concrete on one and regular class 4000 concrete for bridge decks on the other. The two projects are: Purdy Creek which should be on advertisement November 2021 and I-90 Cabin Ck I/C to west Easton which will be on advertisement January 2022.

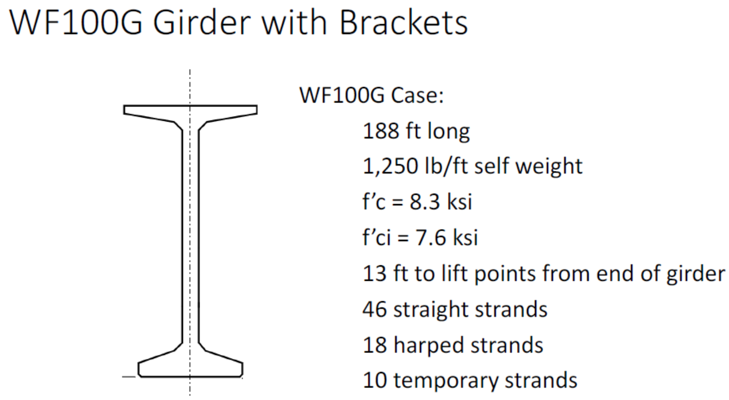
Shotcrete bond properties (Phase 3) - third phase of the shotcrete research that WSU is doing for us. Hope to have an update on their project later his year.

6 Bracket Loading on WF Girder Webs

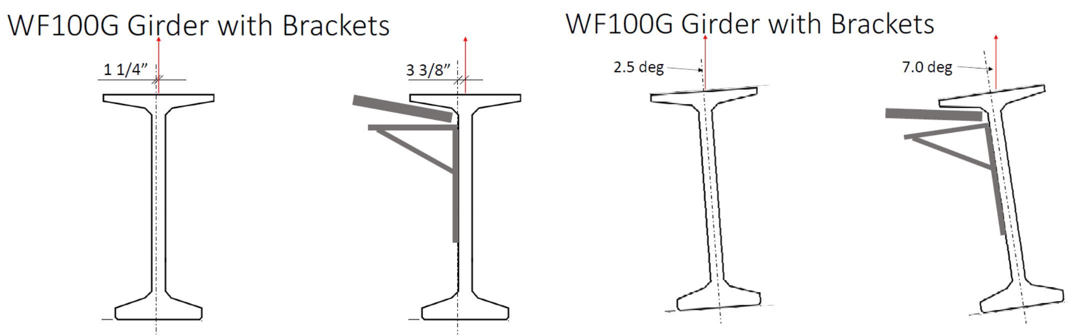
Anthony Mizumori and Rick Brice, both of the Bridge Office, have been looking into the stability of girders when picked with the overhanging brackets attached. The main focus for the Bridge office has to do with concerns regarding the roll that tends to happen when girders are picked and the bow that can happen leading to tension cracking.



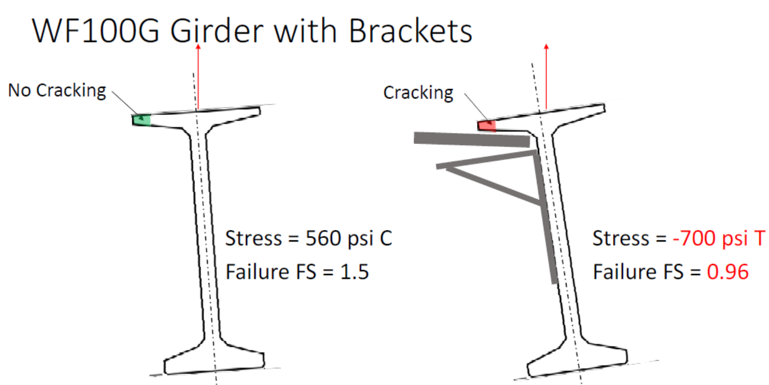
They have been doing some modeling using longer girders with 80 lb brackets attached at 4 ft spacing, and also including the timber at 120 lbs. The corresponding girder bracket system results in a 54 lb/ft load with an eccentricity of about 4.2 ft relative to the girder itself.
The first case they looked at consisted of the following:



The girder without brackets has an eccentricity of 1.25 inches due to lifting eye placement and lateral sweep tolerances. The brackets with timber changes the CG to 3-3/8 inches which increases the tilt from 2.5 deg to 7 deg.

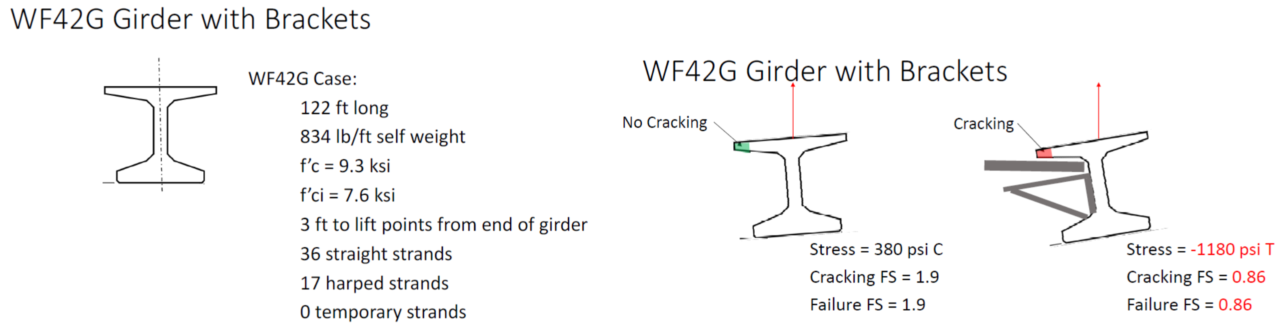


The results of this analysis indicates that there is the potential for cracking in the top web.



For this case, there are not many acceptable solutions. The concrete strength being used in the analysis is 10 ksi and there are 10 temporary strands so none can be added. The only options would be to shorten the girder by 5 feet or to add another girder line to the bridge so the girder prestress could be reduced. Admittedly, this analysis has the wood included and not pre-decking the brackets would certainly reduce the loads and likely make this acceptable, but Anthony has not run that analysis yet.

Anthony also looked at WF42G girders using the same bracket configuration for simplicity. Below is the results which were similar.



Solutions to this case would be to use 10 ksi concrete, add 6 temporary strands, or move the lift points 6 ft inward.

Below are some of the things that Bridge is considering during design to minimize the risk of girder damage moving forward …

1. Check girders for bracket loading and add temporary strands or adjust lift point locations to enable brackets to be used.
2. Design for bracket loading which could result in shorter girders being used or the addition of girder lines. There would be cost implications to the agency with doing this.
3. Require lifting yolks for critical picks.

Stuart suggested including a threshold loading into the contracts. That would save a lot of engineering effort on the part of the contractors provided they were below that loading. Bridge thought that approach may take a lot of parametric analysis. The software that Bridge uses for this analysis is available to the contractors. The Bridge office has some information available that could be used for training and for example calculations.

Anthony volunteered to look at these cases again with just the brackets and no wood. To see where things land.

7 Soldier Pile Backfill

The meeting was only planned to be two hours. We ran out of time for this topic. Look for it to be discussed in a future meeting.

Next Meeting March 4th @ 9:00 am PST
Notes by Jim Cuthbertson

Washington State Department of Transportation

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Agenda

9:00	**Welcome / Review of Agenda**	Cuthbertson/Moore
9:05	**Approval of Previous Meeting Minutes**	Cuthbertson/Moore/All
9:10	**UW Girder Research** UW is looking at the effect of torsion induced twist deformation on girders during shipping and handling. The researchers would like information from the Structures team regarding typ. bracing used during shipping and also after erection.	Rick Brice WSDOT John Stanton UW Richard Wiebe UW
9:40	**Project Reviews** A) Chimacum Combi Wall using kingpiles with a ~4.5' diameter pipe pile connected in series with AZ sheet piles	Patrick O'Neill WSDOT Nishanthi Perera WSDOT
10:10	**Bracket Loading on WF Girder Webs** Anthony Mizumori and Rick Brice of Bridge would like to revisit bracket loading on WF girders… Part III	Mizumori/Brice
10:30	**Soldier Pile Backfill**	Cuthbertson/Sargent

Future meeting dates: April 15, 2022

1 Welcome / Review of Agenda

We started the meeting at 9:00. Welcomed our guests and reviewed the agenda. We moved the Bracket discussion ahead of the project review so that John Stanton and Richard Wiebe of the U of WA could hear that discussion.

2 Approval of Previous Meeting Minutes

No edits were proposed. The previous meeting minutes were approved.

3 UW Girder Research

John Stanton and Richard Wiebe

UW is doing research for WSDOT on the lateral stability of girders during shipping, handling, and after placement. Their research is looking into the torsional stability as well as lateral stability. As girders become longer the effects of torsion and stability become more important. The researchers had several questions and really wanted the contractors to go through all the steps and considerations that are undertaken when handling and placing girders. Ryan Olson of Granite Construction quickly ran through the process: once the girder arrives on the truck, it is rigged for picking. The number of cranes used depends on a number of factors, but girder weight, access/logistics, reach, and economics all play a part in deciding if one crane or two cranes will be used. The crane or cranes will take up the slack in the rigging and apply a little tension to maintain stability while the chains binding the girder to the truck are removed. Girders are then lifted vertically and swung into place and lowered. After the girder is set on the oak blocks it is braced. The bracing can be done from both sides as shown in the image to the right or it can be done with one side using a push/pull mechanism, often a come along is used to provide the tension in a push pull configuration. Once the girder is braced, then the crane is released. The bracing is often held down with wedge anchors at the bottom. At the top of the brace, Atkinson likes to use angle iron bolted through the overhang bracket hole in the top of the web. That way they can use a single brace that functions in both tension and compression. The girder is checked for plumb using a level usually along the web and the bracing is adjusted to get the plumbness within tolerance. Shims, wedges, or adjustable bracing can be used to make those adjustments. At intermediate piers oak blocks may be used when setting the girders and those blocks can remain in place provided they get encapsulated when the diaphragms are cast. John asked about conflicts with the bracing when setting the adjacent girder. He wanted to know if the girder spacing is tight do the contractors just increase the bracing angle or do they do something different to keep the bracing from interfering with the next girder. Atkinson, with their "hard" brace, sets the brace to the outside to avoid that issue if they can. If there are wingwalls at the abutment they may brace to those too.

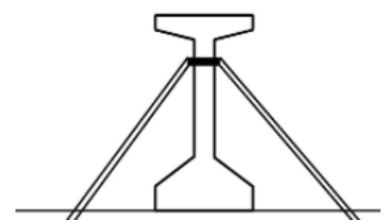


Image from Google use for context only.

Once you get a second girder set, you can start cross bracing girders to one another. Usually there is a tie across the top to keep cross braced girders confined so they do not fall away from each other. Atkinson likes to use a coil rod across the top with angle iron pieces going down into the hanger holes to provide the tension, but other contractors can use chains or come-alongs. John wanted to know where the preferred bracing location was for 4x4 bracing, as there is often a 3-inch chamfer at the transition between the web and the flange. Ryan Olson said that is a great place to put the brace. Dave Stegeman stated that girder length affects where they X-brace. Shorter girders may only be crossed braced at the mid points, longer girders at the third points, and longer still at the quarter points.

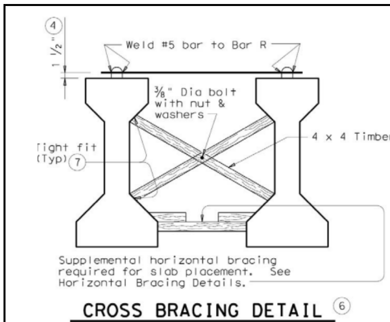


Image from Google use for context only.

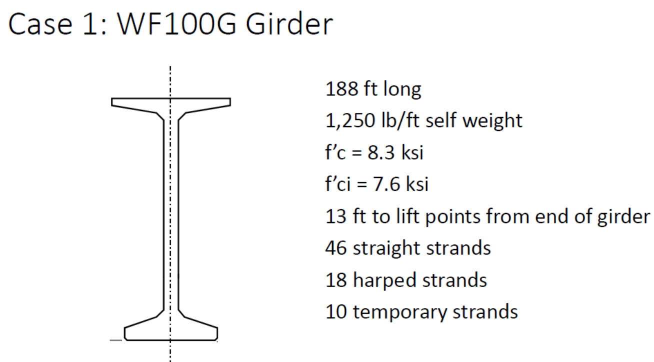
John Stanton asked about the overhang brackets. Were overhang brackets a concern especially when setting that first single girder as the bracket weight is a destabilizing force? Ryan and Dave stated they would assess girder stability with or without the brackets and then error on the side of caution. Their preference is to install the brackets ahead of time, since doing it after girder placement is much more tedious and difficult. Even if they could only install those that were most difficult, say like those over traffic, that is their preference.

John asked for clarification as to who decides to install brackets, WSDOT or the Contractor. Geoff Swett of the Bridge Office explain that right now WSDOT has the contractor make this determination. We prefer that the contractors measure where the lifting loops are and what the sweep is and then take that into account in their analysis. Rick Brice has a simple free stability program and Bridge is putting together example calcs for the contractors to follow. The contractors do the stability analysis and then submit it to WSDOT for review as a Type 2E working Drawing. This conversation was a segue into the next topic.

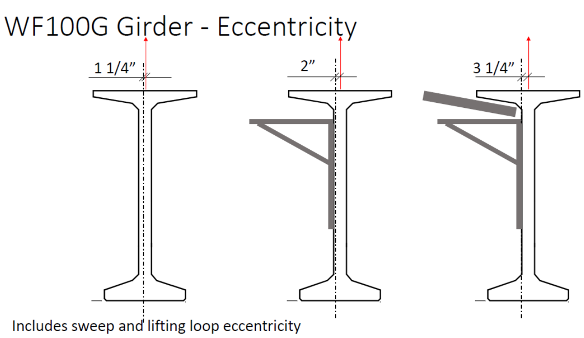
4 Bracket Loading on WF Girder Webs

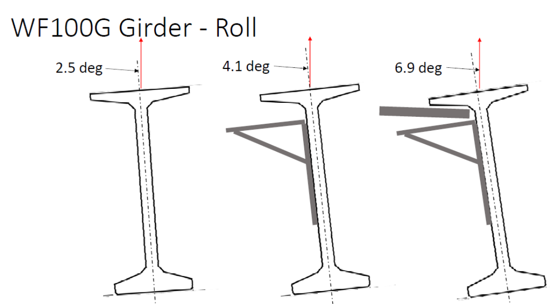
Jim Cuthbertson and Geoff Swett, for Anthony Mizumori

Jim explained that this was the third talk on this topic. Anthony originally performed an analysis with brackets and decking attached. That was presented at the last meeting we had. Anthony was asked to redo the analysis for the same cases without the decking and present the results at this meeting. Unfortunately, Anthony could not be here so Jim and Geoff filled in for him. As before Anthony's analysis was based on brackets installed every four feet along the girder's length. The brackets weigh 24-pounds and the brackets and decking are 54-pounds. The first case he examined was:

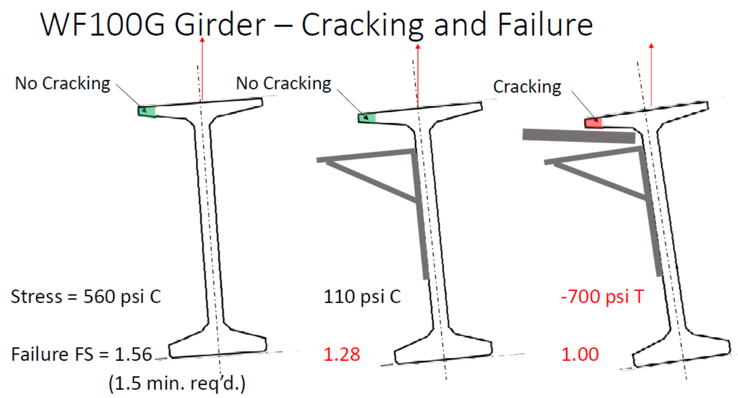


The calculated eccentricities and roll were:

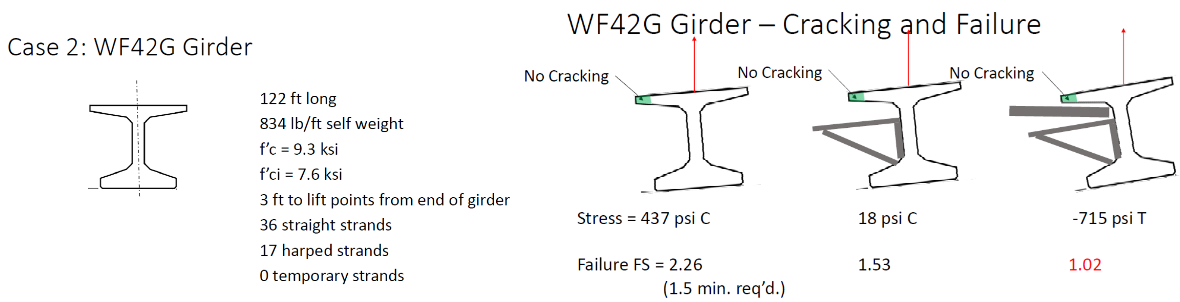




The initial eccentricity of 1.25-inches is the result of manufacturing tolerances. Those worst-case tolerances were carried throughout the entire analysis. The end result was that there are no issues for the girder with no brackets, cracking was not predicted for the bracketed girder but the factor a safety against failure drops to 1.28 which is blow our targeted value of 1.5. The girder with the decking and brackets has a safety factor against failure of 1.0 and cracking is predicted or expected in the top flange due to tensile forces.



For the second case, Anthony got the following results:



Anthony's Conclusions:

- As discussed before, steel overhang brackets plus timber weight isn't generally safe to add.
- Steel overhang bracket weight could possibly be accommodated for some girders, typically shallower girders.
- Steel overhang bracket weight on deeper girders may not cause cracking in girders, but generally leads to an insufficient safety factor (<1.5) against instability/failure.
- This conclusion could explain past success lifting girders without damage.
- If girders have been cracked prior to erection or are subject to wind during erection, damage would be possible.

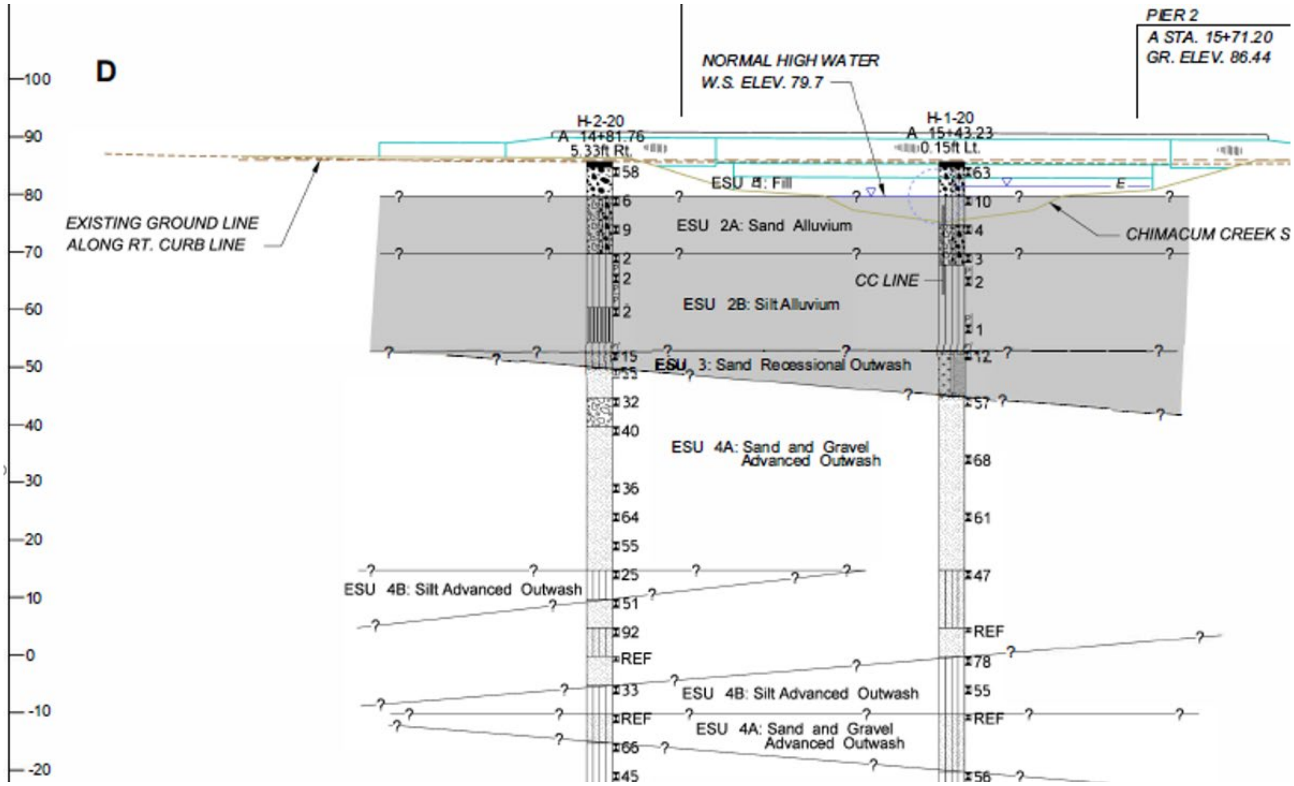
A question was asked, why is WSDOT worrying about this now? We have not had significant issues over the last 20 years. John Stanton pointed out that the reason why this is becoming a concern now is that girders are getting longer and longer. It is the longer girders that have more potential for issues and they are more vulnerable. Someone asked, if this is a length to depth ratio issue? John explained that length to depth ratio is important, but it is not what typically controls. WSDOT's girder shapes tend to have the same flange widths regardless of the heights, and it is that flange width that determines the bending stiffness in the lateral direction. So, if you keep the flange width constant and make the girder deeper or shallower, it does not affect the lateral bending resistance. However, they (U of W) are still evaluating these effects.

Geoff asked about wind loading concerns during construction. WSDOT currently does not specify a max wind speed. We leave that up to the contractors. Kiewit and Atkinson both said that winds in the 30 to 35 mph are typically their upper limits for working. They also pointed out that many of the cranes have wind ratings and the equipment may have limiting wind speeds for safe operation. So, there probably is not one set speed that can be specified.

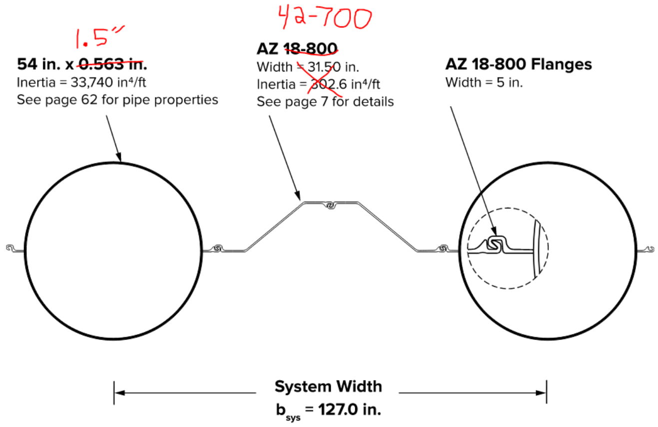
5 Project Reviews

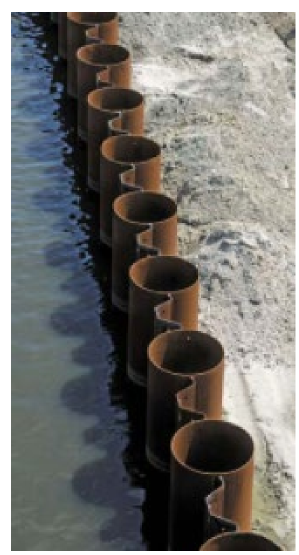
Patrick O'Neill

The fish passage structure being discussed is one of three structures in the East Jefferson County – Remove Fish Barriers Project. The specific structure is near Sequim on SR-116 at Chimacum Creek (MP 0.14 to 0.30) and is WDFW site ID 990077. The current structure is planned to be a 70- foot (skewed) hydraulic opening with 30-inch prestressed concrete slab girders on "Combi-wall" abutments (driven piles + sheet piles interlocked). The walls for the abutments are planned to be 4.5-ft diameter piles with AZ sheet piles between them. The king piles will be roughly 65 to 75 feet in length and driven 30-ft into a dense layer at depth to provide bearing and lateral resistance. The near surface soils are liquefiable to quite a depth and it is the extreme event limit state that is controlling the design. Liquefiable soils are identified at approximately a 6-ft depth down to a 35-ft depth as shown in the grey box below.

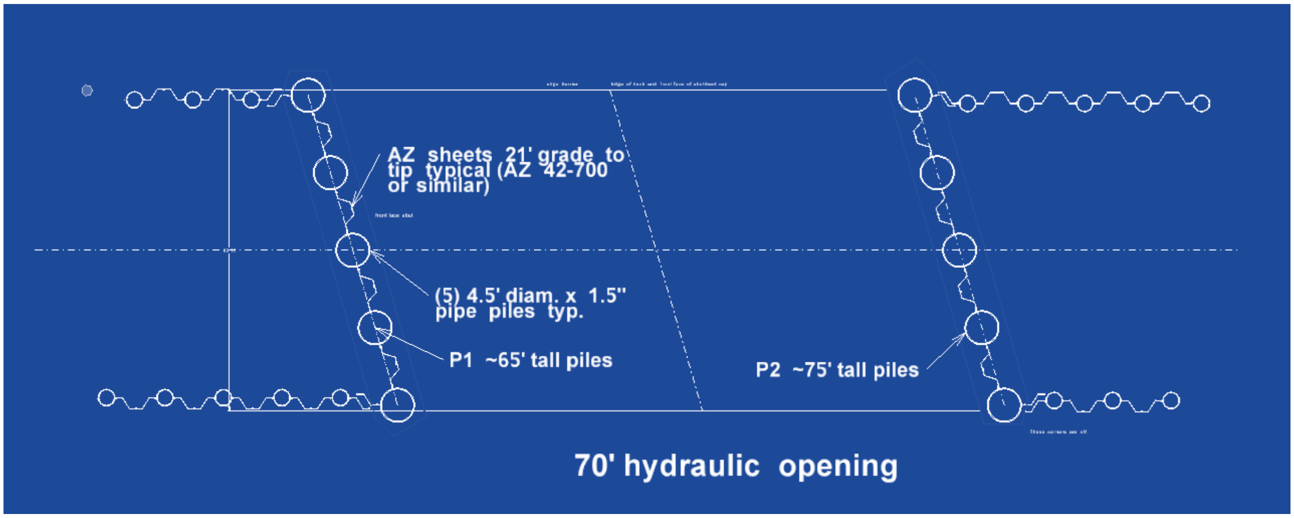


Artesian ground water pressures were encountered during the geotechnical exploration. This project was presented to the Structures Team previously, and the design team has modified the concept based on the Structures team's comments and recommendations. The system being proposed now consists of the following elements with a concept photo to the right:





The layout of the system has five piles at each abutment with wingwalls parallel to the roadway. The wingwalls would likely be comprised of smaller diameter piles and less substantial AZ sheets, but they have not been designed yet.

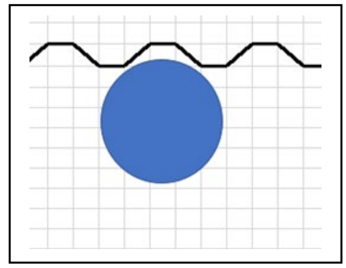


The sheet piles only need to extend below scour, which is 21 feet below existing grade. Because of the abutment geometry the sheet pile lengths after cutoff will only be about 16 ft, but the king pile lengths will be about 65 ft at Pier 1 and 75 ft at Pier 2.

For the interlocked king pile system, Dave Stegeman of Kiewit indicated that his firm has constructed systems like this in the past. Pile placement and tolerances are critical. They prefer to use predrilling to help ensure that piles do not wander during driving, and if they can't do that, then they utilize driving templates. At this site with the artesian conditions, predrilling may not be feasible. He thought they would drive king piles first to partial depth and then begin installing sheets to make sure they had good fit up before too much of the wall was completed and there were limited options for corrections. The sequence would probably be king pile, king pile, then in-fill sheet in the driving sequence. Since the in-fill sheet piles only need to be 20 feet or so, Stuart Moore of Atkinson suggested using flat plates with tabs on the king piles, angle iron, or c-channel to retain the sheets. A tab type system would be much more forgiving with regards to placement tolerances and would eliminate one of the constructability concerns which is binding of the sheet pile interlocks should piles wander slightly. Patrick stated that a plate would need to be 1.25 inches thick due to corrosion concerns. Stuart was concerned that as the king piles are driven into the dense soils at depth, there is a big stiffness difference between those big pipe piles and the infill sheets. He felt there was a potential to damage the interlocks when there is hard driving occurring on the pipes. Jim Cuthbertson stated that he doubted a soil plug would form during driving, but he pointed out that if an inside fit cutting shoe was used or if a stiffening ring was used there could be the potential for water leakage along the pile length due to the artesian pressure.

Cuthbertson also asked about using multiple rows of piles to form a couple and a stiffer system. Patrick stated that with the liquefaction, they effectively loose the fixity necessary for the couple to form and design-wise they end up modeling the abutments as an effective single row anyways. Geoff Swett indicated he had proposed utilizing integral abutments so that the structure could act more rigidly as a whole, and the abutments could share the load and demands. Patrick has been considering that, and he thought that the king pile diameters might be reduced to 4 ft making spiral welded piles an option as a cost savings.

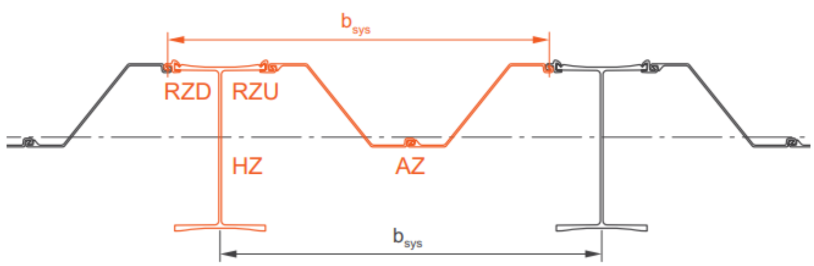
Cuthbertson also asked about the template that would be needed for driving. He thought that it would be comprised of H-piles. Stuart confirmed that it probably would be comprised of an H-pile frame with pockets resting at ground surface, with maybe four additional H-piles at the corners to pin it in place. A second level of framing above the first maybe necessary to maintain alignment, it just depends on how prone the pile are to wander. A two point restraint system may be necessary. Cuthbertson pointed out that he may have concern with the H-piles penetrating the aquitard and providing a potential path for artesian water.



Dave Stegeman stated that if that was a major concern, he would propose that we utilize the alternate concept where the sheet pile wall and king piles are not connected to one another. An alternate concept has also been proposed. The alternate would not require the sheets to be interlocked to the king piles. The alternate has a continuous sheet pile wall entirely behind the king piles. That way we could forgo the template as the construction tolerances for the two separate systems should be greater and he felt templates would not be needed. Patrick asked about the separation distance between the sheets and the pipe piles if the sheets were constructed behind the pipe piles. He was thinking 3-inches, but wanted to know if 1-inch could work. Dave suggested 3-inches plus or minus 1-inch. It was also discussed that the pipe pile driving would probably down drag the sheets, so the pipe piles should be driven first, then the sheets.

Stuart pointed out that the piles being larger than 48-inches makes them hard to get and have long lead times. He thought they might need to be fabricated in CA. If 48 x 1 inch plate were used they may be able to be fabricated in Longview much faster and cheaper as a spiral welded pile. Long lead times can be an issue for Fish Passage projects because of the time of year WSDOT usually advertises these contracts. Something to keep in mind.

As an alternate, an HZ-M pile system was suggested by Dave. Patrick thought corrosion would be an issue for the HZ-M piles as those piles have less thickness, and he was not sure if they would have enough strength and stiffness. The HZ-M system looks like this:



6 Soldier Pile Backfill

Jim Cuthbertson

The ADSC team raised an issue they are having with backfill for soldier piles. The issue is related to our use of the CDF specs in 2-09.3(1) in association with wet excavations. Here is what the section states:

6-16.3(5) Backfilling Shaft

The excavated shaft shall be backfilled with either controlled density fill (CDF), or pumpable lean concrete, as shown in the Plans and subject to the following requirements:

1. Dry shaft excavations shall be backfilled with CDF.
2. Wet shaft excavations shall be backfilled with pumpable lean concrete.
3. Pumpable lean concrete shall be a Contractor designed mix providing a minimum 28-day compressive strength of 100 psi. Acceptance of pumpable lean concrete will conform to the acceptance requirements specified in Section 2-09.3(1) for CDF.
4. A wet shaft is defined as a shaft where water is entering the excavation and remains present to a depth of 6 inches or more.

The issue is centered around the CDF requirements having a maximum strength of 300 psi.

2-09.3(1)E Backfilling…

Controlled Density Fill (CDF) or Controlled Low-Strength Material (CLSM) – CDF is a self compacting, cementitious, flowable material requiring no subsequent vibration or tamping to achieve consolidation. The Contractor shall provide a mix design in writing to the Engineer on WSDOT Form 350-040 and utilize ACI 229 as a guide to develop the CDF mix design. No CDF shall be placed until the Engineer has reviewed the mix design. CDF shall be designed to have a minimum 28-day strength of 50 psi and a maximum 28-day strength not to exceed 300 psi. The CDF consistency shall be flowable (approximate slump 3 to 10 inches).

In order to make the mix pumpable, more fly ash or cement must be added. That results in mixes that often exceed the strength cap required by the CDF spec. Jim sees a number of issues with how these specs are structured:

First, the material being used is called Pumpable Lean Concrete and we are accepting it using requirements clearly identified as being for another material, Controlled Density Fill.

Second, the specifications contain sections devoted to Lean Concrete which are not being utilized. Jim was thinking we should be using them and not the CDF section. Here is what they say:

6-02.3(2)D Lean Concrete

Lean concrete shall meet the cementitious requirements of Section 6-02.3(2) and have a maximum water/cement ratio of 2.

6-02.3(2) Proportioning Materials

Cementitious Requirement for Concrete

Class of Concrete	Minimum Cementitious Content (Pounds)	Minimum percent Replacement of Fly Ash or Ground Granulated Blast Furnace Slag for Portland Cement	Maximum percent Replacement of Fly Ash for Portland Cement	Maximum percent Replacement of Ground Granulated Blast Furnace Slag for Portland Cement
4000	564	*	35	50
4000A	564	*	25	30
4000P	600	15	35	50
4000W	564	*	35	50
3000	564	*	35	50
Commercial Concrete	**564	*	35	50
Pumpable Lean Concrete	*	*	***	***
Lean Concrete	****145	*	35	50

*No minimum specified.

**For Commercial Concrete, the minimum cementitious content is only required for sidewalks, curbs, and gutters.

***No maximum specified.

****Maximum of 200 pounds

6-02.3(5) Acceptance of Concrete
6-02.3(5)A General
Concrete for the following applications will be accepted based on a Certificate of Compliance to be provided by the supplier as described in Section 6-02.3(5)B:
1. Lean concrete

What Jim is proposing is that we revise the text of 6-16.3(5) Backfilling Shaft Item 3 to state:

3. Pumpable lean concrete shall be a Contractor designed mix in accordance with ***6-02.3(2)D Lean Concrete*** providing a minimum 28-day compressive strength of 100 psi. Acceptance of pumpable lean concrete will conform to the acceptance requirements for lean concrete as specified in Section ***6-02.3(5) Acceptance of Concrete*** ~~2-09.3(1) for CDF~~

These recommended edits maintain a lower end requirement on strength, but it does remove the upper end cap that is within the CDF specifications. Jim was not sure we really need that upper strength limit as the contractors who generally install the soldier piles are also the contractors who generally install the lagging. These edits get us some control on the water cement ratio which we didn't have before, and it gets us acceptance by certification. Nobody objected to the changes in the meeting.

Meeting Ended

Next Meeting: April 15th
Notes by Jim Cuthbertson

Washington State Department of Transportation

AGC Associated General Contractors of Washington

AGC/WSDOT Structures Team – Meeting Minutes
(May 12, 2022)

Attendees

Regular Attendees				
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	Christopher, Chris	WSDOT-Const.	360-705-7821	christc@wsdot.wa.gov
X	Cucchiara, Kevin	Quigg Bros.	360-580-0015	kevinc@quiggbros.com
X	Cuthbertson, Jim[1]	WSDOT-Const.	360-870-1108	cuthbej@wsdot.wa.gov
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	Kane, Ed	WSDOT-NWR	425-225-8743	kaneed@wsdot.wa.gov
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X	Watts, Troy	WSDOT-OR	253-255-8215	wattst@wsdot.wa.gov
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X	Wilson, Loren	FHWA	360-753-9482	loren.wilson@dot.gov

1 Team co-chair

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Agenda

9:00	**Welcome / Review of Agenda**	Cuthbertson/Moore
9:05	**Approval of Previous Meeting Minutes**	Cuthbertson/Moore/All
 9:10 **9:40** **10:10**	**Project Reviews** A) SR-241 Mabton Vicinity – Retrofit Bridges Two bridges near Mabton and Sunnyside are weight restricted/ One bridge will have mid-span hinges replaced, the other is a total replacement with horrendous soil conditions. B) SR 542/Squalicum Creek to Bellingham Bay – FP Unsuitable underlying soils will complicate structure and wall design. A single span bridge utilizing lightweight fill embankments has been selected for design to mitigate this risk. C) SR 302/SR 105, Purdy Creek Bridge rehabilitation by repairing bridge columns in Marine Environment. Project from May 2018	 SCR Design Team NWR Design Team/Bridge Office David Sawahata
10:40	**5 min break**	All
10:45	**Bracket Loading on WF Girder Webs** Opportunity for discussion with Anthony Mizumori and Rick Brice of Bridge regarding bracket loading on WF girders… Part III from the last meeting.	Mizumori/Brice
11:00	**Traffic Closures for Mod. Conc. Overlays** Jobs often have a 72 hr work window. AGC believes that often twice as long is needed. This is to discuss the requirements and traffic restrictions.	Graham/AGC
11:30	**Pricing and Material Availability** Issues and concerns to be aware of, possible solutions to reduce bidding risk.	AGC/WSDOT

1 Welcome / Review of Agenda

We started the meeting at 9:00. We went through a roll call, welcomed our guests, and reviewed the agenda. Jim added an item to the above agenda after the project reviews to discuss fit-up for buried structures.

2 Approval of Previous Meeting Minutes

No edits were proposed. The previous meeting minutes were approved.

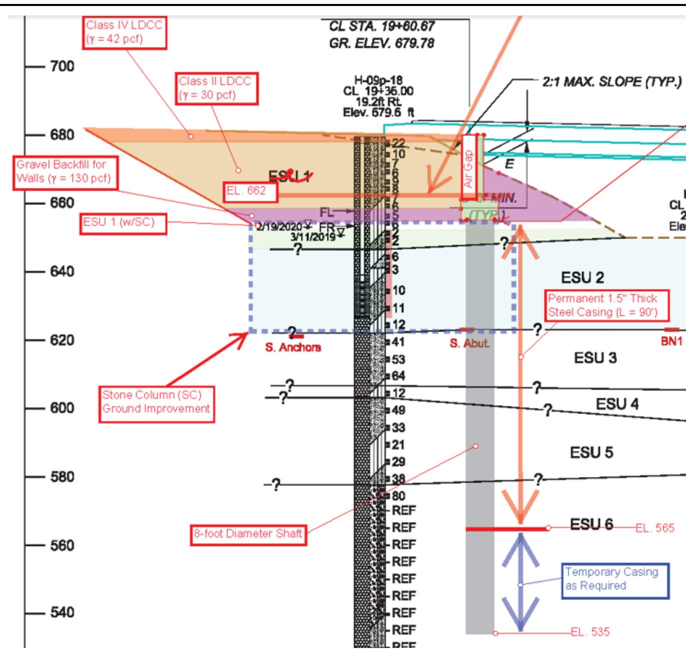
3 Project Reviews

SR-241 Mabton Vicinity – Retrofit Bridges
SCR Design Team – presented by Jeff Minnick

The project location is approximately 4 miles south of Sunnyside and I-82. There are two bridges both of which are weight restricted. One over the Yakima River, and the other over a side channel, slough. The river Bridge 241/5 will be retrofitted by replacing the in-span hinges. The slough Bridge 241/2 will be replaced with a new structure. The hinge replacement will require the use of a strongback system to maintain integrity of the span.

Br 241/2 Looking North

The slough bridge is the focus of the discussion. The bridge will be replaced with a three span structure. The existing approach embankments are underlain by liquefiable and compressible soils. Embankment stability is a concern both longitudinally and transversely. The bridge will be founded on deep foundations, likely shafts, and the instability issues will be mitigated by using ground improvement (stone columns) and light weight cellular concrete within the approach embankment. The soil conditions are depicted in the figure below for Pier 1. Pier 4 is similar.



1. ESU 1 (Fill) - Very loose to medium dense silty SAND and sandy SILT. %Gravel (%G)= 2, %Sand(%S) = 62, %Fines (%F) = 37
2. ESU 2 (Qfs_1) - Very loose to medium dense silty SAND and sandy SILT. %Gravel (%G)= 0, %Sand(%S) = 60, %Fines (%F) = 40
   ESU 2 contains a varying amount of organics.
3. ESU 3 (Qfs_2) - Medium dense to very dense SAND with silt and gravel and sandy SILT. %Gravel (%G)= 7, %Sand(%S) = 62, %Fines (%F) = 32
4. ESU 4 (Qfs_2) - Stiff to very stiff SILT, SILT with sand, and silty CLAY with sand. %Gravel (%G)= 0, %Sand(%S) = 19, %Fines (%F) = 81
5. ESU 5 (Qfs_2) - Medium dense to very dense SAND with silt, silty SAND, SILT with sand, and sandy SILT. %Gravel (%G)= 1, %Sand(%S) = 56, %Fines (%F) = 44
6. ESU 6 (QP_Lg) - Very dense GRAVEL with silt and sand, silty GRAVEL with sand, and SAND with silt and gravel. A cobble, approximately 6-inches in diameter was encountered in boring H-01p-18. %Gravel (%G)= 44, %Sand(%S) = 48, %Fines (%F) = 9

For the scour condition, the Bridge office needs the shaft casings to extend about 90 feet below the shaft cap. The casings need to be permanent and are being relied upon for strength. Casing thickness is currently planned to be 1.5 inches. Shaft diameter is 8 ft currently. The Geotechs do have concerns regarding the necessary penetration into the refusal ESU 6 soils and the potential need for an oscillator to install the casings. Casings are only being used for strength at the abutments. Interior piers do not require permanent casing. The project office plans to construct a work trestle along the downstream (east) side and has the following questions for the team.

1. What work access is required for the ground improvements, bridge demolition, and bridge construction?
2. Are there any constructability concerns with installing stone columns near historic timber pilings from the previous 1962 bridge removal (Figure 3)?
3. Has the group ever seen stone column area replacement ratios higher than 20% for soil types similar to ESU1 and ESU2?
4. Are there any other construction considerations that we have missed?

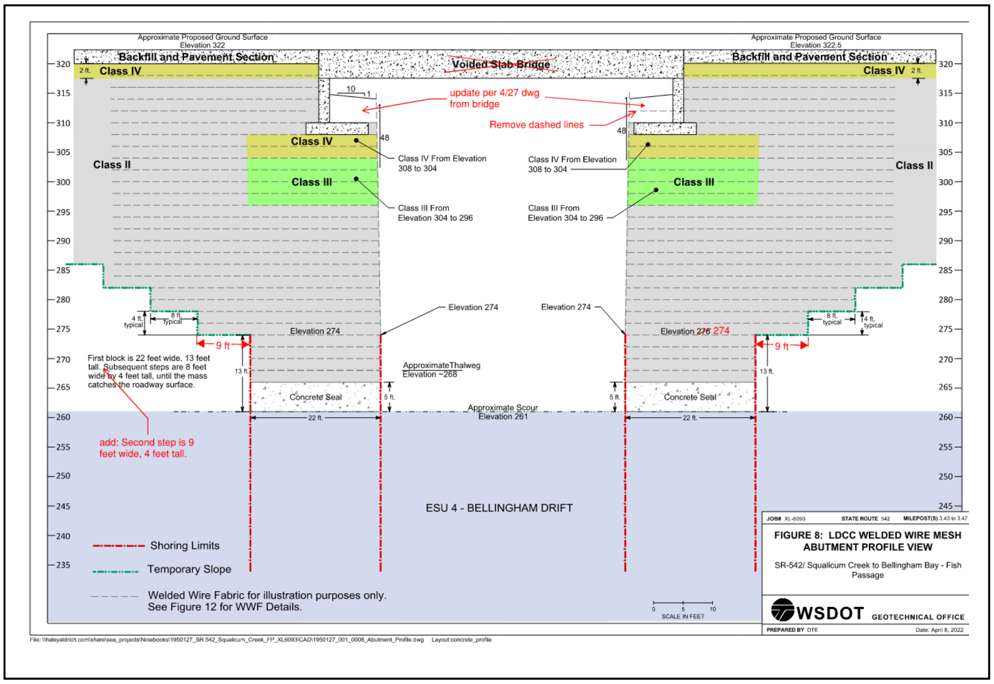
During construction there is a suitable detour so the road will be closed. There will be no staged construction or traffic per se. It was asked if the project will require oscillator installation. That is being considered. It was pointed out that the use of the oscillator would influence the contractor's work trestle as the trestle would need to be designed for the loading of the oscillator or a separate support system would be needed to support the oscillator. However, those issues will only be realized if temporary casing is used for the interior piers. The abutment shafts do not require work trestle access. The conceptual construction plan is to excavate to remove much of the existing embankment creating a working bench at about elevation 655 ft from which stone columns will be installed as well as the shafts. The conceptual plan is to install stone columns before shafts to avoid the potential down drag loads that could develop along the shafts due to any ground settlement associated with column installation. It is likely that a window in the stone column pattern will be left through which the shafts are constructed. Right now the geotechs are looking at a 20% area replacement ratio for the stone columns. Even with a window in the pattern, there may be some densification to the ESU 2 soils making shaft casing installation harder.

Within the stone column area there are older timber piles from the trestle bridge that was in place before the current one. It was asked if those could be removed or if it would be better to leave them in place and adjust the stone column pattern when a pile conflicts. The contractors though that the old piles could be removed provided the tops are accessible and are not decayed. They also suggested leaving them in place. Why remove them if you don't have to, was the question that was raised. It was also suggested to add additional timber piles instead of stone columns to improve the ground and stability.

There is above ground utilities. On the side where the Region wants to construct the work trestle there is overhead power which the region was not planning to relocate. The horizontal distance between the power and structure, is approximately 30 ft. The contracts think that with the potential for oscillator construction the trestle should be 30 to 35 ft in width. They also recommend relocating the power, if not permanently, at least temporarily to ensure at least 15 ft of clearance for the cranes and drill rigs can be achieved. It may be able to move to the other side and combined with the telephone line.

SR 542/Squalicum Creek to Bellingham Bay – FP
WSDOT Bridge – presented by Terry Bondy

The project is on SR-542 at MP 3.5, slightly NE of Bellingham. The project will be replacing a six foot box culvert with a 105 foot prestressed girder bridge. There are poor soil conditions so the plan is to utilize low density cellular concrete to form the abutments and approaches upon which a prestressed girder bridge will be constructed. The agency constructed a similar structure on Anderson Creek in 2015 under contract 008753.



Sheet pile cofferdams with a seal were constructed for the 2015 project, and this project will utilize similar measures to facilitate construction and protect the abutments from scour. The following photos are from the 2015 cofferdam construction.

For this Squalicum Creek project, the sheets will be 40 ft in length with a planned embedment of about 38 ft. The bridge office wants to discuss drivability and sheet pile section selection with the contractors. They are considering two sheet pile sections; one a thinner section with an elastic modulus between 20 to 30 cubic inches or a thicker, larger section closer to 65 or 70 cubic inches. The thinner section will likely require internal bracing for construction where the thicker sections may not. The thicker sheet may also drive better, but steel prices are elevated right now. The braced system is estimated to have 300 kips of steel while the unbraced is estimated to be 380 kips of steel.

It was asked if the bracing would greatly complicate or slow the construction. It was stated that unbraced is always easier to excavate, but it was pointed out that with current steel prices that the 80 kip difference could equate to maybe $150 thousand dollars. If you compared the added labor costs for the bracing and the additional time, it might still work out that the braced system is cheaper, but the office would need to run that metric and evaluate it. It was counter pointed out that soil conditions could be more problematic for the lighter sheets, especially if there are cobbles.

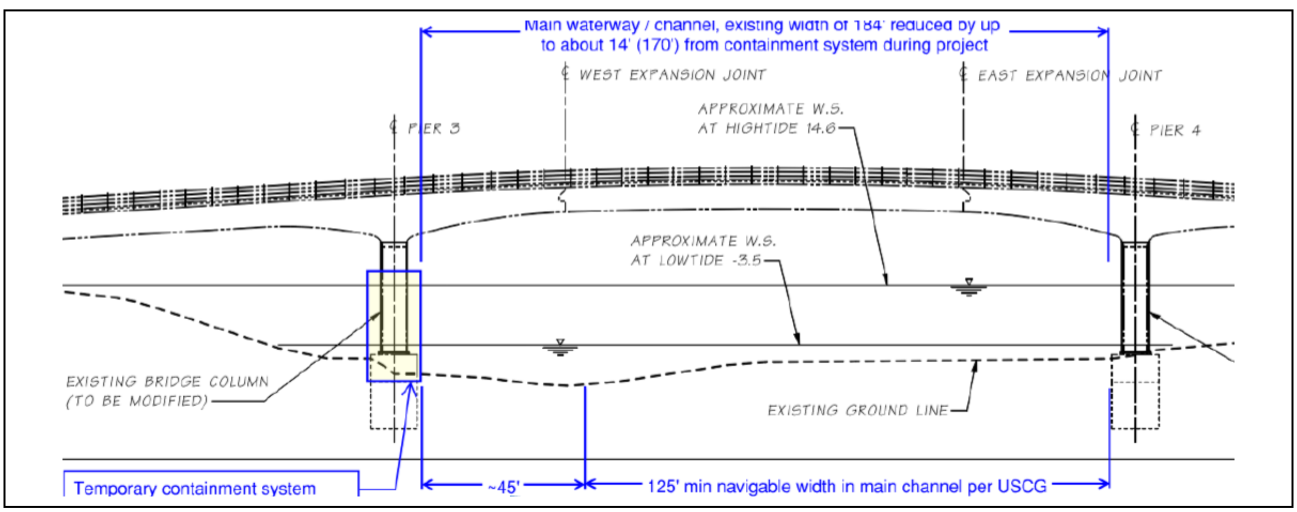
Terry asked about the ability to drive sheets 40 feet into the ground. The drift has single digit blow counts for the standard penetration test but they have on over consolidation ratio of about 2. The contractors thought that it should be feasible and if necessary they could change from vibratory install to impact.

SR 302/SR 105, Purdy Creek
WSDOT Bridge – presented by David Sawahata

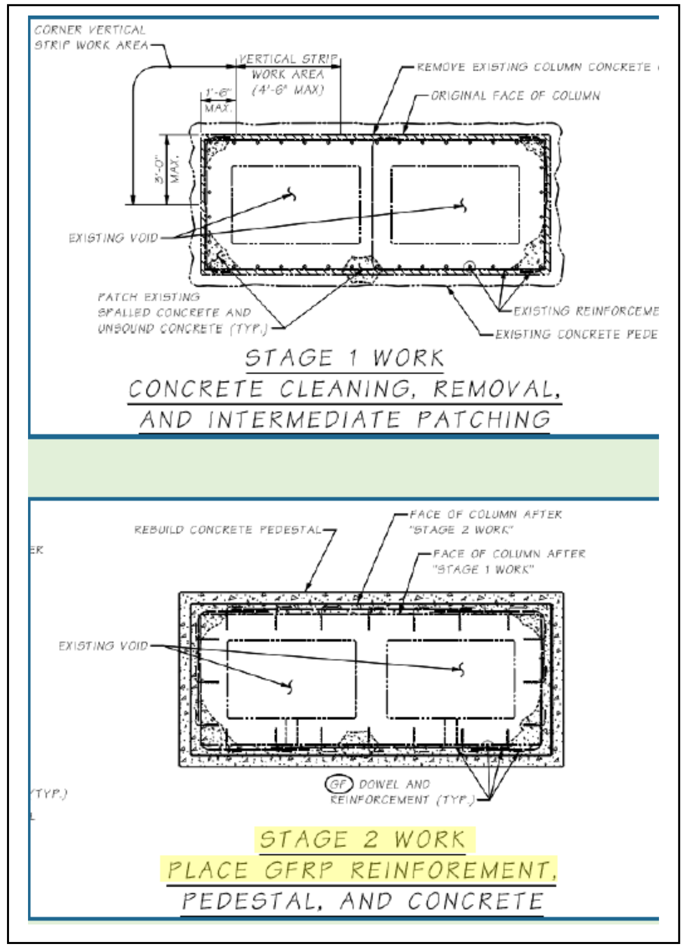
The project is repairing the interior piers of the SR305/105 Purdy Bridge which was constructed in 1936. The interior columns have deterioration from exposure to saltwater and marine growth. The structures team looked at this project back in 2018 when Lou Tran of the Bridge office presented it. Lou retired and a new designer is taking over the project, David. In 2018, it was recommended that the cofferdams for the work be contractor designed. It was also recommended that WSDOT pursue permits that would allow grounding of barges during low tide as permits at the time did not allow the grounding of the barges. The water depth in the vicinity of the piers is shallow. A specific depth of water was not mentioned at the meeting, but the bottom can be seen in the photos that were shown as part of the presentation.

David wanted to present this structure again to the team to hear their input so he could make appropriate design decisions, and some of the work scope has changed.

The current scope consists of first installing a contractor designed temporary containment system and cofferdam. The work needs to be performed in the dry, which creates an overhead clearance issue, as the top of the cofferdam must be above high tide. The high tide water surface elevation is about 14.6 feet and



the bottom of the bridge at the top of column is about elevation 21 feet. Directly above the edge of the of the cofferdam there is a little bit more clearance due to the haunched shape of the superstructure. Pier 3 is the most limited. If the cofferdam is constructed close to the pedestal, there will be about 4 feet if horizontal clearance to the column.



Stage 1 work will consist of cleaning and removing the marine growth and any loose concrete. Then removing the concrete to expose the reinforcing bars in the column, repairing corroded rebar, and performing intermittent patching of the concrete. The bridge piers are hollow and there is concern regarding the integrity of the existing reinforcing. The stage 1 work will be limited to vertical strips that are 4.5 ft in width. This will preserve the structure's ability to support live loads as the structure will remain open and in use during this work. With vertical strips, it will not be possible to repair horizontal bars, only vertical bars. Patching materials will be placed to bed the bars and fill any gaps behind them.

In Stage two, holes will be drilled for dowel bars, GFRP reinforcement will be placed, and there will be new concrete poured to repair the pedestal and column. In stage two, an entirely new glass fiber reinforced polymer rebar cage will be placed around the column and encased in new structural concrete. The GFRP bars will provide the containment necessary for extreme event loading. Self-consolidating concrete is planned for the encapsulation.

Returning to the cofferdam construction, David said that he heard someone talking about using fexi-floats and stacking them up to form the containment. To do that, they would need to be filled with water so they were not buoyant. The team advised against that as removing the stagnant water from inside of them can be very challenging environmentally. In addition, it wasn't mentioned in the meeting, but as note taker I see two other issues with this, One the ground isn't flat and level, so the stacking of them would be very problematic to form a containment system, and two grounding flexi-floats is no different than grounding barges, permit wise. It was suggested that there were other possible options for construction of a cofferdam. Short sheets could be driven at low tide. At a subsequent low tide they could be fresh headed and have either extensions welded on or a structure added that would be watertight. The team thought it unlikely that a contractor would rent a side drive sheet pile installer. They thought a more conventional approach using a small top drive vibe hammer and a small service crane, maybe 70 tons, would be used along with splicing. In an outside the box solution, it was suggested that a contractor could drive piles at the corners out from underneath the bridge and then fabricate a panel type structure that could be affixed to the corner piles to form the cofferdam and containment system, but such an approach would be expensive and difficult. It was suggested that if they could cleaning of the pedestal without containment permitted, that would open up potential options to use a system that seals against the pedestal, provide the pedestal is in decent shape and there is enough room for the column work remaining.

As for flexi floats verses a larger derrick barge it was asked if there were benefits to either. There are a number of contractors who possess their own barge and ownership would be less expensive than the rental of the flexi floats and the labor for assembly. Larger barges require less draft to support the same load as smaller barges, but larger barges are harder to move.

4 Bracket Loading on WF Girder Webs

Anthony Mizumori and Rick Brice could not attend the meeting to discuss their bracket load calculations on girders which was presented at the last structures team meeting. We will have to defer this until another meeting. Scott Sargent was given the time slot to fill.

5 Precast Buried Structures

WSDOT Construction – presented by Scott Sargent

WSDOT and the precast industry met on May 4 to discuss the last year's successes, challenges and changes related to the development, fabrication, and inspection of precast products currently employed by the State. During the meeting two issues were raised which Scott wanted to discuss with the structures team.

In standard specifications section 6-20.3(7)A for precast structures WSDOT requires the following:

> *…For Class 1 and Class 2 precast concrete three sided structures and precast concrete split box culverts, unless otherwise shown in the Plans, the Contractor shall, at a minimum for each set of forms used, progressively shop assemble the top and bottom units of the first 3 adjacent units for inspection of fit up.*
>
> *…The date and time of the shop fit up shall be scheduled during normal business hours and communicated to both the installing Contractor and the Engineer, to allow observation of the assembly if desired. As an alternative to physically being present to observe the fit-up, the Contractor and the Engineer may agree to observe the fit-up via video conference.*

The fit-up requirement for Class 1 structures, those less than 20 ft span, was an addition to the 2022 book. Prior to 2022, only Class 2 structures required the fit-up. WSDOT wanted the structures team's opinion on requiring the fit-up for Class 1 structures. Associated with the fit-up requirements, WSDOT also wanted feedback on whether or not the fit-up observation should be mandatory for the contractor. The precasters would like it to be mandatory.

Question to the team: Do you have concerns regarding doing the fit-up for the smaller class 1 structures? Nobody offered an opinion one way or the other.

2nd Question: WSDOT is considering making the fit-up attendance mandatory for both the contractor and the engineer. Does the team have an opinion?

It was asked, why do we want to change from optional to mandatory? It was explained that WSDOT has had several instances where there were fit-up issues on the grade. The prime blamed it on precaster's quality, the precaster blamed it on contractor's preparation of the bedding and handling damage. WSDOT was thinking that a mandatory fit-up observation would possibly reveal one side or the other as being the most definitive. It was pointed out that the fit-up is being viewed too simplistically. For example, if there is a slope to bottom of the structure to accommodate stream gradient, the fit-up would need to replicate that sloping condition, as sloped pieces when laid on a flat surface will not align properly. It was also pointed out that often times, the fit-up occurs on a pea gravel pad or loosely compacted gravel pad. Any imperfections in the bottom slab are masked by the yielding subgrade in the yard, and then exaggerated in the field when placed on well compacted bedding. This prompted the Bridge Office to want to add a new tolerance into the requirements for the "flatness" of the bottom slab. The bridge office will look into the required tolerances. It was also pointed out that the yard fit-up occurs without the use of the seals and mastics. The contractors reported there have been occurrences where the pieces fit in the yard, but when the sealing materials were introduced into the joints, they no longer fit properly.

At least one contractor was a proponent of mandatory attendance and voiced an opinion that the video option should be removed. It was also voiced that we should require all structures to have flat horizontal bottoms to make the fit-up and assembly easier.

6 Traffic Closures for Mod. Conc. Overlays

Graham Construction – presented by Bryant Helvey and Derek Compton

The high-level overview of this topic is that modified concrete overlay projects are generally being advertised with a 72-hour window (or similar) to complete a single-lane modified concrete overlay, but when you add up the time required to meet all of the specification requirements (especially hydro-demo/scarification and potential repairs) the required schedule can me more than twice as long as what is available within the confines of the contract. This requires the contractors to propose alternative materials or deviate from normal or required means and methods. Often, contractors do not know at bid time if the Agency will be amenable to changes in the work requirements, materials, or methods. Accordingly, contractors price risk into their bids or they price liquidated damages into the bid knowing that they may have them. Less sophisticated contractors may not be prepared to collaboratively work to resolve a number of contract issues caused by insufficient closure times.

Scott Sargent identified that we have two different cure specifications for the overlay materials, one cure for polyester (4 hrs or 3,000 psi) and a different cure for modified concrete (42-hour wet cure). He thought that there may have been an oversight when the specifications for the job being discussed where prepared as 72 hours may not have accounted for the longer cure time. Derek pointed out there is more than just the cure time. There was also the time for hydro scarification and the requirement for bid-well type finishing. Derek mentioned that a rolling screed has less setup time. He also mentioned that with that method they may need to leave the surface high and then profile grind and texturize under a different closure. He also mentioned roto milling rather than hydro demo when time is critical. Roto milling is faster. Derek is aware of upcoming jobs. He would like the State to consider some of these things when developing the specials for the jobs and incorporate more language and methods that could save time and also to just allow more time in the closure. Bottom line, modified concrete overlays are not suitable for weekend closures.

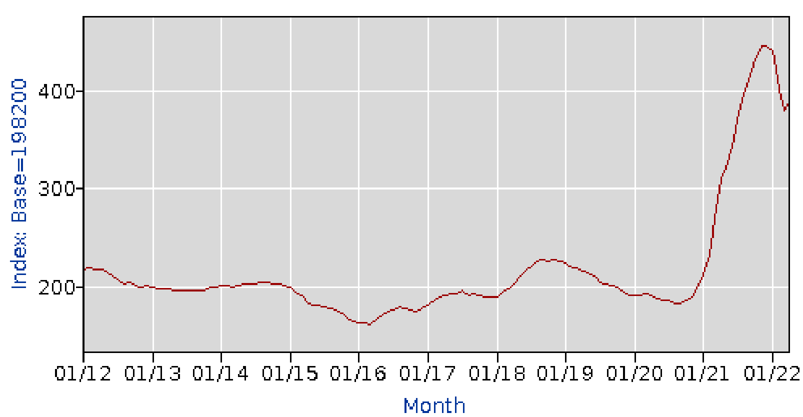
7 Pricing and Material Availability

WSDOT Construction – presented by Jim Cuthbertson

WSDOT just recently ran into a new supply chain issue with pigmented sealer. One of the pigments that we use for our WA Grey is not available, and thus the pig sealer is not available. We also have continuing issues with current steel indexing and pricing. WSDOT uses the PPI for WPUSUSTEEL1. That index saw an unprecedented change in 2021.

PPI Commodity Data

Series Id: WPUSISTEEL1
Not Seasonally Adjusted
Series Title: PPI Commodity data for Special indexes-Steel mill products, including fabricated wire products, not seasonally adjusted
Group: Special indexes
Item: Steel mill products, including fabricated wire products
Base Date: 198200



The preliminary numbers for the last four months were showing a downward trend from the December 2021 high of 447, but April ticked back up to 390 from March's 380. Contractors have not been opting into the steel cost adjustment for a number of reasons. Jim informed them that he just recently advised an office to use $0.80 as the initial cost basis rather than the $0.40 we have historically used. We will see what happens with that particular job.

It was reported by the contractors that PVC pipe shortages are still out there depending on the size needed. Larger sizes seem to be harder to find.

Reinforcing steel is reported by the contractors as being available, but there are longer than usual lead times. The contractors did state that larger bars that are often used in shaft cages, 14s and bigger, are harder to get. Hoops were also reported as being difficult to procure.
The contractors brought up that with these national shortages, the State's practice of time but no money for delays associated with material procurement delays is not very fair. Localized material supply issues are one

thing, but when the product simply cannot be procured anywhere in the nation, they felt that they deserved some assistance or relief of the associated delay costs. What that looks like or how it would work is unknown at this time.

8 Next Meeting

At the meeting, Jim forgot to mention the next meetings. The Team did express an interest in meeting in person, so that will be goal for the fall meetings. We usually take a break during peak summer construction and will resume meeting on our 6 week schedule in September. Here is the 2022 meeting plan:

AGC STRUCTURES	
Scheduled	Comments
1/21/2022	Done
3/4/2022	Done
5/12/2022	Done
Summer Break	
9/22/2022	
11/3/2022	
12/8/2022	

Notes by Jim Cuthbertson

AGC/WSDOT Structures Team – Meeting Minutes
June 9, 2022

Attendees

[1] **Team co-chair**

Regular Attendees				
Present	**Member**	**Company**	**Phone**	**E-mail**
	Allen, Buck	Hamilton Const.	360-742-3326	BAllen@hamil.com
	Bowles, Eric	Conc. Tech.	253-383-3545	ebowles@concretetech.com
	Christopher, Chris	WSDOT-Const.	360-705-7821	ChristC@wsdot.wa.gov
X	Cucchiara, Kevin	Quigg Bros.	360-580-0015	kevinc@quiggbros.com
X	Cuthbertson, Jim[1]	WSDOT-Const.	360-870-1108	cuthbej@wsdot.wa.gov
X	Glassford, Patrick	WSDOT-Bridge	360-705-7828	GlassfP@wsdot.wa.gov
	Griffith, Kelly	Max J. Kuney	509-535-0651	kelly@maxkuney.com
X	Griffith, Steve	RMA Group	971-263-0611	sgriffith@rmacompanies.com
	Helvey, Bryant	Graham	206-718-7266	Bryant.Helevy@grahamus.com
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	Hunt, Neil	The Walsh Group	206-348-1726	nwhunt@walshgroup.com
	Kane, Ed	WSDOT-NWR	425-225-8743	kaneed@wsdot.wa.gov
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X	Moore, Stuart[1]	Atkinson	360-340-6797	stuart.moore@atkn.com
X	Olson, Ryan	Granite Const.	206-793-8110	ryan.olson@gcinc.com
	Owen, Geoff	Kiewit IWCo.	360-609-6548	Geoff.owen@kiewit.com
	Quigg, John	Quigg Bros.	360-533-1530	johnq@quiggbros.com
X	Rider, Kelli	Manson Const.	206-516-9576	KRider@MansonConstruction.com
	Robinson, Eric	WSDOT-WSF	206-515-3897	robinse@wsdot.wa.gov
X	Sargent, Scott	WSDOT-Const.	360-705-7753	Sargenw@wsdot.wa.gov
	Schettler, Jim	Jacobs	425-239-7542	jim.schettler@jacobs.com
X	Smith, Will	WSDOT-SCR	509-577-1804	smithw@wsdot.wa.gov
	Stegeman, Dave	Kiewit IWCo.	253-255-2373	David.Stegeman@kiewit.com
X	Swett, Geoff	WSDOT-Bridge	360-705-7157	swettg@wsdot.wa.gov
	Thody, Ryan	DBM Contractors	206-870-3525	Ryan.thody@dbmcontractors.com
X	Tornberg, Ben	Manson Const.	206-496-9407	btornberg@mansonconstruction.com
	Watt, Doug	CJA	425-988-2150	dwatt@condon-johnson.com
X	Watts, Troy	WSDOT-OR	253-255-8215	wattst@wsdot.wa.gov
	Welch, Pete	Granite Const.	425-551-3100	pete.welch@gcinc.com
X	Wilson, Loren	FHWA	360-753-9482	Loren.Wilson@dot.gov

Guests			
Name	**Company**	**Phone**	**E-mail**
Aldrich, Brian	WSDOT Bridge	360-705-7217	ALDRICB@wsdot.wa.gov
Hooker, Bob	WSDOT SCR	509-577-1760	Hookerb@wsdot.wa.gov
Minnick, Jeff	WSDOT SCR	509-577-1844	Minnicj@wsdot.wa.gov
Mizumori, Anthony	WSDOT Bridge	360-705-7228	Mizumoa@wsdot.wa.gov
Parkins, Jim	Concrete Technology	253-383-3545	JParkins@concretetech.com
Scully, Madison	WSDOT SCR	509-577-1821	Scullym@wsdot.wa.gov
Warren, Erik	WSDOT SCR	509-577-1893	Warreer@wsdot.wa.gov
White, Brian	WSDOT SCR	509-577-1700	Whiteb@wsdot.wa.gov

Agenda

This was a special meeting to specifically provide a constructability review for the following project:
I-90/Vantage Bridge - Replace Bridge Deck and Special Repairs MP 137.2 to 137.7

1 Welcome / Review of Agenda

The meeting started at 2:00 pm. Cuthbertson welcomed participants, reviewed the meeting agenda, and introduced the Bob Hooker the Project Engineer for the project and Anthony Mizumori of the Bridge Office who is the lead structural designer for the project.

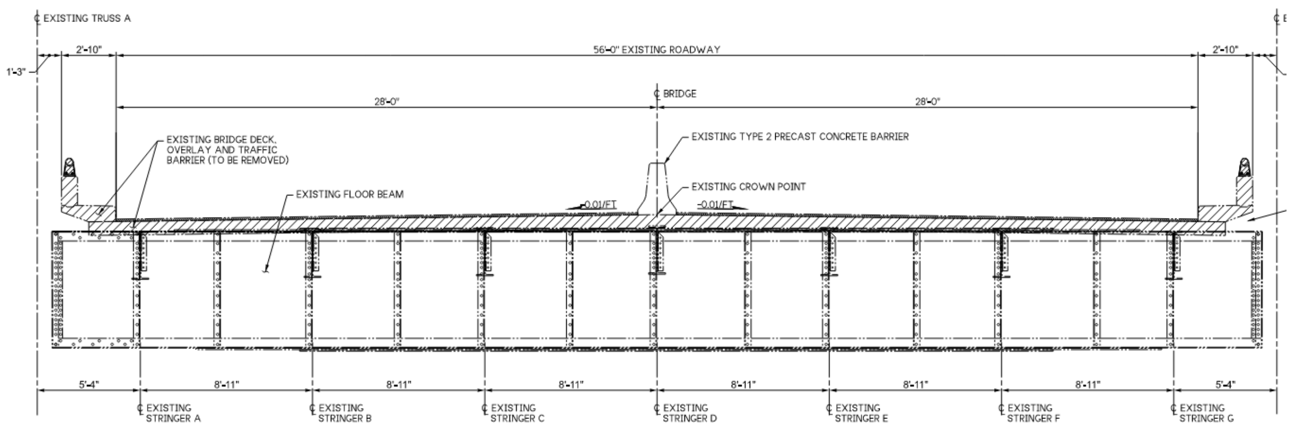
2 Project Review

Bob Hooker, the project engineer from the South Central Region gave a general project overview. The project is located on I-90 roughly midway across the State at MP 137 where I-90 crosses the Columbia River. The current deck is deteriorated and often needs extensive repairs and patching. The bridge has two lanes in both directions. Existing shoulders are extremely tight; two feet and sometimes less. Eastbound and westbound is median barrier separated. Downhill grades exist on both sides of the river and truck volume is very high.

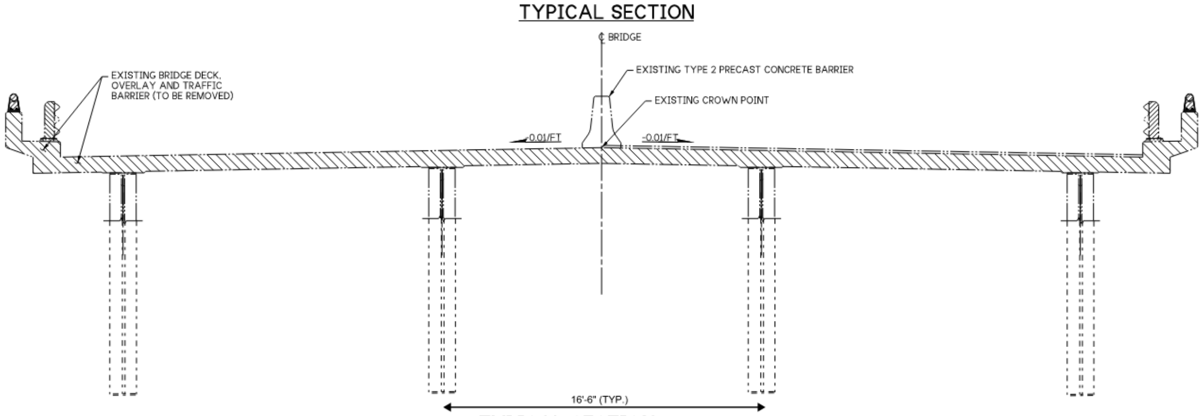
The purpose of this project is to remove and replace the existing bridge deck and repair select columns and struts. This will preserve and maintain the structural integrity of the bridge and allow for the safe and continued operation of the highway. This crossing of the Columbia is the only crossing for many miles making it vitally important for citizens and freight use. The route has no viable detours, and because of that, the bridge must remain open and functional during the deck replacement construction, one lane in each direction. Because this is a vital route, one of the project constraints is a commitment to open the bridge to four lanes of traffic during holidays and when there is known heavy E-W traffic such as that during WSU graduation. Modeling indicates that on heavy traffic weekends backups could approach ten miles and result in a four hour delay.

The Bridge and Structures office is currently working on the design and staging plan for the deck replacement. The region plans to advertise this project in February 2023. Because the bridge must remain in service during construction, they are planning on a long project duration, almost 2.5 years. The bridge is planned to be operationally complete in November 2025. On each side of the river there is WSDOT property that can be used for staging. Although, both sites will require some grading work to be useful. The west side property is about 6.5 acres. The east side is within the loop ramp and is smaller.
The bridge itself has a steel truss portion with steel plate girder approaches on either end. The steel girder portions total 1,325 ft in length and the truss is 1,170 ft in length for, 2,495 ft of total length.

The two different structure types complicate the staging as the girders on the approaches do not align with the stringers in the truss. Also, the girders are widely spaced 16.5 ft typically. Stringers in the truss section are typically 8 ft 11 inches except for the outside. Typical sections are below.

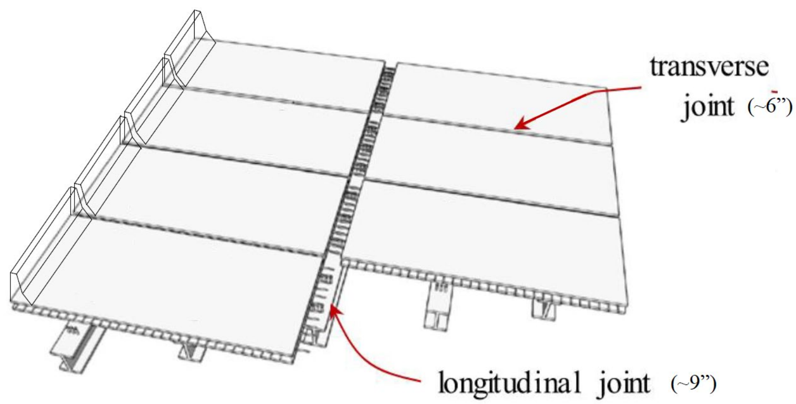


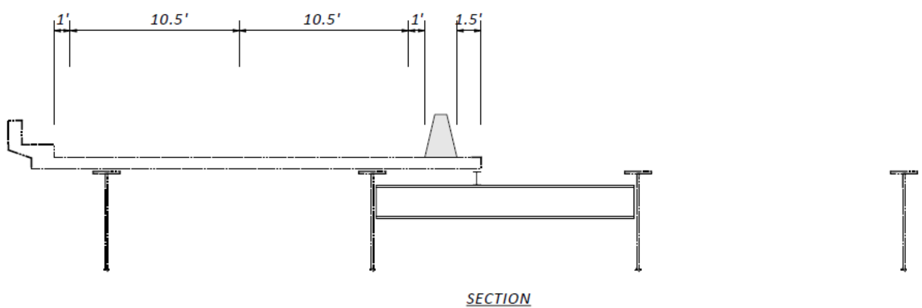
TYPICAL SECTION



TYPICAL SECTION

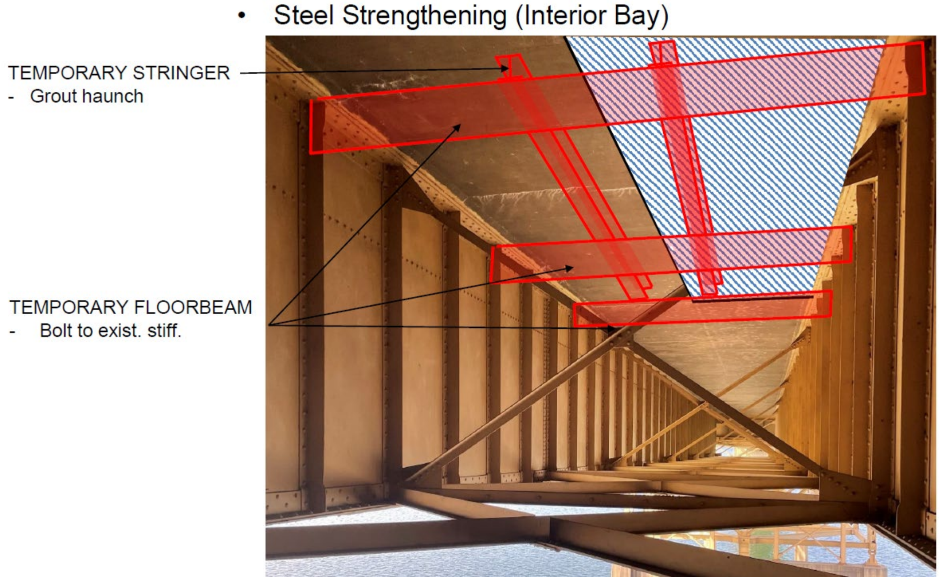
The current plan for demo and construction of the current deck with the girder portion of the bridge is cut the deck into a series of panels. Cuts will be made along the centerline of the deck and then transverse (90 deg) to centerline. Three or four panels on one side will be removed and new precast panels will replace those removed. While that is occurring on one side of the bridge, traffic will be shifted to the other side on 10.5 ft lanes. The panel concept is shown below along with a section showing the removed deck and preserved traffic lanes.





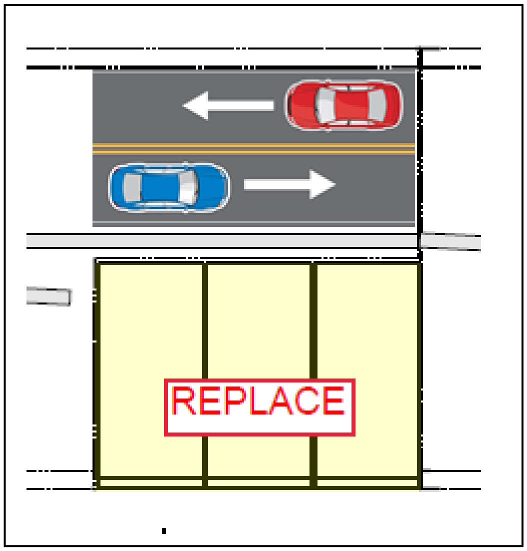
The widely spaced girders present a challenge for the current concept. The existing deck is not sufficient to cantilever and support the loads once cut. Additional temporary support members will be necessary to support the remaining deck at each longitudinal and transverse cut. A concept of the necessary strengthening is shown below and in the section above for the center bay. The transverse cut in the remaining bay will need similar support.

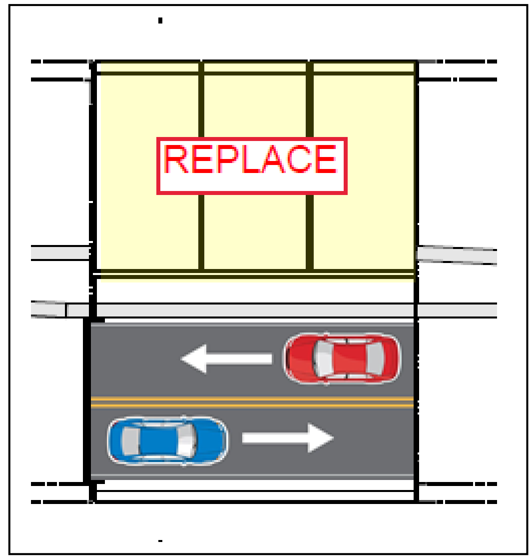
- Steel Strengthening (Interior Bay)



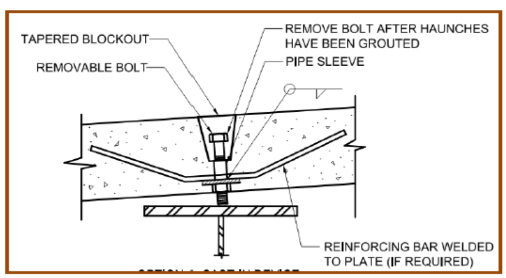
The longitudinal joint is planned to be 9-inches and each transverse joint is planned to be 6-inches. The joints between the new precast panels will be closed using ultra high performance concrete UHPC.

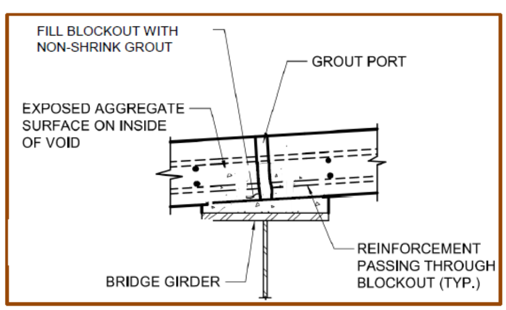
The current plan is progress the deck replacement in a way that allows three panels on one side of the bridge to be replaced. Shift traffic to the side that was just replaced and then replace the mirroring panels on the other side. With this concept the center strengthening members are used for the replacement of both sides of the roadway deck and accomplishes the full width deck replacement in one concentrated area. The whole operation will then move forward and repeat to accomplish the linear progression of the work. When needed, both sides of the bridge can be used for traffic allowing four lanes of traffic, two in each direction.





The bridge office believes that this concept could also be used with multiple crews as long as the crews were replacing panels on the same side and stayed in sequence with one another. The Region really wants to maintain the ability to open the bridge to four lanes each weekend or every other weekend. Once the panels are placed and leveled, the UHPC joints need to be cast and cured. Anthony was thinking they may require 24 to 36 hours for cure time. That is one of the reasons why he is thinking that doing only three panels at a time is feasible, assuming the lanes are closed late Sunday night and reopened on Friday. Anthony stated that they were not planning to install studs to the girders for the closure pour but there would be grout that needed to be placed once the panels were leveled with the leveling bolts.





Based on the age of the bridge, it is assumed that the paint will be lead based so abatement will be necessary when prepping the tops of the girders or when doing the strengthening work in the bays.

Questions for the AGC Structures Team.

1. How much deck panel work could be accomplished in a 4 day 2 lane closure assuming around the clock work? The bridge would be open to 4 lanes during the weekends.

2. How much deck panel work could be accomplished in a 10 day 2 lane closure assuming around the clock work? The bridge would be open to 4 lanes every other weekend.

The Contractors could not provide a detailed estimate of the time they thought it would take or how much production they could attain in response to questions 1 and 2. There is just too much to consider.

The Contractors cautioned that it has been their experience that once the deck is removed, often they need to do repairs to the tops of the girders, mainly because of corrosion.

The contractors felt that the constant shifting of traffic from the existing eastbound lanes to the existing westbound lanes and then back again, over and over, would result in a very long, drawn out construction process. They suggested getting a scheduling firm on board to schedule out the construction duration for the proposed sequence of work. The concept of only having four or five days of access was thought to be a significant issue. The Contractors thought that it may be possible to run three shifts of work, but there was still a lot of work to do in that very short window. Saw cut, remove existing panels, surface prep the girder, bring in new panels, place them, level them, do the closure pour, cure the closure, adjust barriers, pin barriers, and shift traffic. It is a lot of work that is linear in its sequence and if one element is delayed, everything gets delayed. The risk of a delay in opening lanes for the weekend is high.

3. What are the risks of assuming two teams (split the bridge east west) with round the clock crews?

One of the risks identified was if the two crews got out of sequence it may be necessary for one crew to stop work to allow the other to catch up. If they were separated by enough distance, it might be possible to do a traffic cross-over while on the bridge but that is not desired. It may not be possible to move materials and equipment through the work area of the crews, if everything is staged on one side of the river, one crew may become isolated from the staging area.

4. Are there other staging/closure scenarios that WSDOT should consider?

Doing the deck replacement in thirds rather than halves. The Contractors were proponents of doing the deck replacement in thirds rather than in halves. With a third concept, you could maintain one lane of traffic in each direction and could possibly avoid needing to do the center strengthening. You could also minimize the number of traffic shifts. However, it probably would not be possible to open the bridge to four lanes of traffic. The thinking was that if you could sequence the work to avoid the traffic shifts and strengthening, you could drastically shorten the construction duration. It was also suggested that a scheduler look at this concept. Even though you may not be able to have four lanes you may significantly reduce the contract duration and cost. Enough so, that it may be the better option.

5. How soon after award could deck panels be placed? What if PCI precast plan certification is required?

No specific time frame was provided but it was stated that PCI certification would almost certainly require that an offsite casting facility would be needed as not many contractors carry that certification themselves. Even lower-level certifications often require as much as a year to attain. Accordingly, onsite fabrication would be unlikely.

6. Would one work staging area on the west side suffice?

It was suggested that with the anticipated traffic delays and the potential for a car to overheat or something like that, it would probably be best to have some materials and equipment available from either side of the bridge. That way if something happened and you couldn't move materials or equipment within the traffic stream, you may still be able to continue work. Especially if you are running with the two-crew option proposed. If all the supplies are on one side of the bridge, you may not be able to move them across the work zone of the other crew. Using both sides for staging or possibly being able to move supplies and material via water would be good options to consider.

7. What are the most significant risks that WSDOT/Contractor will need to manage?

Liquidated damages were mentioned. Being I 90 with the four lane opening requirement, the contractors thought the LDs would be a concern; anticipating that they would be hefty if they missed an opening.

Doing the strengthening work one season and the deck replacement a second season may be worth exploring.

AGC/WSDOT Structures Team – Meeting Minutes
(September 22, 2022)

Attendees

[1] **Team co-chair**

Regular Attendees				
Initials	**Member**	**Company**	**Phone**	**E-mail**
	Allen, Buck	Hamilton Const.	360-742-3326	BAllen@hamil.com
X	Bowles, Eric	Conc. Tech.	253-383-3545	ebowles@concretetech.com
	Christopher, Chris	WSDOT-Const.	360-705-7821	ChristC@wsdot.wa.gov
X	Cucchiara, Kevin	Quigg Bros.	360-580-0015	kevinc@quiggbros.com
X	Cuthbertson, Jim[1]	WSDOT-Const.	360-870-1108	cuthbej@wsdot.wa.gov
X	Glassford, Patrick	WSDOT-Bridge	360-705-7828	GlassfP@wsdot.wa.gov
	Griffith, Kelly	Max J. Kuney	509-535-0651	kelly@maxkuney.com
X	Griffith, Steve	RMA Group	971-263-0611	sgriffith@rmacompanies.com
	Helvey, Bryant	Graham	206-718-7266	Bryant.Helevy@grahamus.com
X	Hilmes, Bob	WSDOT-ER	509-324-6089	hilmesb@wsdot.wa.gov
X	Hunt, Neil[1]	The Walsh Group	206-348-1726	nwhunt@walshgroup.com
X	Kane, Ed	WSDOT-NWR	425-225-8743	kaneed@wsdot.wa.gov
	Khaleghi, Bijan	WSDOT-Bridge	360-705-7181	khalegb@wsdot.wa.gov
X	Moore, Stuart	Atkinson	360-340-6797	stuart.moore@atkn.com
X	Olson, Ryan	Granite Const.	206-793-8110	ryan.olson@gcinc.com
	Owen, Geoff	Kiewit IWCo.	360-609-6548	Geoff.owen@kiewit.com
	Quigg, John	Quigg Bros.	360-533-1530	johnq@quiggbros.com
	Rider, Kelli	Manson Const.	206-516-9576	KRider@MansonConstruction.com
X	Robinson, Eric	WSDOT-WSF	206-515-3897	robinse@wsdot.wa.gov
X	Sargent, Scott	WSDOT-Const.	360-705-7753	Sargenw@wsdot.wa.gov
	Schettler, Jim	Jacobs	425-239-7542	jim.schettler@jacobs.com
	Smith, Will	WSDOT-SCR	509-577-1804	smithw@wsdot.wa.gov
X	Stegeman, Dave	Kiewit IWCo.	253-255-2373	David.Stegeman@kiewit.com
X	Swett, Geoff	WSDOT-Bridge	360-705-7157	swettg@wsdot.wa.gov
	Thody, Ryan	DBM Contractors	206-870-3525	Ryan.thody@dbmcontractors.com
	Tornberg, Ben	Manson Const.	206-496-9407	btornberg@mansonconstruction.com
	Watt, Doug	CJA	425-988-2150	dwatt@condon-johnson.com
X	Watts, Troy	WSDOT-OR	253-255-8215	wattst@wsdot.wa.gov
	Welch, Pete	Granite Const.	425-551-3100	pete.welch@gcinc.com
	Wilson, Loren	FHWA	360-753-9482	Loren.Wilson@dot.gov

Guests			
Leland, Amy	WSDOT Bridge	360-705-7394	Lelanda@wsdot.wa.gov

Agenda

9:00	**Welcome / Review of Agenda**	Cuthbertson/Hunt
9:05	**Safety Briefing** 911- 6431 Corson Ave S, Seattle, WA 98108, Defib, Evacuation Plan	Cuthbertson/Hunt/All
9:10	**Around the table intros, ice breaker, and added time for technology/equipment battles**	All
9:30	**Approval of Previous Meeting Minutes and Recap/Refresher of where we left things (Jan – June).**	Cuthbertson/Hunt/All
9:45	**Contractor's Opportunity to raise issues and make suggestions, old or new let's hear 'em**	All
10:00	**Build America, Buy America (BABA) Act and Infrastructure Investment and Jobs Act (IIJA)**	Cuthbertson
10:30	**Break (15 min)**	All
10:45	**Division 6 Specification Changes, Fall Prot. Std. Plans, & Const. Manual Updates.**	Sargent
11:15	**DB NDT Testing of Shafts – Topic Kick-off**	Cuthbertson
11:30	**Labor and Materials – availability and escalating costs**	All
Noon	**Adjourn**	All

Last meeting's Action Items review and reporting

DEFERRED ITEMS

a) **Geofoam Fill GSP – Scott Sargent**

Beginning after the first of the year, Scott Sargent plans to begin work on taking a number of project specific special provisions and converting them into a Standard Specification with supporting GSPs.

b) **Fiber Reinforced Bridge Deck Study (2022 briefing at earliest) – Anthony Mizumori**

Anthony Mizumori stated that the Bridge office has two pilot projects identified. Each project has a pair of bridges. The plan is to use fiber reinforced concrete on one and regular class 4000 concrete for bridge decks on the other. The two projects are: Purdy Creek which should be on advertisement November 22, 2021 and I-90 Cabin Ck I/C to west Easton which will be on advertisement January 18, 2022.

c) **Dextra CSL tube spec revisions – Jim Cuthbertson**

WSDOT with input from the ADSC task force plans to revise the material requirements for CSL testing tubes. This group will be kept apprised of those changes, if any. This is on Jim Cuthbertson's to-do list since he is involved with that team.

d) **6-02.3(25) and (26) Const. Manual Updates – Scott Sargent**

This is delayed until Scott Sargent assumes his ASCE role. Patrick Glassford has done some work on these sections already and will share those with Scott.

Future meeting dates: December 8th - Hybrid

1 Welcome / Review of Agenda

Jim Cuthbertson (JC) started the meeting on time. We did not review the agenda. This was a hybrid meeting with both in person participants and attendees via Teams.

2 Safety Briefing

A safety briefing was held. We discussed emergency exit of the building, where to rally-up, location of fire extinguishers, and the defibrillator. Bob Hilmes volunteered to be the 911 caller and coordinator should we need that. We made it through the meeting without incident.

3 Around the table intros, ice breaker, and added time for technology/equipment battles

JC thanked Bob Hilmes for his service on the Structures Team. Bob will be retiring after working 40 years for WSDOT's Eastern Region out of Spokane. Bob has been an integral part of the structures team for the last 20 years.

Neil Hunt introduced himself. Neil mentioned that he was co-chair for the group, but I am not sure that attendees recognized the change in leadership. Neil will be the co-chair for the AGC side. He is taking over for Stuart Moore of Atkinson. Both Neil and Stuart deserve thank yous for being part of the team's leadership. Thank YOU!

All the other attendees introduced themselves too.

4 Approval of Previous Meeting Minutes and Recap/Refresher of where we left things (Jan – June)

The Structures Team, and all of the AGC teams usually take the summer off from meeting to fucus on construction. The September meeting is the first meeting after the summer hiatus. Accordingly, JC thought it would be good to review the first part of the year to jog everyone's memories and sum-up where we left off.

June, our last meeting - We did a project review for the Vantage Br Deck Repl. – There were no action items from that meeting, but we did provide numerous comments to the design team that should improve the constructability of the project.

May – We had continued discussion regarding bracket loading on WF Girder Webs – The Bridge office was tasked with developing sample calcs for submittals that deal with girder picks and picking girders with brackets already attached. Anthony Mizumori at bridge is still working on developing the sample calcs.

Buried Structure fit-up, - Fit-up requirements were discussed and changes were incorporated into the 2023 Standard Specifications. We are keeping the requirement for fit-up, requiring the contractor to observe, but left the option for video observance.

2023 Requirements

6-20.3(7)A Precast Concrete Structures

Except as otherwise noted by these specifications, precast concrete buried structures shall conform to all requirements of Section 6-02.3(9).

Precast prestressed units shall be fabricated and transported in accordance with Section 6-02.3(25).

For Class 1 and Class 2 precast concrete three sided structures and precast concrete split box culverts, unless otherwise shown in the Plans, the Contractor shall, at a minimum for each set of forms used, progressively shop assemble the top and bottom units of the first 3 adjacent units for inspection of fit up. The installing Contractor shall observe the shop fit up. The date and time of the shop fit up shall be scheduled during normal business hours and communicated to both the installing Contractor and the Engineer. As an alternative to physically being present to observe the fit-up, the Contractor and the Engineer may agree to observe the fit-up via video conference. Units shall not be disassembled prior to receiving the Engineer's acceptance. If the Engineer accepts the initial assembly then no

March – Soldier Pile backfill was reviewed. The issue brought to the group was centered around the specifications invoking the CDF material requirements in 2-09.3(1) for the pumpable lean concrete. To make the lean concrete pumpable, the amount of cement or fly ash that needed to be added would often result in mixes with more than the 300 psi maximum allowable compressive strength.

2022 Specification

6-16.3(5) Backfilling Shaft

The excavated shaft shall be backfilled with either controlled density fill (CDF), or pumpable lean concrete, as shown in the Plans and subject to the following requirements:

1. Dry shaft excavations shall be backfilled with CDF.
2. Wet shaft excavations shall be backfilled with pumpable lean concrete.
3. Pumpable lean concrete shall be a Contractor designed mix providing a minimum 28-day compressive strength of 100 psi. Acceptance of pumpable lean concrete will conform to the acceptance requirements specified in Section 2-09.3(1) for CDF.
4. A wet shaft is defined as a shaft where water is entering the excavation and remains present to a depth of 6 inches or more.

The 2023 revisions to the specification no longer reference the CDF of Division 2. The revised specification is below. There is no longer an upper limit on the backfill strength. Contractors will need to consider material strength and curing time developing mix designs when chipping for lagging installation is required.

2023 Specifications

Soldier Pile and Soldier Pile Tieback Walls ***6-16***

6-16.3(5) Backfilling Shaft

The excavated shaft shall be backfilled as shown in the Plans and subject to the following requirements:

1. Dry shaft excavations shall be backfilled with CDF or pumpable lean concrete.
2. Wet shaft excavations shall be backfilled with pumpable lean concrete.
3. Pumpable lean concrete shall be a Contractor-designed mix in accordance with Section 6-02.3(2)D, providing a minimum 28-day compressive strength of 100 psi. Acceptance of pumpable lean concrete will be based on a manufacturer's certificate of compliance that conform to Section 6-02.3(5).
4. A wet shaft is defined as a shaft where water is entering the excavation and remains present to a depth of 6 inches or more.

6-02.3(2)D

Cementitious Requirement for Concrete

Class of Concrete	Minimum Cementitious Content (Pounds)	Minimum percent Replacement of Fly Ash or Ground Granulated Blast Furnace Slag for Portland Cement	Maximum percent Replacement of Fly Ash for Portland Cement	Maximum percent Replacement of Ground Granulated Blast Furnace Slag for Portland Cement
4000	564	*	35	50
4000A	564	*	25	30
4000P	600	15	35	50
4000W	564	*	35	50
3000	564	*	35	50
Commercial Concrete	**564	*	35	50
Pumpable Lean Concrete	*	*	***	***
Lean Concrete	****145	*	35	50

*No minimum specified.

**For Commercial Concrete, the minimum cementitious content is only required for sidewalks, curbs, and gutters.

***No maximum specified.

****Maximum of 200 pounds

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5 Contractor's Opportunity to raise issues and make suggestions, old or new let's hear 'em

Fit-up of buried structures.
After the first part of the year review (item 4 above), Bob Hilmes asked about the fit-up of buried structures. There was a recommendation made to require the fit-up to match the ground slope if the buried structure was not horizontal. Bob wanted to know what happened with that requirement. JC explained that we did consider that, but felt that it would be unlikely that we could force a precaster to place fill and grade it to match a sloping stream bottom so that the pieces could be set like they would be on the job. Ryan Thody stated he thought it wouldn't matter because everything is in a plain. Bob pointed out that the pick points and chokers result in vertical picks. The contractor would need to have exact choker lengths so that the segments could hang to match the slope and not rest edge first on the high side when being placed. Often the chokers are all the same length so the segments make contact on one end first and then need to be slid into position as the hanging section is near vertical and the section they are abutting is not. That fit-up when sections are angled is different than the fit-up when everything is plumb and vertical.

JC asked if the contractors have fit-up issues on the job because the yard fit-up does not include all the seals and joint materials. The contractors indicated that on occasion this is an issue for them. Pieces that fit well in the yard no longer fit well once there is additional material in the joint. The contractors suggested relying on the banding or placing some other form of barrier on the outside of the joints prior to backfilling. Grouted joints were mentioned, but everyone shied away from them due to grout curing time and the need for rapid construction on most jobs.

One contractor mentioned that they recently had issues with the fit-up of precast wingwalls. There is currently no requirement for fit-up of wingwalls, only the buried structure itself.

Buried Structure Advertisements
The contractors also urged WSDOT to get projects advertised earlier so that they can get buried structures fabricated and to include material suspensions for procurement of the buried structure. One contractor stated that they are seeing more owner procured buried structures, where the owner procures them and takes physical possession long before the construction contract is awarded. This is happening more commonly with local agencies.

Buried Structure Closures
Closure durations for buried structure construction were mentioned. A number of jobs expect weekend closures to be sufficient. The contractors really urged to get 72 or 96 hour closures, the longer the better.

Barrier Cure Time
It was requested that the team look at the cure time for barrier prior to placing pigmented sealer. Oregon uses a time frame that allows placement of the sealer much sooner than WSDOT.

Cement Changes
Changes in cement suppliers is causing WSDOT to require new mix designs. The contractors want WSDOT to find a way to streamline the mix approval process especially for mixes that may be approved for another contract. It was suggested to treat concrete mix designs like we do HMA and put them on the QPL. That way a contractor can select different mix designs and suppliers if they need to swap for some reason.

Shotcrete Facing
It seems that a lot of the fish passage projects that are being advertised do not allow the use of shotcrete for wall facia. The use of CIP concrete facia is often more difficult with the fish passages because of the forming and curing requirements associated with CIP facings. Allowing the use of shotcrete can eliminate the need for forms and can also allow faster construction.

6 Build America, Buy America (BABA) Act and Infrastructure Investment and Jobs Act (IIJA)

There were two laws passed by the Federal government on November 15, 2021 that will affect WSDOT construction projects. The laws are:

- Infrastructure Investment and Jobs Act ("IIJA"), Pub. L. No. 117-58,
- Build America, Buy America Act (BABA). Pub. L. No. 117-58, §§ 70901-52.

The laws were written to take effect in May of 2022, 180 days after passing, but USDOT and FHWA were not ready for implementation. They sought a waver and were granted one. That waiver expires November 10, 2022. The law states that all contracts awarded after that date must be compliant with the regulations. The BABA portion, supplements Section 165 (49 U.S.C. § 5323)) of the Surface Transportation Assistance Act of 1982. That is the buy American steel and iron rules we are all familiar with. Those stay in place and are unaffected by BABA. BABA adds manufactured products and construction materials to the buy American requirements. FHWA has an existing waiver for manufactured products so we do not plan on requiring that manufactured products be American made. At least not yet. That may come about in the future. We will be adding construction materials to our made in America requirements. All construction materials on jobs with Federal funding in the construction phase will need to be manufactured in the United States. This means that all manufacturing processes for the construction material occurred in the United States.

- Construction Materials, (materials that are or primarily are)
  - non-ferrous metals
  - plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables)
  - glass (including optic glass)
  - Lumber
  - Drywall

The law also clarifies what is Not a Construction Materials

- an item of primarily iron or steel
- a manufactured product
- cement and cementitious materials
- aggregates such as stone, sand, or gravel
- aggregate binding agents or additives

BABA only applies to projects with fed funding in construction, CN, but the 1982 Buy America (steel) applies to projects with Fed money in any phase, PE, RW, or CN. So, moving forward we can have projects that are "old school" steel only with no BABA, but we can't have BABA w/o steel.

FROM HERE ON EVERTTHING IS IN DEVLOPMENT THIS IS A SNEAK PEAK

- DBB Projects advertised after October 17 will start having BABA requirements.
- DB Projects with Apparent Best Value determinations after November 10 will have BABA
- WSDOT is going through Div 9 to ID what materials fall into what categories.
- Sample of the table

Build America Buy America Act (BABA) Materials			
Exempt	**Manufactured Product**	**Construction Material**	**Steel or Iron**
9-01 Cement	9-04 Joint Sealing Materials	9-04.2(3)A Closed Cell Foam Backer Rod	9-05.1(2) Zinc Coated or Aluminum Coated Corrugated Iron or Steel Drain Pipe
9-02 Bituminous Materials	9-04.1(1) Asphalt Filler for Contraction and Longitudinal Joints in Concrete Pavements	9-04.4 Pipe Joint Gaskets	9-05.4(7) Coupling Bands
9-03 Aggregate	9-04.1(2) Premolded Joint Filler for Expansion Joints	9-04.4(1) Rubber Gaskets for Concrete Pipes and Precast Manholes	9-05.4(8) Steel Nestable Pipe
	9-04.2 Joint Sealants	9-04.4(3) Gaskets for Aluminum or Steel Culvert or Storm Sewer Pipe	9-05.4(9) Steel End Sections
	9-04.2(1) Hot Poured Joint Sealants	9-04.4(4) Rubber Gaskets for Aluminum or Steel Drain Pipe	9-05.4(9)C Toe Plate Extensions
	9-04.2(1)A1 Hot Poured Sealant for Cement Concrete Pavement	9-04.5 Flexible Plastic Gaskets	
	9-04.2(1)A2 Hot Poured Sealant for Bituminous Pavement	9-04.6 Expanded Polystyrene	9-05.5(5) Coupling Bands

- We are running this list by FHWA, and are considering sharing this with everyone as an aid. Probably not as a contract doc though.

- We will be developing a new CMO form
  Certificate of Materials Origin, DOT Form 350-109 (Use for Steel)
  Certificate of Materials Origin, DOT Form 350-110 (Use for Non-Steel)
- Rather than turn in the form for every construction material, we are leaning towards the new form being a prime certification that all of the materials purchased or incorporated into the job under that month's progress estimate were American made. It will be a condition of processing. No paper = no money. Good news it is only one paper once per month rather the alternative of per material and per lot.
- There will be no change to steel CMOs. What you have been doing you will keep doing.

7 Break (15 min)

8 Division 6 Specification Changes, Fall Prot. Std. Plans, & Const. Manual Updates.

For the 2023 Standard Specifications book, the following changes were made to division six.

The entire book had some grammar changes, most but not all gender references were removed and the word "any" was changed to "all". We also tried to limit the use of "etc." and inserted more descriptive language in its place where we could.

6-02.3(14)B Class 2 Surface Finish had the following text added:

The Contractor shall remove all lifting embedments to 1 inch below the finished surface and fill the voids in accordance with Section 6-02.3(14)A, items two and three.

The contractors had concerns that this change would apply to MSE wall panels. Those panels have pick points but they lie within the joints abutting adjacent panels and are not exposed to weather. WSDOT agreed to look into the matter and see if there needed to be clarification added.

6-02.3(19) Bridge Bearings added language requiring the elastomeric bearing pads to be glued to grout pads.

1. Elastomeric bearing pads conforming to Section 9-31.8(1).
The Contractor shall adhere the elastomeric bearing pads to the concrete surface using the manufacturer's recommended adhesive product.

6-07.3(2)D Hazardous Waste Containment, Collection, Testing, and Disposal
Submittal Component added language to item no 8 about including air flow calculation in the submittal.

8. Provisions for dust and debris collection, ventilation, and auxiliary lighting within the containment system. The plan shall include a minimum calculation of airflow in accordance with section 10.6 of SSPC Guide 16.

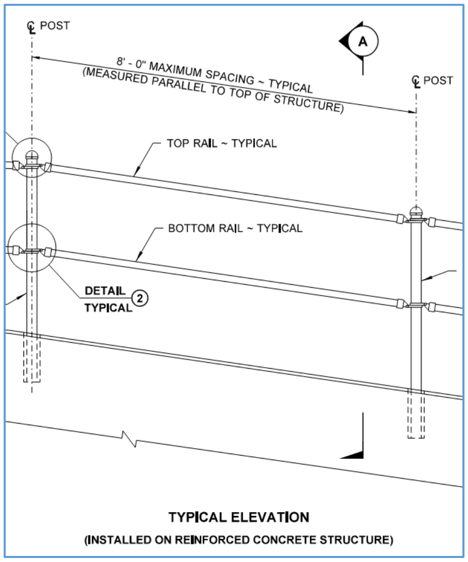
6-16.3(5) Backfilling Shaft added language about pumpable lean concrete. See the meeting notes above.

6-20.3(1)H Concrete Structures added the following:

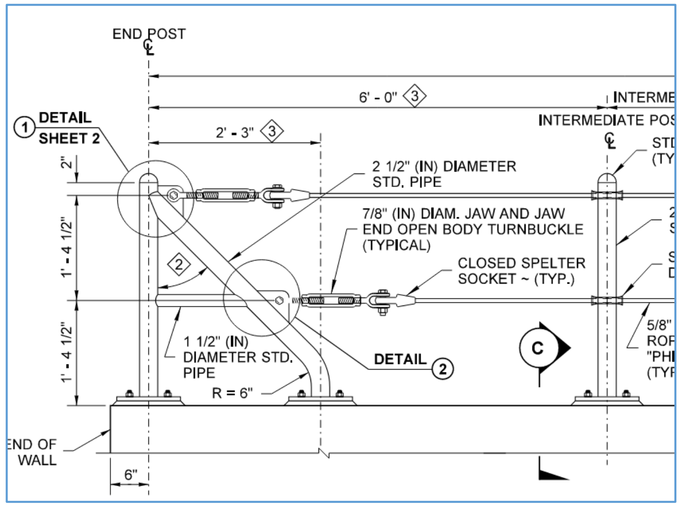
Bridge approach slabs shall be required for Class 1 and Class 2 buried structures without full depth roadway section (including HMA and CSBC) within 25 feet of each end of the buried structure.

There were also two new standard plans developed for fall protection systems.
STANDARD PLAN L-5.10-00 – Bridge Railing Type Chain Link Pipe Rail
STANDARD PLAN L-5.15-00 – Cable Fence

Below are two image captures for the two new plans so you can get a sense of what they are.



Chain Link Pipe Rail L-5.10-00



Cable Fence L-5.15-00

9 DB NDT Testing of Shafts – Topic Kick-off

The design build templates that WSDOT uses as a starting point for their Request for Proposals (RFP) contains language about non-destructive testing of shafts. The text from the templates is attached to the end of the notes for reference. Stuart Moore requested that we review the RFP requirements at a previous meeting. The structures team went through the requirements. Unfortunately, Stuart had another commitment and couldn't be present for this discussion, but he did describe his issue via e-mail. Section 2.3.8.2.4 Non-destructive Testing of Drilled Shafts – Periodic Inspection has a requirement where the design builder is required to submit the determination of final acceptance to the WSDOT Engineer for review and comment, but there are no requirements or time limits associated with the State providing comments. Stuart wanted WSDOT to add language that would commit the State to rapidly providing comments. This seemed like a reasonable request and will be passed to the WSDOT Design Build group for consideration. The recommended added text is shown below as highlighted and underlined text.

> *…The EOR will determine final acceptance of each shaft, based on the CSL/TIP test results and analysis for the tested shafts. The test results and analysis and determination of Final Acceptance by the EOR shall be provided to the WSDOT Engineer for Review and Comment within 3 Calendar Days after receiving the test results and analysis. <u>The WSDOT Engineer will Review and Comment within 3 Calendar Days of receiving the test results, analysis, and determination of Final Acceptance.</u>*

10 Labor and Materials – availability and escalating costs

Labor and material issues were discussed over the course of the meeting. There was not much added with this discussion that hadn't already been discussed.

11 Adjourn

Next Meeting December 8, 2022 at Corson

Notes by Jim Cuthbertson

SHAFT NDT RELATED REQUIREMENTS FROM RFP TEMPLATES

2.6 Personnel Requirements

2.6.3.7 <u>Non-Destructive Shaft Testing Personnel</u>

Personnel providing non-destructive shaft testing and reporting services shall be a Professional Engineer shall have a minimum of 2 years of experience in testing and interpretation of the method utilized and shall have performed similar tests on a minimum of three deep foundation projects in the last 2 years.

2.6.8 Special Inspection

2.6.8.2 <u>Elements Requiring Special Inspection</u>

2.6.8.2.4 <u>Non-destructive Testing of Drilled Shafts – Periodic Inspection</u>

The Design-Builder shall perform Crosshole Sonic Log (CSL) or Thermal Integrity Profiling (TIP) testing of all drilled shafts constructed for bridges in accordance with the Standard Specifications. The Design-Builder shall submit the results and analysis of the non-destructive testing for each shaft tested to the EOR for review. The EOR will determine final acceptance of each shaft, based on the CSL/TIP test results and analysis for the tested shafts. The test results and analysis and determination of Final Acceptance by the EOR shall be provided to the WSDOT Engineer for Review and Comment within 3 Calendar Days after receiving the test results and analysis.

All repair of defects, including coring and schedule impacts shall be the sole responsibility of the Design-Builder and shall be included in the Proposal Price.

2.6 Submittals

2.6 <u>General</u>

All submittals, including those pertaining to changes during construction, shall be submitted to the WSDOT Engineer for Review and Comment in accordance with the requirements of Section 2.12, *Project Documentation* and Section 2.28, *Quality Management Plan*.

Project geotechnical submittals, at a minimum, include the following:

- SIP
- GIP
- GSIP
- Soil and Rock Properties for design
- Pre-condition survey
- Peer Reviewer qualifications
- Calculation verification packages
- Technical memoranda and supporting calculations
- Geotechnical report(s) and supporting calculations
- Ground stabilization measures and supporting calculation.
- Design and supporting calculations for temporary works, including shoring, cofferdams, slopes, retaining walls, work access, and work platforms
- All Geotechnical Recommendations, calculations, and communications issued between the Design-Builder and the Peer Reviewer
- Non-destructive test reports and determination of final acceptance by the EOR

2.28 Quality Management Plan

2.28.4.5 Materials Testing Frequencies and Random Sampling

…The WSDOT Engineer or its agent will perform nondestructive shaft QV tests on at least one and up to 10 percent of the drilled shafts constructed for bridges. The Design-Builder shall make the shafts accessible to WSDOT Inspectors for nondestructive shaft testing and shall notify the WSDOT Engineer when drilled shaft concrete is placed in each shaft so the WSDOT Engineer can schedule nondestructive shaft QV testing. The WSDOT Engineer will inform the Design-Builder if a shaft will be nondestructive shaft tested within 2 Calendar Days of receiving the Design-Builder's notification that shaft concrete has been placed.

2.28.5.4 Hold Points

Hold Points shall be identified in the construction process where critical characteristics are to be measured and maintained, and at points where it is impractical to determine the adequacy of either materials or workmanship once Work proceeds past this point. Pre-activity meetings shall be included in the Design-Builder's QMP as Hold Points. Hold Points shall be established where required QA inspection is mandatory. The Design-Builder shall provide the WSDOT Engineer with a minimum of 3 Calendar Days' notice of each Hold Point so that the WSDOT Engineer, at its discretion, can observe or visually examine a specific Work operation or test. Work shall not proceed until inspection is performed and a written release is granted by the Design-Builder's QA organization.

The development of Hold Points shall occur during final design. The EOR shall submit specific Hold Points with the Final Design Submittal and the RFC Documents.

At a minimum, the CQAM and DQAM shall establish Hold Points at the stages listed below. The QMP shall identify necessary additional Hold Points for compliance certification. The following Hold Points are not intended to limit or diminish the Design-Builder's responsibility to inspect all construction Work.

… Structures

- At completion of bridge embankment or excavation, and before the start of structure foundation
- Before saw cutting of concrete occurs
- Before pile driving or drilled shaft operations
- After completion of the first piling driven at each structure support, and at the completion of each pile group, for each structure support
- After completion of each drilled shaft along with nondestructive shaft testing, and at the completion of each drilled shaft group, for each structure support.

AGC/WSDOT Structures Team – Meeting Minutes
(December 8, 2022)

Attendees

[1] Team co-chair

Initials	Member	Company	Phone	E-mail
		Regular Attendees		
X	Allen, Buck	Hamilton Const.	360-742-3326	BALLEN@HAMIL.COM
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	Watt, Doug	CJA	425-988-2150	DWATT@CONDON-JOHNSON.COM
X	Watts, Troy	WSDOT-OR	253-255-8215	WATTST@WSDOT.WA.GOV
	Welch, Pete	Granite Const.	425-551-3100	PETE.WELCH@GCINC.COM
	Wilson, Loren	FHWA	360-753-9482	LOREN.WILSON@DOT.GOV

Guests			
Waligorski, Kevin	WSDOT Construction	509-668-0711	WALIGOK@WSDOT.WA.GOV
Polyakov, Yakov	WSP	N/A	YAKOV.POLYAKOV@WSP.COM

Agenda

9:00	**Welcome / Review of Agenda/Prior Minutes**	Cuthbertson/Hunt
9:05	**Safety Briefing** 911- 6431 Corson Ave S, Seattle, WA 98108	Cuthbertson/Hunt/All
9:10	**Around the table intros, ice breaker, and added time for technology/equipment battles**	All
9:30	**Safety While Hauling Pre-cast Structures**	All
9:45	**6-07.3(11)B1 Powder Coating Submittals and Reviews**	All
10:00	**Fuel Cost Adjustment Modifications** (Fuel Factor with LS Superstructure)	All
10:30	**Buried Structure Seismic Design**… What does that mean for Class 1 and 2 Structures?	All
	<<Added Agenda Item>> **Precast Wingwall Shear Key Constructability**	Geoff Swett Yakov Polyakov
11:00	**Clarifying the description of the CJ between the shaft and the transition pour**; clarify in 6-02.3 (12) and 6-19.3(7)F that they include or do not include shaft transition joints	All
11:30	**Select Next Meeting Times / Adjourn**	All
	DEFERRED ITEMS **Geofoam Fill GSP – Michael Bressan** Work on taking a number of project specific special provisions and converting them into a Standard Specification with supporting GSPs. **Fiber Reinforced Bridge Deck Study (2023briefing at earliest) – Anthony Mizumori** The Bridge office has two pilot projects identified. Each project has a pair of bridges. The plan is to use fiber reinforced concrete on one and regular class 4000 concrete for bridge decks on the other. The two projects are: Purdy Creek which has not been advertised yet and 009786 I-90 Cabin Ck I/C to west Easton executed 07/18/22. **6-02.3(25) and (26) Const. Manual Updates – Scott Sargent→Michael Bressan** Michael needs to check the status and finish this up.	

1 Welcome / Review of Agenda

The meeting was started just after nine. We did a round of introductions, a brief safety minute for the Holidays, and reviewed the agenda. Geoff Swett added a topic regarding precast wingwalls and Yakov Polyakov of WSP attended the meeting to discuss them.

2 Approval of Previous Meeting Minutes

We skipped the review of previous minutes. The minutes were distributed by e-mail after the last meeting. Comments were solicited. None were received.

3 Safety While Hauling Pre-cast Structures

The 2022 construction season had three lost load incidents related to the hauling of precast buried structure sections. Two occurred on a single WSDOT project and the third was on an Okanogan County Public Works contract. The Okanogan accident resulted in a fatality when another vehicle struck the culvert section which tipped onto SR-97. WSDOT and Snohomish County have heard verbal complaints from truckers who arrive on site and the loads are already on trailers, and do not appear stable. Yet, the truckers are expected to haul the load as is. Cuthbertson asked the contractors if WSDOT needed to require that an engineer or other competent person evaluate the loads and determine a center of gravity for the load then submit some form of documentation or certification that the load will be stable. Basically, requiring a hauling analysis and submittal for the transport of the segments.

The most stable position for the segments would be to always ship them with the bottom down and legs up, or on their “back” with the lid down and its legs up too. However, the top component would require flipping to be placed in that position then flipping again to right it for placement once delivered to the site. Neil Hunt stated that he was on a job where they had a large number of segments and they basically constructed a sand tipping bed where the segments could be tipped without damage, but he acknowledged that is generally not cost effective nor is there usually room for that sort of operation near the work site.

Eric Bowles stated that Concrete Tech will often use ballast blocks if they are shipping elements that are eccentric, but their engineers are aware of that need prior to shipping. Neil stated that the truck driver is responsible for the load they are hauling, but no truck driver is going to know where the center of gravity is for the load, nor would they be capable of determining it. It would not be right to expect the driver to do that kind of analysis, but someone needs to be responsible for doing that assessment. The general consensus was that it is the responsibility of the precaster and their in-house engineers to do a stability assessment. Geoff Swett stated that he thought WSDOT should be requiring some form of stability analysis submittal, but Troy Watts was not in favor of a separate shipping submittal. Troy thought that it may be appropriate to require that the precaster include an appropriate shipping position detail within their working drawings. A requirement like that would at least alert the engineer to consider shipping as part of the overall design.

Geoff Swett wanted to talk with Rick Brice about the analysis the Bridge Office performs when designing girders. He thought that Rick may have some ideas or suggestions about what calculations or submittals WSDOT should be requiring for these buried structure elements. Neil expressed his concern that once the elements arrive on site, the flipping of them to their correct position is also something than needs to be assessed. The larger GC firms have good access to an engineer who could do that kind of analysis, but some of the smaller firms may not have the engineering staff available for that and it could be a burden for small contractors. He just wanted WSDOT to keep that in mind.

4 6-07.3(11)B1 Powder Coating Submittals and Reviews

Geoff Swett raised a concern regarding the review of powder coating plans. Currently, powder coating plans are a required submittal under standard specification 6-07.3(11)B1, but that submittal is not listed in the Construction Manual under Figure 1-1. Consequently, each project engineering office is reviewing the plan and there have been issues with the consistency and quality of the submitted materials and consistency and quality of the review. Geoff would like to add the powder coating submittal to the table and follow

Page 1-56

Figure 1-1 Working Drawings, Shop Plans or Submittal Type

Working Drawing, Shop Plan, or Submittal Type	*Construction Manual* Reference	Standard Spec. or Other References	WSDOT Review Groups
Pile Driving Equipment Adequacy Submittals		6-05.3(9)	Project Engineer Bridge Construction Support Geotechnical Engineer Assistant State Construction Engineer
Painting Plan – Shop Application	None	6-07.3(2)	Project Engineer Bridge Technical Advisor Assistant State Construction Engineer State Materials Engineer (Fabricatic Inspection)

the same review as we do for Painting Plans – Shop Application. Geoff wants to ensure that the Bridge Office is included in the review for consistency.

Kevin Cucchiara mentioned that he has had difficulty on powder coating submittals but mainly when it comes to acceptable color. He would like to see WSDOT have standard colors for some things like fencing.

5 Fuel Cost Adjustment Modifications

Kevin Waligorski of the State Construction Office presented potential edits to the WSDOT Fuel Cost Adjustment that the Construction Office is considering implementing. The GSP itself is not really changing all that much, and most of the edits are associated with the instructions for the GSP's use and also the factors that are used in the calculation of the adjustment.

Within the GSP itself, WSDOT is considering changing the triggering percentage when the adjustment occurs. Currently the threshold is set at 10%, but WSDOT is considering using 5% as the trigger. That 5% works both ways when the price is more than 105% or when the price drops to below 95%. The actual GSP edits are as follows:

If the Monthly Fuel Cost is greater than or equal to ~~110~~105% of the Base Fuel Cost, then:

Adjustment = (Monthly Fuel Cost – (1.~~10~~ 05 x Base Fuel Cost)) x Q

If the Monthly Fuel Cost is less than or equal to ~~90~~95% of the Base Fuel Cost, then:

Adjustment = (Monthly Fuel Cost – (0.~~90~~ 95 x Base Fuel Cost)) x Q

Where Q = Σ ((Fuel Usage Factor for each Eligible Bid Item) x (Quantity paid in the current months progress estimate for each Eligible Bid Item)) for all Eligible Bid Items listed below:

Eligible Bid Item	Fuel Usage Factor
*** $$1$$ ***	*** $$2$$ ***
*** $$3$$ ***	*** $$4$$ ***

Some of the other more significant changes are associated with the instruction that go with the GSP. The instructions contain the fuel usage factor "Q" that is used in the calculation above. When the GSP was developed the usage factors, which are bid item specific and equipment dependent, were based on a 1980 FHWA Report (T 5080.3 Development and Use of Price Adjustment Contract Provisions). Since that time, equipment has changed becoming more efficient, but our haul distances have increased along with haul time due to traffic. TRB issued a more recent document in 2013 with updated fuel factors. TRB's National Cooperative Highway Research Program (NCHRP) Report 744: Fuel Usage Factors in Highway and Bridge Construction. https://www.trb.org/Publications/Blurbs/168693.aspx. An excerpt from that report follows:

Exhibit S-1. Fuel usage factor summary table.

Category	Item of Work	Units	FUF	1980 FUF
Clearing and Removal	Clearing	Gallons/Acre	191.200	200.000
	Pipe Removal	Gallons/L.F.	0.863	
	Pavement Removal - Asphalt	Gallons/C.Y.	1.397	
	Pavement Removal - Concrete	Gallons/C.Y.	0.562	
	Structure Demolition (House/Building)	Gallons/Each	375.000	
	Structure Demolition (Bridge per S.F. of Deck)	Gallons/S.F.	0.626	
Excavation	Excavation - Earth - Off Road - Long Haul	Gallons/C.Y.	0.320	0.440
	Excavation - Earth - Off Road - Short Haul	Gallons/C.Y.	0.263	
	Excavation - Earth - On Road - Long Haul	Gallons/C.Y.	0.687	
	Excavation - Earth - On Road - Short Haul	Gallons/C.Y.	0.319	
	Excavation - Rock - Off Road - Long Haul	Gallons/C.Y.	0.402	0.570
	Excavation - Rock - Off Road - Short Haul	Gallons/C.Y.	0.311	
	Excavation - Rock - On Road - Long Haul	Gallons/C.Y.	0.740	
	Excavation - Rock - On Road - Short Haul	Gallons/C.Y.	0.465	
	Strip Topsoil	Gallons/C.Y.	0.167	
	Roadway Finishing	Gallons/S.Y.	0.073	

Using that 2013 Report as a guide, WSDOT is proposing the following edits to the GSP instructions.

Eligible Bid Item Fuel Usage Factor
____ Excavation Incl. Haul, per cubic yard ~~0.29~~0.70 gal/cy
____ Excavation Incl. Haul –
Area ____ per cubic yard ~~0.29~~0.70 gal/cy
____ Borrow Incl. Haul, per cubic yard ~~0.25~~0.68 gal/cy
____ Borrow Incl. Haul, per ton ~~0.17~~0.45 gal/ton
Structure Excavation Class ___
Incl. Haul, per cubic yard ~~0.25~~0.70 gal/cy
~~Shoring or Extra Excavation Class A ______,~~
~~lump sum 0.04 gal/dollar~~
Crushed Surfacing ____, per ton 0.70 gal/ton
Crushed Surfacing ____, per cubic yard ~~1.02~~1.20 gal/cy
~~Processing and Finishing, per mile 270 gal/mile~~
~~Agg. From Stockpile for BST, per cubic yard~~
~~0.61 gal/cy~~
Furnishing and Placing Crushed ____,
per cubic yard ~~1.02~~1.20 gal/cy
Furnishing and Placing Crushed to No. 4,
per square yard 0.02 gal/sy
Furnishing and Placing Crushed Screening No. 4 to 0, per square yard 0.002 gal/sy
Planing Bituminous Pavement, per square yard 0.09 gal/sy
HMA Cl. ____ PG ____, per ton 0.90 gal/ton
HMA for ____, per ton 0.90 gal/ton
Commercial HMA, per ton 0.90 gal/ton
Cement Concrete Pavement, per cubic yard ~~1.0~~1.2 gal/cy
Cement Concrete Pavement -
Including Dowels, per cubic yard ~~1.0~~1.2 gal/cy
Concrete Class ____, per cubic yard ~~1.0~~1.2 gal/cy
Commercial Concrete, per cubic yard ~~1.0~~1.2 gal/cy
Superstructure ____, lump sum ~~0.02~~0.005 gal/dollar
St. Reinf. Bar, per pound ~~0.02~~0.004 gal/Lb
Epoxy-Coated St. Reinf. Bar, per pound ~~0.02~~0.004 gal/Lb

Note, Planing Bituminous Pavement is a new bid item we are adding to the eligible items, but there are also a couple we are planning to eliminate. One of the other significant changes is changing when the GSP should be included. Formerly the GSP was only included in design bid projects that had a duration greater then 200 working days. We are revising that to 100 working days or for projects that have an anticipated substantial completion date more than six months after the bid opening date to accommodate early advertisement of projects.

1-09.3.OPT1.FR1 Fuel Cost Adjustment
(~~August 7, 2017~~Update)
Use requires Region Construction Manager Approval and concurrence from HQ Construction Office. At the Region's discretion, use in Design-Bid-Build projects with more than ~~200~~ 100 working days or an anticipated substantial completion date more than 6 months beyond the bid opening date (for jobs with early bid dates) that include any of the bid items that are eligible for adjustment. Include an estimated amount for the bid item "Fuel Cost Adjustment" in the Engineers Estimate. Only the items described below are eligible for adjustment.

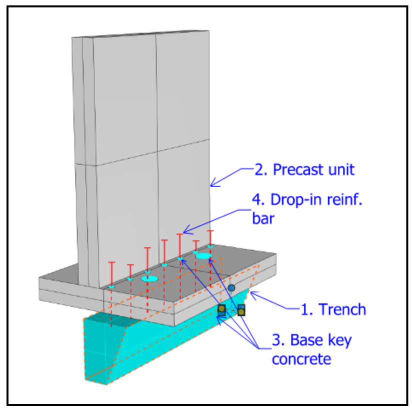
Kevin acknowledged that these adjustment factors are for DBB projects, and do not work well for our design build projects which often have longer durations and may not have construction occurring for a long time after bid submission, as design must happen first. He is exploring something that may be more applicable to DB jobs. One option being considered would be to have the DB identify a percentage of the total cost for the job that is attributed to fuel, say 1% for example. Then when a progress payment is made we could look at 1% of the payment and possibly make any adjustment to that portion of the payment based on differences in the index value. Another method may be to submit a fuel usage plan that indicates the fuel consumption per month, and then that could be used against the indexes for adjustment. Stuart Moore stated that it may be difficult for the Prime DB to identify the percentage of fuel, as most of the fuel consumption occurs by subs. They would need to poll each sub as to what they think their fuel needs may be and that may not be very effective.

6 Buried Structure Seismic Design

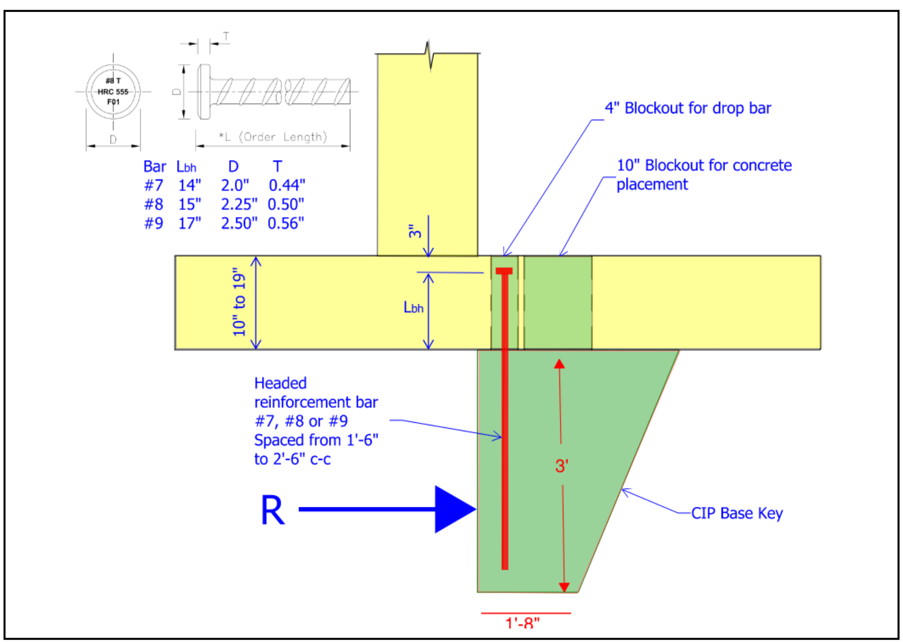
There is currently confusion regarding the content of the Bridge Design Manual, the Geotechnical Design Manual, and the RFP technical chapters 2.6 Geotech and 2.13 Structures. The confusion is centered around buried structure seismic design. Currently the BDM and RFP 2.13 state that class one buried structures, those less than 20 feet do not require “seismic design”. The term seismic design covers a lot of aspects in both geotechnical and structural design. Seismic loading and seismic effects can influence slope stability, settlement, bearing resistance, sliding, overturning, earth pressures, shear, moments, liquefaction, lateral spreading, and a number of other things that fall under the “seismic” umbrella. The intent of the statement in the Bridge Design Manual and RFP was that buried structures less than 20-feet do not require a racking analysis which the Bridge office requires for buried structures and tunnels greater than 20-feet. Neil Hunt pointed out that there is also a difference in how adjacent structures are treated under the contract. The wingwalls do not receive any kind of relief from seismic design requirements, yet the buried structure does. The two structures have different “failure” criteria in their designs and likely different levels of performance. Stuart Moore stated that it is also confusing because the structure does not require seismic design but the earth touching it does. It does not make sense to not design the structure for earthquakes yet they have to design the dirt for them. He suggested making all the design consistent with type 2. At least that would eliminate some of the confusion. Geoff Swett stated that prior to Bijan Khaleghi’s retirement, he asked Geoff to look into this issue and work with Geotech to clarify the GDM, BDM, and RFP.

7 Precast Wingwall Shear Key Constructability

Geoff Swett explained that the Bridge Office has retained WSP to design standard plan buried structures and wingwalls. Yakov Polyakov of WSP is working on the wall designs and is having trouble getting a design to work for the case where the wall has a 2H:1V backslope and a high earthquake acceleration coefficient (0.64 g). The issue is that the wall slides because in LRFD design, the resistance factor used for a precast concrete footing on compacted foundation material is very low. To solve the sliding issue, WSP is considering including a shear key in the design. They have dismissed the concept of a precast shear key as WSP felt it would be too difficult to construct and structurally connect to the wall. They are pursuing a CIP key.



The construction sequence that they are considering would be to establish the bearing elevation and bearing surface for the precast wall. Excavate the shear key trench, approximately 3-feet below the base of the footing. Set the precast wall in place over the excavated and unfilled trench. Then through 10-inch block-outs, fill the trench with concrete. While the concrete is still wet, set reinforcement bars through pre-cast pockets.



Yakov wanted opinions and suggestions from the contractors regarding the concept.

Several contractors immediately stated that a CIP shear key would make any kind of construction under a weekend closure impossible. Neil Hunt pointed out that the shape of the shear key would not look like the depiction, unless formwork were placed into the trench in order to form the vertical and sloping surfaces. In reality, he thought it would be excavated as a trench with vertical sidewalls. There was also concern that the trench depth could cause more issues with groundwater and dewatering. The footings are already required to be two feet below scour and the trench is another three plus feet beyond that. Given that these are fish passages with streams and diversion for construction there is a high chance of having issues with groundwater. It was also pointed out that rock may be encountered within the shear key excavation limits and rock excavation might be required. [*Note taker comment: the presence of shallow rock would be something that would need to be investigated and confirmed prior to advertisement and construction. If it were present, shear key walls may not be the best option.*] Kevin Cucchiara asked if either vertical or near horizontal ground anchors (tiebacks) had been considered. Yakov said they had not, at least not yet. Geoff pointed out that some of their difficulty for the design is because they are trying to keep the segments a manageable size and weight for shipping and handling. They could make the sections larger or heavier to solve some of the sliding issues, but then the segments are no longer manageable.

Jim Cuthbertson asked if they were working with Geotech to reduce the loads on the structure either by using better quality backfill or by allowing more movement structurally. Higher friction angle backfills would reduce the seismic soil pressure (Kae) and allowing more sliding in the design could also decrease Kae. Geoff stated that what they were doing was decreasing Kae until they found a value that works, then Geotech will reverse engineer that value to determine what soil properties and deformations would be applicable for the structure.

It was mentioned that a way to speed up construction might be to utilize a precast shear key, even though that has already been dismissed. Placing a precast shear key in the trench, backfilling the annular space with CDF, then setting the wall units on top may be viable. It would require that the precast shear key had vertical bars extending up into the footing block outs, and grout could be used to tie things together. A precast option may pose other problems though. The key could be set too high causing point loading and tipping or be set too low causing coverage and corrosion concerns for the pins when the closure pour is made.

The subject of installing anchors after placement was mentioned a second time. The anchors could be installed through the wall face after placement and backfilling using low clearance drill rigs, assuming you have enough width between the two opposing walls. Another alternative would be to bury a deadman during backfilling and rely on a deadman with a tie-rod to provide the sliding resistance, but that would increase excavation limits. Lightweight backfill could also be used to reduce the applied loads.

Kelly Griffith asked if it would be possible to backfill the shear key trench with 9-inch slump concrete before setting the wall segments, and then wet setting the bars. That would eliminate concerns with sidewall stability of the trench and concern about getting the shear key filled 100%. For a limited number of wall segments the 9-inch slump concrete will remain workable enabling wet setting of the bars.

8 Clarifying the description of the CJ between the shaft and the transition pour

Neil Hunt brought up an issue he encountered on a project where the inspection staff wanted the construction joint that is constructed at the top of the shaft to be prepped following 6-02.3(12)B *Construction Joints Between Existing and New Construction* rather than 6-19.3(7)F *Cleaning and Removal of Previously Placed Shaft Concrete* in the Shaft specifications. Neil requested an edit to 6-02.3(12)B to make it clear that those 6-02 requirements are not intended for the shaft to column transition construction joint. Geoff Swett stated that he would look at this and see if they could provide either clarifying language in the specifications or on the top of shaft detail that their office typically uses.

Next Meeting: TBD

Notes by Jim Cuthbertson