

**November 19, 2010 Meeting**

**WSDOT Bridge and Structures Office  
Tumwater, WA**

**Attendees:**

**WSDOT**

Geoff Swett  
~~Erie Schultz~~  
~~Jesse Beaver~~  
~~Scott Sargent~~  
 Jeri Bernstein

**ACEC**

~~Paul Bott (HDR)~~  
 Yuhe Yang (PB)  
~~David Goodyear (TY Lin)~~  
 Jim Schettler (Jacobs)  
 Jake Menard (DEA)  
 Bill Elkey (Parsons)  
 Richard Patterson (AECOM)  
~~Chester Werts (HDR)~~  
 Paul W. Guenther (CH2M HILL)

**Guests**

~~Bijan Khaleghi~~  
 Tony Allen

**Agenda:**

1. Review meeting minutes from October's meeting at AECOM.
2. Finalize revised Team Charter
3. Discuss MSE supported abutment walls. Tony Allen and Bijan will be attending at 10AM. I've attached the guidelines that are currently included in the GDM. Please review prior to the meeting and bring any question, suggestions, etc. to be discussed. Any folks that had previous examples discussed 2 meetings ago; please bring plan sheets etc. along with you.
4. Review design-build issues list and select next topic.
5. Assign Action Items.

9:00 to 9:15		<ul style="list-style-type: none"> <li>• Meeting Minutes and Action Items</li> </ul>
Jim will prepare meeting minutes for next meeting, where they will be reviewed.		
9:15 to 10:00 am		<ul style="list-style-type: none"> <li>• Review Team Charter</li> </ul>
<p>The Team worked on finishing the revisions/updates to the Team Charter. A copy of the revised Charter will be sent out to the team for one final review. There was discussion on the necessity for a Purpose, Vision and a Mission section within the Charter. Much of the text was repetitive. Therefore, the Mission section was deleted. The Team agreed that we need a one line "Vision Statement" that is all encompassing of what the Team's vision is. Action item for all members is to bring a suggested Vision Statement to our next meeting.</p> <p>Comments on the remainder of the Charter should be submitted to Geoff by December 10<sup>th</sup>.</p>		
10:00 to 11:00		Discussion on Abutments/MSE Walls
<p>Bijan Khaleghi, State Bridge Design Engineer, and Tony Allen, State Geotechnical Engineer, were invited to the meeting to discuss design and construction of abutment walls on top of MSE walls. Bijan was unable to attend but Tony Allen attended and there</p>		

was a lengthy discussion regarding the topic. Currently there are guidelines in the GDM, Section 15.5.3.5, for MSE Wall Supported Abutments. This is a tool for the “design toolbox” than can be considered when appropriate to eliminate the need for tall, expensive abutment walls or an additional span in the structure. The Team’s goal is to develop a section for the BDM (Chapter 7) to supplement the guidelines in the GDM. The new section would be presented to Bijan for consideration to be added to the next update. Geoff discussed this with Bijan prior to the meeting and he is amenable to adding some guidelines to the BDM. Following are some of the highlights of the discussion:

- The team expressed our desire to add a new section to the BDM to supplement the guidelines in the GDM. Tony thought this was a good plan.
- Tony informed us that discussion on this topic is timely in that he will be meeting with FHWA later this month to discuss MSE supported abutments. FHWA is sponsoring an initiative trying to get States to use MSE supported abutments more often.
- Tony discussed his experiences during a visit to Chile after the Feb. 27<sup>th</sup>, 2010 8.8 earthquake. His general observation was that MSE walls performed very well, including examples where abutments were constructed on top of MSE walls. There were walls as high as 30’ in Chile that performed well. He did observe a few walls with some “minor” problems mainly due to severe geometry or poor detailing in the corners.
- The current GDM guidelines limit the MSE supported abutments to a 25’ high wall. Jim asked if this limit could be increased. Tony was OK increasing this limit to 30’ to 35’, depending on the wall type. Various wall types have height limitations that are covered elsewhere in the GDM. For example, modular block walls should be limited to 30’. Increasing the height limit will be beneficial for Design-Build projects, where structural decisions need to be made during the RFP process.
- Jim asked what would be required to go taller than 30’ to 35’. Tony said at a minimum, you would need a dynamic finite element model that was independently checked. Tony did express that he was much less comfortable allowing walls higher than 30-35’ until additional research was performed. UC San Diego is scheduled to perform some full scale shake table tests on walls as high as 30’, so there may be more information available in the near future.
- Economics need to be considered when walls get taller than 25’ – 30’ high. At some point adding another span becomes more economical.
- Horizontal loads from the abutment into the wall are covered in AASHTO and the FHWA guidelines on MSE Walls. By Jan 31<sup>st</sup>, 2011, all walls will be required to be designed LRFD, so there shouldn’t be a problem of using LRFD abutment design and LFD wall design.
- Displacements, both vertical and horizontal, need to be considered in the abutment design when supported on MSE walls. For example, geosynthetic walls do get some creep (up to 1” at the top) for walls 35’ tall. There is also settlement within the wall fill from abutment loading. Steel straps have less creep, but some still does occur.

After the discussion Tony presented a PowerPoint on his trip to Chile, which was very

informative and showed several examples of where MSE walls had performed quite well. The Team agreed that we would draft up a section for the BDM and then run it by Tony and Bijan for concurrence. Tony said he would look into revising the GDM to allow taller walls, but would wait until he reviewed our draft section.

Following are copies of the minutes from September where examples of MSE supported abutments were presented and discussed. (for reference)

**Previous Discussion from September Meeting Minutes:**

The main focus of the topic is to discuss the placement of abutments on top of MSE walls, which are either on founded on spread footings or some type of deep foundation (piles or shafts). Placing an abutment on top of an MSE wall can eliminate the need for an additional span in the structure or can eliminate the need for a tall abutment wall. This is not normal practice within WSDOT. Cost savings is the primary reason for considering this technique.

Jim presented a case study of a bridge constructed on an I405 design build project. The structure was I405 SB over I90. An L-type abutment on a spread footing was placed on top of an MSE wall. The MSE wall was constructed in front of the abutment and along one side. Some of the challenges with the project were establishing criteria for design of the abutment and the MSE wall. Extensive coordination was required between the design team and the WSDOT State Geotechnical Engineer, Tony Allen. Another challenge was the loading on the wall. The bridge structure was designed using AASHTO LRFD, while the wall manufacturers were still using the AASTHO Std. Specifications. Loads were converted from LRFD to ASD, which was the design method used by the wall manufacturer. Setback of the footing from the wall and the distribution of bridge inertia loads also had to be established. Settlement is also a concern when considering this method, especially with a spread footing abutment.

The team felt that this technique could be useful in the future and should at least be made available as a tool for the designer's "toolbox". The next step is to discuss with the State Bridge Design Engineer, Bijan, and the State Geotech, Engineer, Tony. If they were amenable to considering this approach in the future, than the team would take on the effort of developing guidelines to be added to the BDM. The GDM also needs to be reviewed to see if there are any current guidelines already established.

Yuhe and Bill presented additional case studies. Both of the cases involved placing a pier out in front of the MSE wall, essentially eliminating the abutment, and then a "jump" span was placed from the pier onto grade (i.e. a more robust approach slab). The team discussed the pros and cons of this approach; the primary con being the aesthetics. The biggest pro was the fact that seismic loads could now be distributed to two additional bents instead of being resisted by the other interior piers. The team felt there were no significant design challenges with this approach and the real issue was the "devil in the details". The team also felt that although it is not common, there was no reason it couldn't be utilized in the future. The focus of our efforts will remain with abutments perched up on or behind MSE walls.

<p>Jake discussed briefly a case study in Maryland where the abutment was behind the MSE wall but supported on H-piles. The contractor ran into several constructability problems, including compaction around the piles, downdrag on the piles from post settlement, which was likely due to the poor compaction. The project required re-design.</p> <p>The team also discussed alternate strap arrangements in the vicinity of the MSE wall and abutment. Straps could be attached from the wall directly into the abutment. Concern was raised about mixing trades with the Contractors. One idea was also brought up about attaching straps to the backside of the wall, which could potentially reduce the heel requirements on the abutment. This idea will also be discussed with Tony and Bijan.</p>		
11:45 – 12:00pm		Action Items
<p>The team reviewed and assigned action items for next meeting. See below for a listing.</p> <p>Next meeting the Team will discuss balanced stiffness issues, review a WSF design issue to be presented by Jeri, and continue work on the MSE supported abutments.</p>		
12:00 – 12:15pm		
<p>There will be no meeting in December and following are the meeting dates for the first part of 2011.          Next meetings:          January 14<sup>th</sup>, 2011 – CH2MHILL - Bellevue          February 11<sup>th</sup>, 2011 – WSDOT          March 25<sup>th</sup>, 2011 – DEA – Bellevue          April 22<sup>nd</sup>, 2011 – WSDOT          May 20<sup>th</sup>, 2011 – Parsons - Seattle</p>		

**Action Items:**

1. Verify ACEC sponsor (Jim)
2. Ask Prof. Stanton if we can put presentation on the ACEC/WSDOT website (Geoff)
3. Send out email related to balanced stiffness (Geoff). Develop ideas (draft text) and bring to next meeting (Team).
4. Develop “Vision Statements” (All)
5. Develop draft for abutment on MSE for BDM (text and figures) (Jim)
6. Send out revised Team Charter for final review (Geoff). Provide comments to Geoff by December 10<sup>th</sup>. Develop and bring a one line “Vision Statement” to the next meeting. (All)
7. Add WSF design item to agenda for Jeri for January meeting (Geoff)