



Florida Department of Transportation

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GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

STEPHANIE KOPELOUSOS
SECRETARY

August 7, 2009

Monica Gourdine
Program Operations Engineer
Federal Highway Administration
545 John Knox Road, Suite 200
Tallahassee, Florida 32303

Re: Office of Design, Specifications
Section 455
Proposed Specification: 4550510B Structures Foundations - Pilings

Dear Ms. Gourdine:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

These changes were proposed by Larry Jones to change capacity determination of prestressed concrete pile bridge foundations (without test piles) from blow per foot to the Embedded Data Collector (EDC) results using damping values determined from dynamic load tests.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via Email to ST986RP or rudy.powell@dot.state.fl.us.

If you have any questions relating to this specification change, please call Rudy Powell, State Specifications Engineer at 414-4280.

Sincerely,

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

RP/dt
Attachment

cc: Gregory Jones, Chief Civil Litigation
Florida Transportation Builders' Assoc.
State Construction Engineer

All bridge projects with square, prestressed concrete pile foundations, without test piles. *If other pile types are used, contact Central Office Specifications.*

STRUCTURES FOUNDATIONS - PILING
(REV 86-918626-09)

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. *The Engineer will determine pile capacities 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~~ *two consecutive 12²⁴ inches increments* 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 5-10.3 (PAGE 534) is deleted and the following substituted:

455-5.10.3 Practical Refusal: Practical refusal is defined as 20 blows per inch with the hammer operating at the highest setting *which can be used without exceeding the tension or compressive allowed stresses specified in 455-5.11.2* ~~or setting determined by the Engineer~~ and less than 1/4 inch rebound per blow. Stop driving as soon as the Engineer determines that the pile has reached practical refusal. The Engineer will generally make this determination within 2 inches of driving. ~~However, the Engineer will~~

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~~in no case approve the continuation of driving at practical refusal for more than 12 inches. When the required pile penetration cannot be achieved by driving without exceeding practical refusal, use other penetration aids such as jetting or Preformed Pile Holes.~~

SUBARTICLE 455-5.11.1 (PAGE 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 using externally mounted instruments. Allow the Engineer one work day after driving the dynamic load tested pile to ~~perform CAPWAP analysis~~ analyze the data and determine the damping value for the EDC equipment. ~~After analyzing the PDA data to determine~~ the appropriate damping value 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 Dynamic Load Test 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 requires ~~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.~~

All bridge projects with square, prestressed concrete pile foundations, without test piles. *If other pile types are used, contact Central Office Specifications.*

SUBARTICLE 455-5.14 (PAGES 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:

All bridge projects with square, prestressed concrete pile foundations, without test piles. *If other pile types are used, contact Central Office Specifications.*

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.

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>

All bridge projects with square, prestressed concrete pile foundations, without test piles. *If other pile types are used, contact Central Office Specifications.*

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 ~~for~~ EDC will include all costs related to the work as described herein.*

SUBARTICLE 455-12.15 (PAGES 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 (PAGES 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. |
| 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> |

All bridge projects with square, prestressed concrete pile foundations, without test piles. If other pile types are used, contact Central Office Specifications.

STRUCTURES FOUNDATIONS - PILING
(REV 8-6-09)

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. The Engineer will determine pile capacities 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.

The Engineer may accept a driven pile when the pile has achieved minimum penetration, and the minimum required bearing capacity obtained for two consecutive 12 inch increments of 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 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.

SUBARTICLE 5-10.3 (PAGE 534) is deleted and the following substituted:

455-5.10.3 Practical Refusal: Practical refusal is defined as 20 blows per inch with the hammer operating at the highest setting which can be used without exceeding the tension or compressive allowed stresses specified in 455-5.11.2 and less than 1/4 inch rebound per blow. Stop driving as soon as the Engineer determines that the pile has reached practical refusal. The Engineer will generally make this determination within 2 inches of driving. When the required pile penetration cannot be achieved by driving without exceeding practical refusal, use other penetration aids such as jetting or Preformed Pile Holes.

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

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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 using externally mounted instruments. Allow the Engineer one work day after driving the dynamic load tested pile to analyze the data and determine the damping value for the EDC equipment. After determining the appropriate damping value, 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 Dynamic Load Test equipment to the damping value provided by the Engineer prior to driving the production pile.

If the Engineer requires 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.

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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.

All bridge projects with square, prestressed concrete pile foundations, without test piles. If other pile types are used, contact Central Office Specifications.

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 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
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36	1600

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 of EDC will include all costs related to the work as described herein.

All bridge projects with square, prestressed concrete pile foundations, without test piles. If other pile types are used, contact Central Office Specifications.

SUBARTICLE 455-12.15 (PAGES 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 (PAGES 553 – 556) is expanded by the following:

455-12.16 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