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

MEMORANDUM

DATE: June 26, 2009

TO: Specification Review Distribution List

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

SUBJECT: Proposed Specification: 4550510B 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

SP4550510B
All bridge projects with
square, prestressed concrete pile
foundations, without test piles

STRUCTURES FOUNDATIONS - PILING
(REV 6-~~*918*~~*26*-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 (ECD) 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 first production pile at each pier or bent based on the results of a Dynamic Load Test. 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 production pile. Allow the Engineer one business day after driving the dynamic load 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 455-5.14 (page 541 - 542) is deleted and the following substituted:

455-5.14 Pile Lengths: *Authorized 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.*

~~**455-5.14.1 Test Pile Length:** Provide the length of test piles shown in the plans or as directed by the Engineer.~~

~~**455-5.14.2 Production Pile Length:** When shown in the plans, the lengths are based on information available during design and are approximate only. The Engineer will determine final pile lengths in the field which may vary significantly from the lengths or quantities shown in the plans.~~

~~**455-5.14.3 Authorized Pile Lengths:** The authorized pile lengths are the lengths determined by the Engineer based on all information available before the driving of the permanent piles, including, but not limited to, information gained from the driving of test piles, dynamic load testing, static load testing, supplemental soil testing, etc. When authorized by the Department, soil freeze information obtained during set checks and pile redrives may be used to determine authorized pile lengths for sites with extreme soil conditions. The Contractor may elect to provide piling with lengths longer than authorized to suit his method of installation or schedule. When the Contractor elects to provide longer than authorized pile lengths, the Department will pay for the furnished length as either the originally authorized length or the length between cut-off elevation and the final accepted pile tip elevation, whichever is the longer length.~~

~~Within five working days after driving all the test piles, completing all load tests, completing all redrives, and receiving all test reports, the Engineer will furnish the Contractor an itemized list of authorized pile lengths. Use these lengths for furnishing the~~

~~permanent piling for the structure. If the Contractor is willing to start his pile driving operations in zones consisting of at least four test piles designated by the Engineer, and if the Contractor so requests in writing at the beginning of the test pile program, the Department will furnish pile lengths for these designated phases within five working days after driving all the test piles, completing all load tests, completing all redrives, and receiving all test reports for those designated zones. The Engineer will furnish the driving criteria for piles within three working days of furnishing pile lengths.~~

~~On multiple phase projects, the Engineer will not furnish pile lengths on subsequent phases until completing the piling on initial phases.~~

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 (page 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.

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
36	*1600*

ARTICLE 455-11 (page 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 for EDC 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 (553 – 556) is expanded by the following:

455-12.1*6*~~5~~ 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.
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.
Item No. 455-146- Embedded Data Collector (EDC) - each