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: December 1, 2010

TO: Brian Blanchard, Chief Engineer

FROM: David O'Hagan, Interim Director, Office of Design
David Sadler, Director, Office of Construction

COPIES: Rudy Powell, State Specifications Engineer

SUBJECT: Mandatory Specification Revision No. 4

I approve the implementation plan of the subject Specification for all projects let effective with the January 2011 Letting.

David O'Hagan — signature on file — 12-2-10
Interim Director, Office of Design — Date

David Sadler — signature on file — 12-2-10
Director, Office of Construction — Date

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M E M O R A N D U M

DATE: December 1, 2010

TO: District Specifications Engineers and Central Office Staff

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

SUBJECT: MANDATORY SPECIFICATIONS REVISIONS
January 2011 Workbook: Mandatory Revision No. 4

The following specification revisions must be made to projects with the referenced letting date as noted:

Specification Number	Heading	Revision Date	Effective Letting Date	Remarks
SP4550512	Structures Foundations - Piling	11-22-10	1-11	**New SP.** Usage note: All Bridge Projects with square, prestressed concrete pile foundations. Do not use with SP4550510A or SP4550510B.
SP4550510A	Structures Foundations - Piling	11-22-10	1-11	**Usage note changed to**: All Bridge Projects with square, prestressed concrete pile foundations, with test piles when authorized by the State Geotechnical Engineer. Do not use with SP4550512.
SP4550510B	Structures Foundations - Piling	11-22-10	1-11	**Usage note changed to**: All Bridge Projects with square, prestressed concrete pile foundations, without test piles when authorized by the State Geotechnical Engineer. Do not use with SP4550512.

Beginning in January 2010, Electronic Data Collectors (EDCs) were installed in all square, prestressed concrete piles to compare and correlate pile driving data gathered from EDCs with data from typical dynamic testing. Even though the initial cost of EDCs was high, the intent was to realize savings in pile lengths and through more widespread use, the cost of EDCs would decrease. This has not yet proven true. Therefore, beginning in January 2011, EDC use will return to test piles only. An implementation of January 2011 is needed because the cost of providing EDCs in all production piles may not be justified. The cost effectiveness of EDCs in production piles will be evaluated based on the projects let to date.

Three special provisions are provided. SP4550512 requires EDCs in test piles and will be used the majority of the time. SP4550510A and SP4550510B require the use of EDCs in production and test piles and will be used only when authorized by the State Geotechnical Engineer. See Structures Design Bulletin C10-02 and DCE Memorandum 05-10, dated March 17, 2010, for more information.

Attached is a list of projects anticipated to be impacted by this revision. Verify these projects in your district and identify other projects that may be impacted.

SP4550512
All Bridge Projects with square,
prestressed concrete pile foundations.
Do not use with SP4550510A or SP4550510B.

STRUCTURES FOUNDATIONS - PILING.
(REV ~~9-18-08~~*11-22-10*) (1-~~09~~*11*)

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

455-5.12.1 Description: *Furnish test piles with Embedded Data Collectors (EDCs) installed in accordance with Design Standards, Index No. 20602. Ensure the EDCs are installed by the manufacturer's approved personnel.*

Notify the Engineer at least one day prior to driving the test piles. Do not drive test piles without the presence of the Engineer. Data from the EDCs will be collected by the Department 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 Statnamically) 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 Statnamically) load tested, ignore this minimum and drive these piles as anticipated for the production piles.

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 preforming 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 455-11 (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 the 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 for furnishing and installing EDCs.*

455-12.1~~5~~*6* 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.*

SP4550510A
All Bridge Projects with square, prestressed concrete pile foundations, with test piles.
when authorized by the State Geotechnical Engineer.
Do not use with SP4550512.

STRUCTURES FOUNDATIONS - PILING.
(REV 8-6-09) (FA 8-27-09) (1-1*1*~~0~~)

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 consecutive12 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 455-5.10.3 (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:

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 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.

SUBARTICLE 455-5.12.1 (Pages 537 and 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 Statnamically) 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 capacity is generally increasing, for 10 feet unless reaching practical refusal first. For test piles which are to be statically (or Statnamically) load tested, ignore this minimum and drive these piles as anticipated for the production piles.

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 preforming 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 and 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
24	600
30	950
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.

SUBARTICLE 455-12.15 (Pages 555 and 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

SP4550510B
All Bridge Projects with square, prestressed concrete pile foundations, without test piles.
when authorized by the State Geotechnical Engineer.
Do not use with SP4550512.

STRUCTURES FOUNDATIONS - PILING
(REV 8-6-09) (FA 8-27-09) (1-10*1*)

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:

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.

SUBARTICLE 455-5.14 (Pages 541 and 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.

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 and 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
24	600
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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.

SUBARTICLE 455-12.15 (Pages 555 and 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.