

4550510A and 4550510B STRUCTURES FOUNDATION
COMMENTS FROM INDUSTRY REVIEW

David OHagan
414-4283

Comments:

How much verification research has been performed to assure us that EDCs are accurate through a doveled splice?

Response: None to date. No changes made.

David OHagan
414-4283

Comments:

A & B versions? What's the deal?

Response: (per State Specifications Office)

Version A is for prestressed concrete piles with test piles and Version B is for prestressed concrete piles without test piles. Hope this answers your question.

Steve Plotkin
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Comments:

455-5.10.1 General: Drive piles to provide the bearing capacities required for carrying the loads shown in the plans *as determined by the Engineer* **[it is not clear what is to be determined by the Engineer]** using the methods described herein.

455-5.11.1 General: *Notify the Engineer two work days prior to placement of piles within the template and at least one work day prior to driving piles. Do not drive piles without the presence of the Engineer.*

*The Engineer will determine pile capacity of the first production pile at each pier or bent based on the results of a Dynamic Load Test. After analyzing the PDA **[is PDA spelled out somewhere?]** data to determine the appropriate damping factor, the Engineer will*

Response: 455-5.10.1: The first two sentences have been rephrased for clarification as follows: "Drive piles to provide the bearing capacities required for carrying the loads show in the plans. *The Engineer will determine pile capacities using the methods described herein*".

455-5.11.1: The text has been revised to remove the need for the "PDA" reference by stating "Dynamic Load Test using externally mounted instruments".

Wing Heung, P.E.
Turnpike Lead Geotechnical Engineer
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Comments:

I have a couple minor comments in consistency as follows

455-5.11.1, second paragraph of both specifications mention about “damping factor” and “damping value” . Suggest to use the same terminology for consistency.

455-11.15: The last sentence in the specifications with test pile indicates that “The price will include ...”. The specifications without a test pile show slightly differently as “The price of EDC will include” I know it is minor but still suggest to make them consistent.

Response: 455-5.11.1: “Damping Value” will be used.
455-11.15: “The price of EDC will include” will be used.

Paul Passe
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Comments:

Type: 4550510A and 4550510B

Text: (1) If the EDC fails to respond in the field (for example, if the transmitter can not be woken up and data can not be gather from the EDC)is this considered as being under "If the EDC does not perform to the satisfaction of the Engineer due to actions of the Contractor,...." if not how is this (or any other issues that are not "contractor action" related) to be handled?(will be handled on a case by case basis.) (2) Who is responsible for performing the PDA testing on the test piles?(The Department/CEI as current practice.) (3) If it is the contractor's how much analysis if any is he to perform and what does ne need to supply to the Engineer?(see previous response.) (4) What specification is to be implemented if you have both steel piling and prestressed concrete piles on a project?(A modified special provision will be needed. The usage note has been revised to clarify.) (5) If the EDC does not function or only functions for part of the drive does the contractor get paid for it?(will be handled on a case by case basis. No change is made.)

Response:

- (1) These issues will be handled on a case by case basis.
- (2) The Department/CEI, as current practice.
- (3) See previous response.
- (4) A modified special provision will be needed. The usage note has been revised to clarify this.
- (5) This will be handled on a case by case basis. No change is made.

No Name

Comments:

Since under section 455-5.10.2 "Blow Count" is removed than shouldn't it be removed under 455-5.12.1 "where the blow count is increasing, for 10 feet" especially since this is hardly ever achievable and is normally ignored?

Response: We do not agree. This is normally achievable and should not be ignored, however the text will be revised by changing "blow count" to "capacity is generally increasing,...").

Keith Waugh
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Comments:

4550510A and B

Text: 455-5.11.1 (1) Notification should be for initial installations with Department not requiring "notice" for each foundation set-up as the project progresses.(Disagree. We feel notification as stated is needed. No changes made.) (2) Who will determine where fault lies "If the EDC does not perform to the satisfaction of the Engineer"?(The Engineer) (3) If the damage is proven to be the fault of the Contractor, then the Contractor would not receive payment for a Dynamic Test Load. Regardless, PDA testing should be performed by the Department.(Disagree. This would not provide any incentive for the Contractor to protect EDC. No changes made.) (4) If Static Load Tests are required but there is no contract item, the Department should direct the Contractor in writing within one work day and agree to provide an adjustment to the contract time for material acquisition, performance of the work, evaluation time by the Department and impacts to the schedule.(The Static Load Testing language does not reflect any changes to the current specifications. No changes made.)

455-7.2 (5) The Department should furnish and install all EDC. This would eliminate inconsistent pricing and settle argument regarding the "If the EDC does not perform" dilemma. The Contractor will coordinate with the District Geotech Office regarding pile casting schedule. (This will be considered for future implementation.)

Response:

- (1) Disagree. We feel notification as stated is needed. No changes made.
- (2) The Engineer will determine this on a case by case basis.
- (3) Disagree. This would not provide any incentive for the Contractor to protect EDC. No changes made.
- (4) The Static Load Testing language does not reflect any changes to the current specifications. No changes made.
- (5) This will be considered for future implementation.

Jennifer Williams
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Comments:

455-5.10.1 General - Is bearing established based on EDC capacity for every blow for 24 inches or perhaps average for 24 inches or average of 2 - 12 inch increments; please clarify.

(will be revised to “average of two consecutive 12 inch increments of driving.”)

455-5.10.2 Bearing Criteria - Should some rebound criteria still be considered?

(This should not be required when pile acceptance is based on EDC measurements. No changes made.)

455-5.11.1 General

1st paragraph

With limited EDC testing resources statewide, time frames should be expanded to mitigate scheduling issues. (No changes made.)

Recommend piles not be lifted and placed in template without presence of Engineer in order to ascertain if lifting or placement cause damage to gages. (Physical damage should remain visible after lifting and placing in the template. No changes made.)

2nd paragraph

It is my understanding PDA and EDC are both Dynamic Load Tests. Anytime “Dynamic Load Test” is mentioned, recommend stating “Dynamic Load Test using PDA” if the intent is to use PDA or perhaps remove “Dynamic Load Test” and just state PDA. (Changed “Dynamic Load Tests” to “Dynamic Load Tests using externally mounted instruments.”)

“Fixed Method of Analysis” Why should Specification dictate type of analysis? With PDA, Specification does not specify type of analysis such as RMX,RSU, etc....(FDOT’s data comparisons favored well between PDI’s PDA using RMX equations and EDC’s Fixed Method of Analysis when the same damping value is used. No changes made.)

“..... due to actions of the Contractor.” Who determines if the malfunction was due to Contractor’s action? (This will be determined on a case by case basis by the Engineer. No changes made.) How can the malfunction be proven? Contractor will always say it was not his fault unless it is observed for example the crane boom knocking out an antenna.

The last sentence is better placed as the second sentence. (Agree, change made.)

3rd paragraph

Explain or differentiate “.... Contractor to perform additional Dynamic Load Test” Verses “.... Contractor engage Specialty Engineer to perform Dynamic Load Test on properly working EDC...” . (First sentence changed to “If the Engineer requires an additional ...”.

Generally speaking, who is responsible for preparing a pile for PDA testing when pile is set in the template or partially driven? (Generally speaking, the department or specialty engineer should prepare the pile prior to placement in the template.)

455-7.8 Pre-Planned Splices - If piles possess EDC and they are working properly, why is there a need to perform Dynamic Load Test (PDA) and pay contractor to assist in performing Dynamic Load Test. Further whether EDC or not and Contractor elects Pre-Planned splice, this office objects to paying for Dynamic Load Test on spliced piles when option planned and chosen by Contractor. (There is no payment for Dynamic Load Test to verify the integrity for a preplanned dowel splice.)

455-11.15 Embedded Data Collectors - The quantity of EDC needs clarification. Clarification along the lines of EDC set, EDC assembly or something to indicate set or assembly consists of gages at the top and toe of pile. "Pay Item No. 455-146- Embedded Data Collector (EDC) – each assembly per pile" may be a way to provide clarification. (This text was taken from the existing special provision that has been in use for the last few years. To our knowledge, this has not been an issue. 455-7.2 reference Index 20602, which clarifies EDC assembly.)

Suggest replacing the word “..completed..” with “... performing satisfactory as determined by the Engineer..” (“Completed and accepted” infers performing satisfactory as determined by the Engineer. No change made.)

4550510B - Comments provided for 4550510A also apply as comments for 4550510B.

Response: Please see responses contained within above text.

Juan Castellanos
D4/D6 Geotechnical Eng.
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Comments:

Rudy: These are my comments. They apply to both 4550510 A and B

1. In section 455-5.11.1, second paragraph: Third sentence: Remove the condition “due to actions of the Contractor” . That is not the way you had in your first draft. Whether the gauges fail because the Contractor mishandles them or because they were defective or wrongly installed, the Department should not be responsible for it. If it is the supplier’s fault the Contractor can always recover the expenses from them.
2. In section 455-5.11.1, second paragraph. To improve the sequence of events, move the following sentences to the end of the paragraph: If the EDC does not perform to the satisfaction of the Engineer, engage a Specialty Engineer to perform Dynamic Load Testing of the pile installation at no additional cost to the Department. Set PDA equipment to the damping value provided by the Engineer prior to driving the production pile. (Note: first you talk about the initial PDA testing or test piles, derivation of the Jc value, then you talk about what happen if during production one EDC malfunctions).
3. Your bending strength tables for mechanical splices include 36” piles. Do we even have a Standard Index for 36” piles? If we don’t yet I would suggest taking it out.

4. I am concerned that the RFP for DB projects may end up without being updated for the new specs, and therefore we may end getting responsible for all a lot of stuff that we are not supposed to. Could you add (at least temporary) the following paragraphs:

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One at the end of section 455-5.10 both specs. “ In Design Build and Concessionaire type of projects, the Design Build team and Concessionaires will be responsible for determining the bearing resistance based on the EDC Gauges monitoring and PDA.”

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Another at the end of section 455-5.11, both specs. “In Design Build and Concessionaire type of projects, the Design Build team and Concessionaires will be responsible for performing any test pile instrumentation (both PDA and EDC gauges), CAPWAP analysis determining the bearing resistance based on the EDC Gauges monitoring and PDA, determining pile lengths, and monitoring production piles (both EDC and PDA when the EDC malfunctions).”

Response:

- (1) This language was added in response to other concerns. No changes made.
- (2) Agree. Change made.
- (3). Disagree. No changes made.
- (4) These requirements need to be incorporated into other documents. No changes made.

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Comments:

In reviewing the 4550110A and 4550110B specifications I have a few comments:

- 1. 455-5.10.1, 1st sentence – The way the sentence is written it is not clear what exactly is “as determined by the Engineer”. Recommend re-writing the sentence to make that abundantly clear.
- 2. 455-5.10.1, 2nd paragraph, 1st sentence – recommend adding “is” between “capacity” and “obtained”.
- 3. 455-5.11.1, 4th paragraph – Shouldn’t there be a comment addressing if it is due to the fault of the contractor then he will not be paid for it? Currently it just reads if the documents don’t include pay items for Static Load Tests they will be paid as Unforeseeable Work. It seems like this should be on the Contractor if it is his fault and I did not see where the specs address that situation.

Response:

- (1) The sentence has been rewritten for clarification. See response to Steve Plotkins comments.
- (2) Disagree. No change made.

(3) The Static Load Testing language is very similar to previous versions of the Specification and Static Load Tests would not be required due to a small number of EDC's not functioning. No changes made.

Juan Castellanos
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D4 Materials and Research
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Comments:

455-10.3 Practical refusal: The definition of practical refusal needs to be modified. So I would change the first sentence of this paragraph. A suggested definition would be "Refusal is defined as 20 Blows/in with the hammer operating at the maximum stroke that can be used without exceeding the tension or compressive allowed stresses specified in 455-11.2, and operating at a minimum stroke at which the required capacity is observed". (I would remove the 1/4" rebound exception because we are measuring capacity). I would keep the remainder of the section.

455-5.10.4: I would remove the paragraph c) Uninstrumented Set-checks and Uninstrumented Pile Redrive, since we are not going to have driving criteria, let alone set-check criteria.

Response:

455-10.3: Agree with the need to revise the Section. A similar change is inserted. Disagree with removing rebound references since we are measuring "refusal".

455-5.10.4: It is not necessary to remove this paragraph even though it would often not apply. No change made.

Chris Wood
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Comments:

I have received the following comments from the D2 Construction Residencies for the above mentioned Specification change (4550510B):

- 1) Why pay for each EDC and not just include it in the price of the test pile?

Response:

EDC is included in all piles, not just test piles. No change made.

Ken Zinck,
D5 Quality Systems Mgr.
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Comments:

4550510A and 4550510B (D5 comments are reflected by highlighted and underlined text)

455-5.10.1 General:

Second paragraph, first sentence:

The Engineer may accept a driven pile when the pile has achieved minimum penetration, ~~the blow count is generally increasing~~ and the minimum required bearing capacity obtained for 24 inches of consecutive driving^[D51]

[D51] Does every blow need to be > than NBR? Should capacity be increasing at the end to ensure the last foot is not transitioning to a weaker layer?

Response: This section has been revised in response to previous comments.

455-5.10.2 Bearing Criteria:

The Engineer will determine the bearing resistance of the pile based on the results of Dynamic Load Tests, data received from Embedded Data Collector (EDC)^[D52] equipment installed in each pile or both. ~~The Engineer will determine the number of blows required to provide the required bearing according to the methods described herein. Determine the pile bearing by computing the penetration per blow with less than 1/4 inch rebound averaged through 12 inches each of penetration. When it is considered necessary by the Engineer, determine the average penetration per blow by averaging the penetration per blow through the last 10 to 20 blows of the hammer.~~

[D52] What about rebound? Is EDC accurate if rebound > 1/4 inch?

Response: The EDC should determine the reduction in pile capacity due to the causes of pile rebound. No change made.

455-5.11.1 General:

Second paragraph:

The Engineer will determine pile capacity of the Test Piles based on the results of Dynamic Load Tests^[D53]. After analyzing the PDA data to determine the appropriate damping factor^[D54], the Engineer will determine the capacity of the production piles for each pier or bent based on EDC equipment using the Fixed Method of analysis^[D55]

[D53] Change to: PDA Dynamic Load Tests.

Response: Disagree. Changed to “Dynamic Load Tests using externally mounted instruments”.

[D54] Does the damping factor need to be specified by depth if it varies, or should an elevation below which it applies be given?

Response: Yes. If it varies significantly by depth, it should be noted. However, since all piles in a bent are driven to the same capacity (normal resistance), this should be an infrequent issue. No change made.

[D55] The qualifications of the person collecting the EDC data in the field is important. The average CTQP Certified inspector will probably not be sufficient unless the CTQP training course is dramatically upgraded. For the foreseeable future, this monitoring should be done by experienced PDA Engineers.

Response: Noted.

Third paragraph:

*If [D56] the EDC does not perform to the satisfaction of the Engineer, engage a Specialty Engineer to perform **Dynamic Load Testing** [D57] of the **pile** [D58] installation at no additional cost to the Department. Set **PDA** [D59] equipment to the damping value provided by the Engineer prior to driving the production pile. Allow the Engineer one business day after driving the dynamic load test pile to perform CAPWAP analysis and determine the damping value for the EDC equipment.*

[D56] Recommend making this a new paragraph.

Response: This sentence changed to begin a new paragraph. See previous responses to comments by others.

[D57] Should this be “PDA Dynamic Load Testing”?

Response: No. “Dynamic Load Test” is defined the Specification. No change made.

[D58] Should this be “production pile”?

Response: No. There is not a need to insert the word “production” here. No change made.

[D59] Should this be “EDC”?

Response: No. The EDC would not be working. “PDA” has been changed to “Dynamic Load Test” equipment.

Fourth paragraph:

If the Engineer directs the Contractor to perform an additional Dynamic Load test for comparison purposes on piles with a properly functioning EDC, the Contractor will be paid an additional Dynamic Load Test. If the Engineer directs the Contractor to engage a specialty engineer to perform Dynamic Load Tests on a pile with a properly functioning EDC, the Specialty Engineer will be paid for as Unforeseeable Work. [D510]

[D510] Suggested rewording: “If the EDC is performing to the satisfaction of the Engineer and the Engineer directs the Contractor to perform additional PDA Dynamic Load tests for comparison purposes; the Contractor will be paid one additional Dynamic Load Test. If the Contractor is required to engage a Specialty Engineer to perform the additional test, the Specialty Engineer will be paid for as Unforeseeable Work.”

Response: Disagree with the need to reword as suggested. However, in the first sentence “directs the Contractor to perform” has been changed to “requires...”.

455-5.12.1 Description:

First paragraph:

Data collection from EDCs will be the responsibility of the Department, and will be in addition to the information collected in accordance with 455-5.13^[D511].

[D511] Why do we need EDC in the test piles if we are doing PDA Dynamic Load Tests on each test pile?

Response: EDC's are installed in all piles. No changes made.

455-7.2 Manufacture:

Fabricate piles in accordance with Section 450. *Supply and install EDCs in all square prestressed bridge foundation piles^[D512] in accordance with Index 20602. Ensure the EDCs are installed by the manufacturer's approved personnel.*

[D512) Why do we need EDC in the test piles if we are doing PDA Dynamic Load Tests on each test pile?

Response: EDC's are installed in all piles. No changes made.

455-7.8 Pre-Planned Splices:

Third paragraph:

Ensure sections of mechanically spliced piles are restrained from rotating with respect to the other sections^[D513]. Mechanical pile splices shall be capable of developing the following capacities^[D514] in the pile section unless shown otherwise in the plans and capable of being installed without damage to the pile, EDC, or splice:

[D513] Add sentence: "Piles with mechanical splices shall be driven in accordance with the maximum allowed pile stresses indicated in Section 455-5.11.2."

Response: Disagree. This would be unnecessarily redundant. No changes made.

[D514] Suggest changing this to: "structural capacities" to distinguish this from allowable driving stresses.

Response: Disagree. This is not needed because allowed pile driving stresses are already addressed in a separate section. No change made.

4550510B

455-5.14 Pile Lengths:

Authorized^[D515] lengths are provided as Production Pile Order Lengths in the Pile Data Table in the Structure Plans. Use these lengths for furnishing the permanent piling for the structure.

[D515] Recommend changing this to “When authorized” ...

Response: Disagree. If authorized pile lengths are not in the plans, 4550541B would not apply. No change made.

Response: Please see responses contained within above text.

Fred Ochoa
D4 Structures Design
954-777-4639

Comments:

I noticed a minor typographical error on Spec 4550510B, Section 455-5.10.2, which makes reference to ECD instead of EDC. Otherwise, it looks like we’re moving full steam ahead into the EDC world. It’s good to see FDOT stay on the cutting edge of technology.

Response: (From the State Specifications Office) This has been corrected.

Tom Taylor
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Comments:

Kathy,
I was curious if you had read the new EDC specification especially the first paragraph under 455-5.12.1.
It says that the Engineer is to be present for the installation of the data collectors.
Do you feel this is something we need to express on these projects as we are not normally notified of the casting?

Response:

(per Kathy Gray, D5 Materials and Research) In this case, I believe the term “Engineer” refers to the Department’s inspection force. We have inspectors at the Prestress Yards. Unless there is something unusual about the job, I would imagine that is sufficient. Do you agree Sastry?

(per Sastry Putcha, CO Construction Office) Dave: New EDC specification first paragraph under 455-5.12.1, says that the Engineer has to be present for the installation of the data collectors. I agree with Kathy Gray that the “Engineer” refers to the Department’s inspection force. Do you agree?

(per Paul Steinman, State Construction Engineer) My thoughts on this issue. The Resident Engineer has the ability to delegate his authority as he deems necessary and appropriate. In this case, unless there is something unusual about the casting process, I would expect that this would be delegated just as any other inspection authority is delegated to inspection in the field.

(per Dave Sadler, Director, Office of Construction) Sastry, As we discussed yesterday, the prestress yards have a prestress Engineer and inspectors at the yards that oversee prestress operations. The installation of the EDC devices does take some oversight and pre-concrete placement and post-concrete placement continuity testing to ensure that the devices function properly. I expect that these folks are capable of the oversight of the EDC installations.

Larry Jones
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Comments: 4550510A

1. The usage note needs to be changed to: All bridge projects with square, prestressed concrete pile foundations, with test piles. This SP is not applicable to fender pile projects and most likely would not be needed for pile supported walls, etc.
2. The text changes in the sixth paragraph of 455-5.12.1 (regarding performing equipment available at the site) are not necessary. Please remove these changes from the SP.
3. Revise 455-7.2 as follows: **455-7.2 Manufacture:** Fabricate piles in accordance with Section 450. Supply and install EDCs in all square prestressed bridge foundation piles in accordance with Interim-Index-Number 20602. Ensure the EDCs are installed by the manufacturer's approved personnel.
4. Please confirm that the bending strength requirement of a 36" pile splice should be 1315 kip-feet. If this is correct, please ask Specs to put this requirement in the table of 455-7.8 of the SP.

Response: (per State Specifications Office)

1. Make this change. (Usage note changed.)
2. Remove these changes as Larry wishes. Larry: You just wanted these changes added when we met in my office. You said something about that was a change that should have happened a while ago but did not get made.
3. Make this change. (This change has been made.)
4. Charles: This one is yours. Please give Debbie the data to fill in the table.

Larry Jones
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Comments: 4550510B

1. The usage note needs to be changed to: All bridge projects with square, prestressed concrete pile foundations, without test piles. This SP is not applicable to fender pile projects and most likely would not be needed for pile supported walls, etc.
2. The Special Provision SHOULD NOT delete Subarticle 455-5.12.1. The “SUBARTICLE 455-5.12.1 (page 537 - 538) is deleted: ...” text should be removed from the SP. Furthermore, the changes to existing Articles 455-5.15 & 455-5.16 should be removed from the SP. It would be beneficial for everyone if the Subarticle numbers do not change from one project to the next.
3. Revise 455-7.2 as follows: **455-7.2 Manufacture:** Fabricate piles in accordance with Section 450. Supply and install EDCs in all square prestressed bridge foundation piles in accordance with Interim-Index-Number 20602. Ensure the EDCs are installed by the manufacturer’s approved personnel.
4. Please confirm that the bending strength requirement of a 36” pile splice should be 1315 kip-feet. If this is correct, please ask Specs to put this requirement in the table of 455-7.8 of the SP.

Response: (per the State Specifications Office)

1. Make this change. (Usage note changed.)
2. Don’t delete subarticles 455-5.12.1, 455-5.13, 455-5.15, and 455-5.16. The changes to 455-5.14 will stay as you have them except the numbering will not be changed. See attached for reference. Larry: I believe this is how we had it and then you wanted it changed before we went to internal review.
3. Make this change. (This change has been made.)
4. Charles: This one is yours. Give Debbie the data.
