5480805 RETAINING WALL SYSTEMS
COMMENTS FROM INTERNAL/INDUSTRY REVIEW

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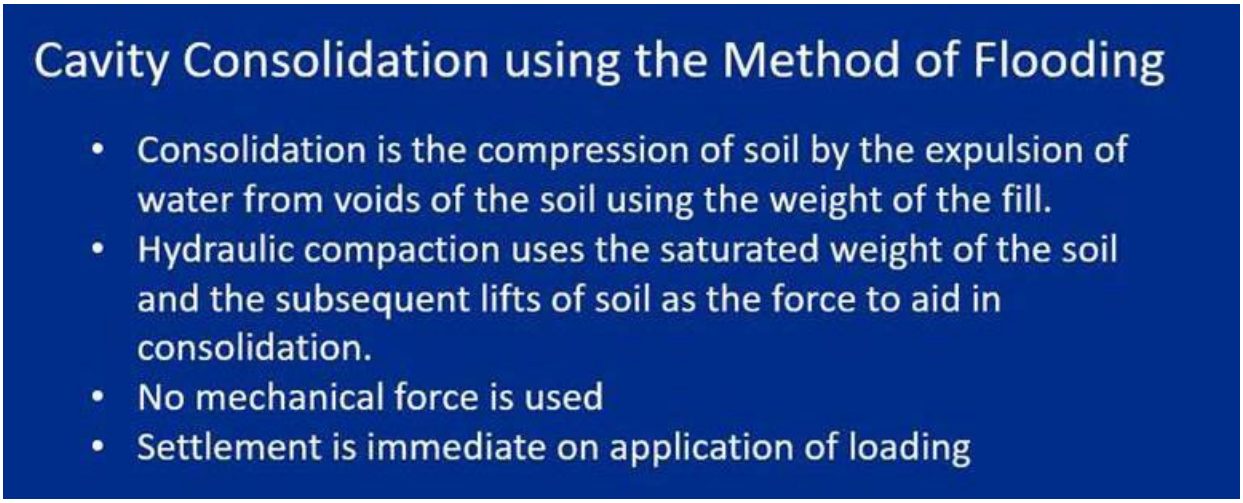
Comments: (Internal 6-11-20)
Here are the comments that I have received.
1. As two-phase walls are the exception and not the rule, why include anything in the standard specs? If a two-phase wall is required due to excessive expected settlement, let it be a job specific TSP.
2. I still see a problems with the way the spec is trying to cover holes in a project specific designed system. At the end of the day, I think FDOT wants 6" or 12" lifts because they are comfortable those lift thicknesses and the testing. There is a discomfort with thicker lifts and/or hydraulic compaction.
There are a couple of things that should be pointed out:

- 548-8.7 – A 12" lift does not always work with a project specific two stage designed wall system. This was true for the system that we utilized on our project. On the 60" panels, turnbuckles were located 15" from the bottom of the panel with another one 15" down from the top of the panel. The manufacturer wanted a 30" lift so that the turnbuckles were evenly loaded. The Department and CEI eventually allowed a 15" lift, but it created some tolerance challenges because the turnbuckles were unevenly loaded.
- The proposed spec calls for compaction with power operated or manual compactors. On the our project, a 12" lift would place the top of lift approximately 3" below the turnbuckle. Therefore, compaction with power operated or manual compactors would not be feasible.
- Including the void between the 1st and 2nd stage in the retained earth volume is also an attempt to write a spec to confine the contractor into a methodology that the Department is comfortable with. The retainer earth volume is specifically addressed in compaction requirements. Our engineering proved that the 2nd stage of the wall has no structural value, and that the void/cavity did not even have to be filled. In other locations around the country, this void has been left empty or loosely filled with stone.

If the Department is going to mandate that these two stage walls have project specific designs that are signed and sealed, then they have to be willing to live with the project specific design parameters. This includes lift thickness and method of compaction. The Department should not expect to have it both ways. The alternative would be the following:

- The Department designs a constructible two stage wall and puts it out with the bid documents.
- The Department writes a spec that requires all of the specialty designers to design within very strict parameters that fits their comfort level (effectively doing the same thing).
- Images below show actual conditions and dimensions within the cavity. It's unrealistic to expect any contractor to use power operated or manual compactors. No equipment can get into the cavity to compact fill.

- Use of Nuclear gauge for density test results have great limitations when working in a trench like the MSE wall cavity. Results will be vastly inaccurate due to proximity to a concrete face wall on one side and dirt on the other side. The MSE wall engineers don't have density requirements in the cavity and conflicts with the 548 language that was put forth. QC firms can expand on the limitations of the nuclear gauge in this application.
- Here's something the Department should consider when putting the specification together regarding consolidation in the cavity:



3. The wall cavity should be limited to 2'. The turnbuckles used to connect the panels have limited tensile capacity and when the distance between the two walls exceeds 2' there have been failures of the turnbuckles.

Without settlement, the horizontal forces on the panels is a bin pressure. As the wall cavity gets larger there is more potential for differential settlement. Differential settlement between the two walls, results in greater tensile loads on the turnbuckles. Finite Element Analysis shows that as differential settlement increases, the back-calculated horizontal force is increased from bin pressure to an active pressure (ka) and then an at-rest pressure (ko) which can result in stresses that the connections are not designed for.

Additionally, when the turnbuckles are excessively skewed, the turnbuckle capacity is reduced and due to the skewing, they may not be threaded to the appropriate length further reducing their tensile capacity. Given the various potential for failures of the turnbuckle system, a reduced cavity dimension with a concrete closure poor is recommended in lieu of select backfill or coarse aggregates.

The design of the turnbuckle system is not dependent on the compaction of the material in the cavity. Please note, the need to fill the cavity is to provide resistance if a vehicle ever crashes into the wall. A filled cavity would prevent panels from crushing into the cavity which would result in unsupported panels above.
Let's discuss once you all had time to digest this info.
Response: (6-17-20 Dan Hurtado, Office of Construction)
Ananth,
Thank you for the comments. Based on your comments and our internal discussion, we are revamping the proposed Spec. We will provide a courtesy copy for discussion prior to moving forward to Industry Review. Thank you.
Respectfully,
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Comments: (Internal 6-22-20)
Two comments that I have received.

- The APL requirement should be excluded. These unique walls from RECO or Vista Wall are not APL and don't think the manufacturers are willing to spend a whole bunch of money for a system that is rarely used. There's no return for a high investment like this. There's only one manufacturer in the APL for a 2-stage system – TENSAR. I attached the drawings for your reference. I personally would never use it. They have a CIP fascia in front of the stage 1 wall. If stage 1 face moves, pillows or experienced any sort of rotation, it will be difficult to get a regular concrete fascia and few more other complications that will be put on the Contractor's side by a "good" CEI. This system is not practical and will keep contractors away from it.
- Specification 548-3 (11) still has density requirements. It now poses responsibility on the manufacturer to provide the method to be used to meet compaction requirements. It can be hydraulic backfill just like we did but the testing with nuclear gauge is not in accordance with current regulations and the wall engineers don't have density requirements in that cavity. FDOT is not ok with this and that's the problem. It'll be better if they draft something like this:

11. Details for widenings and two-staged phase construction. When select fill or coarse aggregate are used, indicate the methods to ~~be used to meet the compaction requirements~~ backfill the cavity between stage 1 and stage 2 walls.

Response: 6-29-20

After a meeting held between the CO (Construction and Structures Design) and Industry representatives on June 25, 2020, it was decided to remove the proposed changes related to the two-stage walls and widenings.
Attached is the revised document to be posted for the Industry review.
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Comments: (Industry 7-8-20)
Origination form states: "548-2.6 Include the wall cavity in the wall volume definition."
However, Specification provided does not include 548-2.6 revision.
Response: (Specifications Office)
Thank you for your comments. Change has been made to reflect the revised proposal. The original proposal was revised during Internal Review prior to Industry Review.
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