

ORIGINATION FORM

THE INFORMATION BELOW IS TO BE PROVIDED BY THE ORIGINATOR (The person who receives or originates the issue and needs to forward the issue for action.)

Specification: 455

Subject: various sections

Origination date: 6-15-2009

Originator: Larry Jones

Office/Phone: (850) 414-4305

Problem statement: Changing capacity determination of prestressed concrete pile bridge foundations from blow per foot to the Embedded Data Collector (EDC) results using damping values determined from dynamic load tests.

Proposed solution: See above.

Information source: Statistical analyses of a database of 197 pile drives including 54 instrumented set-checks of piles monitored concurrently using the EDC and Pile Driving Analyzer (PDA), Rodrigo Herrera, David Sadler

Recommended Usage Note:

- A. All bridge projects with square, prestressed concrete pile foundations with test piles.
- B. All bridge projects with square, prestressed concrete pile foundations without test piles.

Estimated fiscal impact, if implemented:

Initially, an added cost of \$2,500 per pile is expected. Cost impacts are expected to reduce as volume increases, industry becomes more familiar with EDC. With increased familiarity there should be additional efficiencies recognized.

Implementation of these changes, if and when approved, will begin with the January 2010 letting.

For State Specifications Office Use Only

Begin date:

File Number:

Scheduled completion date:

Implementation date:

Implementation team member:

Usage Note:

Notes:



Florida Department of Transportation

CHARLIE CRIST
GOVERNOR

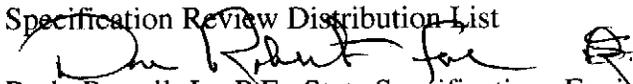
605 Suwannee Street
Tallahassee, FL 32399-0450

STEPHANIE KOPELOUSOS
SECRETARY

M E M O R A N D U M

DATE: June 26, 2009

TO: Specification Review Distribution List

FROM: 
Rudy Powell, Jr., P.E., State Specifications Engineer

SUBJECT: Proposed Specification: 4550510A Structures Foundations - Piling

In accordance with Specification Development Procedures, we are sending you a copy of a proposed specification change.

This change was proposed by Larry Jones to change capacity determination of prestressed concrete pile bridge foundations from blow per foot to the Embedded Data Collector (EDC) results using damping values determined from dynamic load tests.

Please share this proposal with others within your responsibility. Review comments are due within four weeks and should be sent to Mail Station 75 or to my attention via e-mail at ST986RP or rudy.powell@dot.state.fl.us. Comments received after **July 27, 2009**, may not be considered. Your input is encouraged.

RP/dt
Attachment

All bridge projects with square,
prestressed concrete pile
foundations, with test piles

STRUCTURES FOUNDATION – PILING.

(REV 6-91826-09)

SUBARTICLE 455-5.10.1 (page 534) is deleted and the following substituted:

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 using the methods described herein*. For all types of bearing piles, consider the driving resistance as determined by the methods described herein sufficient for carrying the specified loads as the minimum bearing which is accepted for any type of piles. ~~Determine pile bearing using the method described herein or as shown in the plans.~~

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. At his discretion, the Engineer may also accept a driven pile when the minimum penetration is achieved and driving has reached practical refusal in firm material.

SUBARTICLE 455-5.10.2 (page 534) is deleted and the following substituted:

455-5.10.2 ~~Bearing Blow Count~~ Criteria: *The Engineer will determine the bearing resistance of the pile using the data received from Embedded Data Collector (EDC) equipment installed in each pile according to the methods described herein.* ~~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.~~

SUBARTICLE 455-5.11.1 (pages 535) is deleted and the following substituted:

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 Test Piles based on the results of Dynamic Load Tests. After analyzing the PDA data to determine the appropriate damping factor, 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. If the EDC does not perform to the satisfaction of the Engineer due to actions of the Contractor, 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

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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.

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.

The Engineer may also require static load tests to confirm pile capacities. When the Contract Documents do not include pay items for Static Load Tests, they will be paid for as Unforeseeable Work.

~~Dynamic load test will be used to determine pile capacity for all structures or projects unless shown otherwise in the Contract Documents. When necessary, the Engineer may require static load tests to confirm pile capacities. When the Contract Documents do not include items for static load tests, the Engineer will consider all required static load testing Unforeseeable Work. When considered necessary by the Engineer, adjust the blow count criteria to match the resistance determined from static load tests.~~

SUBARTICLE 455-5.12.1 (pages 537 - 538) is deleted and the following substituted:

455-5.12.1 Description: *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.*

Drive piles of the same cross-section and type as the permanent piles shown in the plans, in order to determine any or all of the following:

- (a) the installation criteria for the piles.
- (b) the nature of the soil.
- (c) the lengths of permanent piles required for the work.
- (d) the driving resistance characteristics of the various soil strata.
- (e) the amount of work necessary to obtain minimum required pile

penetration.

- (f) the ability of the driving system to do the work.
- (g) the need for point protection.

Because test piles are exploratory in nature, drive them harder (within the limits of practical refusal), deeper, and to a greater bearing resistance than required for the permanent piling. Except for test piles which are to be statically (or Statnamicly) load tested, drive test piles their full length or to practical refusal. Build up test piles which have been driven their full length and have developed only minimal required bearing, and proceed with further driving.

As a minimum, unless otherwise directed by the Engineer, do not cease driving of test piles until obtaining the required bearing capacity continuously, where the blow count is increasing, for 10 feet unless reaching practical refusal first. For test piles which are to be statically (or Statnamicly) load tested, ignore this minimum and drive these piles as anticipated for the production piles.

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When test piles attain practical refusal prior to attaining minimum penetration, perform all work necessary to attain minimum penetration and the required bearing. Where practical, use water jets to break the pile loose for further driving. Where jetting is impractical, extract the pile and install a Preformed Pile Hole through which driving will continue. The Department will consider the work of extracting the pile to be Unforeseeable Work.

When driving test piles other than low displacement steel test piles, have performing equipment available at the site and water jets as specified in 455-5.7 when jetting is allowed, ready for use, before the test pile driving begins.

The Engineer may elect to interrupt pile driving up to four times on each test pile, two times for up to two hours and two additional times during the next working day of initial driving to determine time effects during the driving of test piles at no additional cost to the Department.

If additional set-checks are determined necessary by the Engineer within two working days following the end of initial driving, each set-check will be paid as an additional set-check. If set-checks are determined necessary by the Engineer after two working days from the end of initial driving, each set-check will be paid for as Pile Redrive.

Install instruments on test piles when dynamic load tests are included in the plans or when directed by the Engineer.

SUBARTICLE 455-7.2 (page 543) is deleted and the following substituted:

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 Index 20602. Ensure the EDCs are installed by the manufacturer's approved personnel.*

SUBARTICLE 455-7.8 (pages 545 - 546) is deleted and the following substituted:

455-7.8 Pre-Planned Splices: Splices shall be made by the doweled splice method contained in the Standard Indexes or may be made using proprietary splices which are listed on the Department's QPL. Splice test piles in the same manner as the production piles. Include in the pile installation plan, the chosen method of splicing and the approximate locations of the splice. Generally, place the splice at approximately the midpoint between the estimated pile tip and the ground surface, considering scour if applicable. Stagger the splice location between adjacent piles by a minimum of 10 feet. Obtain the Engineer's approval prior to constructing any pile sections. Construct piles which are to be spliced using the doweled splice with preformed dowel holes in the bottom section and embedded dowels in the upper section.

When ~~the~~ electing to use dowel splices, assist the Engineer in performing a dynamic load test on each dowel spliced pile to verify the splicing integrity at the end of driving. Replace any damaged pile splices in accordance with 455-11.2.7. Provide the Engineer 48 hours advance notification prior to driving piles with epoxy-bonded dowel splices.

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

a) Compressive strength = (Pile Cross sectional area) x (28 day concrete strength)

b) Tensile Strength = (Pile Cross sectional area) x 900 psi

Pile Size (inches)	Bending Strength (kip-feet)
18	245
20	325
24	600
30	950
<i>36</i>	<i>1600</i>

ARTICLE 455-11 (pages 549 - 553) is expanded by the following:

455-11.15 Embedded Data Collectors: The quantity to be paid for will be the number of EDCs as shown in the plans or authorized by the Engineer, actually installed in piles, completed and accepted in accordance with the Contract Documents. The price will include all costs related to the work as described herein.

SUBARTICLE 455-12.15 (page 555 - 556) is deleted and the following substituted:

455-12.15 Embedded Data Collectors: Price and payment will be full compensation for all labor, equipment, and materials required to perform this work.

ARTICLE 455-12 (page 553-556) is expanded by the following:

455-12.165 Payment Items: Payment will be made under:

- Item No. 455- 2- Treated Timber Piling - per foot.
- Item No. 455- 14- Concrete Sheet Piling - per foot.
- Item No. 455- 18- Protection of Existing Structures - lump sum.
- Item No. 455- 34- Prestressed Concrete Piling - per foot.
- Item No. 455- 35- Steel Piling - per foot.
- Item No. 455- 36- Concrete Cylinder Piling - per foot.
- Item No. 455- 37- Fiberglass Structurally Reinforced Composite Piles-per foot.
- Item No. 455-119- Test Loads- each.
- Item No. 455-120- Point Protection - each.
- Item No. 455-133- Steel Sheet Piling - per square foot.

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Item No. 455-143-	Test Piles (Prestressed Concrete) - per foot.
Item No. 455-144-	Test Piles (Steel) - per foot.
Item No. 455-145-	Test Piles (Concrete Cylinder) - per foot.
<i>Item No. 455-146-</i>	<i>Embedded Data Collector (EDC) - each</i>