4551706 STRUCTURES FOUNDATION
COMMENTS FROM INTERNAL/INDUSTRY REVIEW

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Comments: (11-16-20, Internal)
This spec needs further discussion for the following reasons:

This language suggests to me that FDOT is mandating coring every time CSL velocity reductions exceed 30%:

accurate depth measurements in the CSL records. When the measurements indicate a 30% or greater reduction in velocity between one or more pairs ~~perform~~, take one or two concrete cores to allow further evaluation and repair, or replace the shaft as directed by the Engineer. Determine

Response: There is not a new requirement here. Subarticle 455-17.6.2 requires, when the shaft is unacceptable based on CSL and other testing (Thermal for example) the contractor must core to allow further testing and repair. No Change made.

And this language suggests to me we have to use 3D tomography to locate the core(s):

to allow further evaluation and repair, or replace the shaft as directed by the Engineer. Determine the location of the concrete cores by performing 3D tomographic analysis using the CSL measurements. The core depths shall be at least 5 feet deeper than the bottom of the anomaly

Response: It is in the specs right now. Every time there is a 30% or more in velocity the contractor consultant needs to perform 3D tomography (455-17.6.2). And he must do it with 4 offset readings not just one or three. The intent of the tomography was always to identify the location and size of the anomaly and to locate the cores in a rational way. No Change made.

Respectfully, as you know, we have cored many "false positives"…and coring a shaft where the capacity of the shaft will not be affected by weaker concrete just feels unnecessary; for instance:

Example 1

Contractor pours a shaft tipping into a granular profile…the action of the tremied concrete will inevitably scour the sand profile and push some weaker bearing materials to the periphery of the shaft. This peripheral mounding can show up as a loss of velocity between peripheral tube pairs and if I read this Spec Change correctly will result in cores. As FDOT's shafts are typically designed without end bearing this peripheral mounding will not adversely affect the capacity of the shaft and the cores are unnecessary.

Response: It is not the intent of the specification to force cores if they are not necessary. EARs that can proof capacity and integrity above the anomaly have been considered until now and may be continued to be considered. Will add the following text "The Engineer may accept a drilled shaft without rock cores if an EAR demonstrates that the anomaly does not affect the structural

and the geotechnical axial capacity, the structural and geotechnical lateral stability, the settlement behavior of the shaft, and that the anomaly will not impact the durability of the foundation".

Example 2

Contractor pours a shaft that is designed to include end bearing. CSL Testing reveals >30% velocity reduction between tube pairs at the Tip. The cost of cores and the time to evaluate might exceed the cost of a load test. Why not allow a load test?

Response: Load Tests can always be proposed as part of an EAR. Load Tests being cheaper than cores is not what we have seen in previous projects. No Change made.

Example 3

FDOT allows 1.5" to 2" ID CSL Pipes. Change the specification to require 2" ID CSL Pipes and plastic end caps at the bottom of the CSL pipes. If we encounter a tip anomaly with >30% loss of velocity we can run a small diameter drill string down through the CSL pipe and break out the plastic caps, then pressure grout the tip of the shaft at the anomaly.

I think we have come a long way as a Team over the years and I have appreciated the common sense approach that FDOT has brought to bear upon the deep foundation industry.

I would suggest another step in the right direction would be to use Thermal Integrity Profiling like we did on the recent Fuller Warren Bridge project. Universal Engineering ran TIP Testing through the CSL pipes and if the TIP Testing was "good" no further testing was necessary. If the TIP Testing was inconclusive then we ran CSL Tests after the concrete cured. This to me is a step in the right direction.

Response: We have moved in this direction for some time already. Since the July 2018 specifications, Thermal Integrity Testing is the primary integrity testing method. Under the current specifications CSL testing is performed only when the time window for thermal testing has expired or to evaluate repairs, because TIP is not feasible in these cases. We still have projects let prior to July 2018 where CSL was the primary testing, but we expect the amount of CSL testing to be minimal in current and future projects. No change made.

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Comments: (11-30-20, Industry)

Suggest to replace the sentence “When repairs are done, perform CSL taking measurements of the tube pairs with the source and receiver running at the same depth and two offset measurements per pair with vertical offsets between the source and the receiver” with “When repairs are done, perform CSL measurements in all tube pair combinations with the source and receiver in the same horizontal plane and at vertical offsets of 45 degrees above and below.” The suggested language attempts to address the following issues which may become future disputes. 1./ The current proposed language can be interpreted as a total of only two vertical offset measurements per tube pair which is probably not the intent. As an example, a shaft with 4 tubes have 6 tube pair combinations and therefore only 12 additional offset measurements. 2./ The current proposed language shows “…the tube pairs…” and does not define which tube pairs need the offset measurements. It can be all tube pair combinations or the same tube pair combinations in the original CSL test or to be determined by the CSL Test Engineer per current 455 Spec language (When a shaft contains four tubes, test every possible tube combination. For shafts with five or more tubes, test all pairs of adjacent tubes around the perimeter, and one-half of the remaining number of tube combinations, as chosen by the Engineer.) Suggested language above shows all tube pair combinations which may or may not be the intent. However, suggest to clarify. Otherwise, we may receive offset measurements from tube pairs with >30% velocity reduction in the original test only (another way to interpret "...the tube pairs..").

Response: Agree. Change made.

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Comments: (12-10-20, Industry)

455-17.6.2 Take one or two concrete cores is a vague direction- needs to be clarified. When the measurements indicate a 30% or greater reduction in velocity between one or more pairs perform, take one or two concrete cores to allow further evaluation and repair, or replace the shaft as directed by the Engineer.

Response: We should not be limited to one core if there is more than one anomaly detected o if the size of the anomaly is significant. Also, we should not ask for two cores if it is only one anomaly detected. No change made.

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