



*Florida Department of Transportation*

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November 4, 2016

Khoa Nguyen  
Director, Office of Technical Services  
Federal Highway Administration  
3500 Financial Plaza, Suite 400  
Tallahassee, Florida 32312

Re: State Specifications Office  
Section: **451**  
Proposed Specification: **4510701 Prestressed Soil Anchors.**

Dear Mr. Nguyen:

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

The changes are proposed by Juan Castellanos of the State Construction Office to clarify the language relating to performance and creep testing.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to [dan.hurtado@dot.state.fl.us](mailto:dan.hurtado@dot.state.fl.us).

If you have any questions relating to this specification change, please call me at 414-4130.

Sincerely,

Signature on file

Dan Hurtado, P.E.  
State Specifications Engineer

DH/dt  
Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**PRESTRESSED SOIL ANCHORS.****(REV ~~9-20-16~~11-4-16)**

SUBARTICLE 451-7.1 is deleted and the following substituted:

**451-7.1 General:** Test each prestressed soil anchor. ~~Perform performance tests as follows: The Engineer will select the prestressed soil anchors to be performance tested and those to be creep tested, and, at his discretion, may increase or decrease the number of tests.~~

~~1. on the first two soil anchors installed on the project prior to the grouting of any additional soil anchors. The purpose of these initial tests is to verify the Contractor's installation procedures and the performance of the bond length. Perform creep testing and performance testing at the beginning of the anchor installation, prior to installation of the remaining soil anchors, unless directed otherwise by the Engineer. In projects with multiple anchor row levels, the Engineer may request performance and creep testing at the beginning of the installation of soil anchors for subsequent levels. The purpose of these initial tests is to verify the Contractor's installation procedures, the performance of the bond length, and, the calibration of testing equipment.~~

~~Perform creep testing as follows:~~

~~1. as shown in the Plans~~

~~2. on 5% of the prestressed soil anchors.~~

~~Perform performance testing as follows:~~

~~1. as shown in the Plans~~

~~2. on 10% of the prestressed soil anchors or a minimum of three,~~

~~whichever is greater.~~

~~Perform creep testing as follows:~~

~~1. as shown in the Plans~~

~~2. on 5% of the prestressed soil anchors~~

~~The Engineer will select the prestressed soil anchors to be performance tested and those to be creep tested and, at his discretion, may increase or decrease the number of tests.~~

Perform proof tests on all prestressed soil anchors, not subjected to a performance test or a creep test. Record the results of each test on forms approved by the Engineer, such as the testing forms provided in the appendix of the AASHTO/AGC/ARTBA Joint Committee Task Force 27 Report. Submit a separate form for each test. Submit the test results to the Engineer on a weekly basis within one week of testing. Do not apply a load greater than 10% of the factored design load to the prestressed soil anchor prior to testing. For the maximum test load, do not exceed 90% of the minimum yield strength of the tendon. Simultaneously apply the test load to the entire tendon. Do not perform stressing of single elements of multi-element tendons.

Provide testing equipment that consists of:

1. a dial gauge or vernier scale capable of measuring to 0.001 inch to measure the ground anchor movement. Use a movement-measuring device that has a minimum travel equal to the theoretical elastic elongation of the total anchor length at the maximum test load and that has adequate travel so the prestressed soil anchor movement can be measured without resetting the device.

2. a hydraulic jack and pump to apply the test load. Use the jack, with a minimum ram travel of not less than the theoretical elastic elongation of the total anchor length at the maximum test load, and a calibrated pressure gauge, graduated in 100 psi increments or

less, or calibrated load cell with readout box, to measure the applied load. Ensure that the jack and pressure gauge are calibrated by an independent firm as a unit, and that the calibration is performed within ~~45~~60 ~~working~~calendar days of the date submitted.

~~3. When~~Provide an electrical resistance load cells ~~will~~and readout to be used ~~for~~when performing a creep test. Load cell may also be used in performance and proof tests, at the Contractor's discretion. ~~e~~Ensure that the load cell is calibrated by an independent firm and that the calibration is performed within ~~45~~60 ~~working~~calendar days of the date submitted. Obtain the Engineer's approval of the calibration before testing commences. In case of disagreement between the load cell and pressure gage, use the load cell measurement.

~~34.~~ Keep a calibrated reference pressure gauge at the site in possession of the Engineer. Ensure that the reference gauge is calibrated with the test jack and pressure gauge.

~~45. Provide an electrical resistance load cell and readout to be used when performing a creep test. Ensure that the load cell is calibrated by an independent firm and that the calibration is performed within 45 working days of the date submitted.~~Place the reference pressure gauge in series with the pressure gauge during each performance test.

~~56.~~ Place the stressing equipment over the prestressed soil anchor tendon in such a manner that the jack, bearing plates, load cells and stressing anchorage are axially aligned with the tendon and the tendon is centered within the equipment.

If, during the performance of any load test (proof, performance, or creep), the load determined by the load cell or the load determined by the reference gauge differs by more than 10% from the load determined by the pressure gauge when the pressure gauge measures 80% of the Factored Design Load (0.80 DL), suspend the test, unload the anchor being tested, recalibrate the load cell, jack, pressure gauge, and reference pressure gauge, and repeat the test at no expense to the Department. Obtain the Engineer's approval of the recalibration data prior to resuming testing.

If, at any time, a pressure gauge, reference pressure gauge, or load cell is repaired or replaced, obtain the Engineer's written approval of calibration data of the repaired or the new measuring device (load cell or pressure gauge, or reference gauge) prior to resuming testing. Perform additional performance tests, at no expense to the Department, on the first two soil anchors using a new measuring device to verify the calibration of the equipment.

SUBARTICLE 451-7.2 is deleted and the following substituted:

**451-7.2 Criteria for Performing a Performance Test and a Proof Test:** Raise the load from one increment to another immediately after recording the prestressed soil anchor movement. Measure and record the prestressed soil anchor movement to the nearest 0.001 inch with respect to an independent fixed reference point at the alignment load and at each increment of load. Monitor the load with a pressure gauge or load cell. At load increments other than the maximum test load, hold the load just long enough to obtain the movement reading.

Hold the maximum test load in a proof test for at least 10 minutes. Pump the jack as necessary in order to maintain a constant load. Start the load-hold period as soon as the maximum test load is applied, and measure and record the prestressed soil anchor movement, with respect to an independent fixed reference, at 1, 2, 3, 4, 5, 6, and 10 minutes. If the prestressed soil anchor movement between 1 minute and 10 minutes exceeds 0.04 inches, hold the maximum test load for an additional 50 minutes. If extending the load-hold, record the prestressed soil anchor movements at 15 minutes, 20, 25, 30, 40, 50 and 60 minutes.

**451-7.2.1 Performance Test:** ~~Place the reference pressure gauge in series with the pressure gauge during each performance test. If the load determined by the reference pressure gauge and the load determined by the pressure gauge differ by more than 10%, recalibrate the jack, pressure gauge, and reference pressure gauge at no expense to the Department.~~

Perform the performance test by incrementally loading and unloading the prestressed soil anchor in accordance with the following schedule:

Performance Test Schedule	
Load	Load
AL	AL
0.20 DL*	0.20 DL
AL	0.40 DL
0.20 DL	0.60 DL
0.40 DL*	0.80 DL
AL	0.90 DL*
0.20 DL	AL
0.40 DL	0.20 DL
0.60 DL*	0.40 DL
AL	0.60 DL
0.20 DL	0.80 DL
0.40 DL	0.90 DL
0.60 DL	1.00 DL*
0.80 DL*	Reduce to lock-off load

AL - is the alignment load.  
DL - is the prestressed soil anchor factored design load.

Plot the prestressed soil anchor movement versus load for each load increment marked with an asterisk (\*) in the performance test schedule, and plot the residual movement of the tendon at each alignment load versus the highest previously applied load.

**451-7.2.2 Proof Test:** Perform the proof test by incrementally loading the prestressed soil anchor in accordance with the following schedule:

Proof Test Schedule	
Load	Load
AL	0.80 DL
0.20 DL	0.90 DL
0.40 DL	1.00 DL
0.60 DL	Reduce to lock-off load

Compare the proof test results to the performance test results. If there is any significant variation from the performance test results, perform a performance test on the next anchor.

Plot the prestressed soil anchor movement versus load for each load increment in the proof test.

SUBARTICLE 451-7.3 is deleted and the following substituted:

**451-7.3 Criteria for Performing a Creep Test:** Perform the creep test by incrementally loading and unloading the prestressed soil anchor in accordance with the performance test schedule given above. At the end of each loading cycle, hold the load constant for the observation period indicated in the creep test schedule below. Use the following times for reading and recording the prestressed soil anchor movement during each observation period: 1, 2, 3, 4, 5, 6, 10, 15, 20, 25, 30, 40, 50, 60, 75, 90, 100, 120, 150, 180, 210, 240, 270, and 300 minutes as appropriate. Start each load-hold period as soon as applying the test load. ~~In a creep test, use the pressure gauge and reference pressure gauge or load cell to measure the applied load, and use the load cell to monitor small changes in load during a constant load hold period.~~ Pump the jack as necessary in order to maintain a constant load.

Plot the prestressed soil anchor movement and the residual movement measured in a creep test as described for the performance test above, and plot the creep movement for each load-hold as a function of the logarithm of time.

Creep Test Schedule	
Load	Observation Period (minutes.)
AL	
0.20 DL	10
0.40 DL	30
0.60 DL	30
0.80 DL	40
0.90 DL	60
1.00 DL	300

## **PRESTRESSED SOIL ANCHORS.**

**(REV 11-4-16)**

SUBARTICLE 451-7.1 is deleted and the following substituted:

**451-7.1 General:** Test each prestressed soil anchor. The Engineer will select the prestressed soil anchors to be performance tested and those to be creep tested, and at his discretion, may increase or decrease the number of tests.

. Perform creep testing and performance testing at the beginning of the anchor installation, prior to installation of the remaining soil anchors, unless directed otherwise by the Engineer. In projects with multiple anchor row levels, the Engineer may request performance and creep testing at the beginning of the installation of soil anchors for subsequent levels. The purpose of these initial tests is to verify the Contractor's installation procedures, the performance of the bond length, and the calibration of testing equipment.

Perform creep testing as follows:

1. as shown in the Plans
2. on 5% of the prestressed soil anchors.

Perform performance testing as follows:

1. as shown in the Plans
2. on 10% of the prestressed soil anchors or a minimum of three,

whichever is greater.

Perform proof tests on all prestressed soil anchors, not subjected to a performance test or a creep test. Record the results of each test on forms approved by the Engineer, such as the testing forms provided in the appendix of the AASHTO/AGC/ARTBA Joint Committee Task Force 27 Report. Submit a separate form for each test. Submit the test results to the Engineer on a weekly basis within one week of testing. Do not apply a load greater than 10% of the factored design load to the prestressed soil anchor prior to testing. For the maximum test load, do not exceed 90% of the minimum yield strength of the tendon. Simultaneously apply the test load to the entire tendon. Do not perform stressing of single elements of multi-element tendons.

Provide testing equipment that consists of:

1. a dial gauge or vernier scale capable of measuring to 0.001 inch to measure the ground anchor movement. Use a movement-measuring device that has a minimum travel equal to the theoretical elastic elongation of the total anchor length at the maximum test load and that has adequate travel so the prestressed soil anchor movement can be measured without resetting the device.

2. a hydraulic jack and pump to apply the test load. Use the jack, with a minimum ram travel of not less than the theoretical elastic elongation of the total anchor length at the maximum test load, and a calibrated pressure gauge, graduated in 100 psi increments or less, or calibrated load cell with readout box, to measure the applied load. Ensure that the jack and pressure gauge are calibrated by an independent firm as a unit, and that the calibration is performed within 60 calendar days of the date submitted.

3. Provide an electrical resistance load cell and readout to be used when performing a creep test. Load cell may also be used in performance and proof tests, at the Contractor's discretion. Ensure that the load cell is calibrated by an independent firm and that the calibration is performed within 60 calendar days of the date submitted. Obtain the Engineer's

approval of the calibration before testing commences. In case of disagreement between the load cell and pressure gage, use the load cell measurement.

4. Keep a calibrated reference pressure gauge at the site in possession of the Engineer. Ensure that the reference gauge is calibrated with the test jack and pressure gauge.

5. Place the reference pressure gauge in series with the pressure gauge during each performance test.

6. Place the stressing equipment over the prestressed soil anchor tendon in such a manner that the jack, bearing plates, load cells and stressing anchorage are axially aligned with the tendon and the tendon is centered within the equipment.

If, during the performance of any load test (proof, performance, or creep), the load determined by the load cell or the load determined by the reference gauge differs by more than 10% from the load determined by the pressure gauge when the pressure gauge measures 80% of the Factored Design Load (0.80 DL), suspend the test, unload the anchor being tested, recalibrate the load cell, jack, pressure gauge, and reference pressure gauge, and repeat the test at no expense to the Department. Obtain the Engineer's approval of the recalibration data prior to resuming testing.

If, at any time, a pressure gauge, reference pressure gauge, or load cell is repaired or replaced, obtain the Engineer's written approval of calibration data of the repaired or the new measuring device (load cell or pressure gauge, or reference gauge) prior to resuming testing. Perform additional performance tests, at no expense to the Department, on the first two soil anchors using a new measuring device to verify the calibration of the equipment.

SUBARTICLE 451-7.2 is deleted and the following substituted:

**451-7.2 Criteria for Performing a Performance Test and a Proof Test:** Raise the load from one increment to another immediately after recording the prestressed soil anchor movement. Measure and record the prestressed soil anchor movement to the nearest 0.001 inch with respect to an independent fixed reference point at the alignment load and at each increment of load. Monitor the load with a pressure gauge or load cell. At load increments other than the maximum test load, hold the load just long enough to obtain the movement reading.

Hold the maximum test load in a proof test for at least 10 minutes. Pump the jack as necessary in order to maintain a constant load. Start the load-hold period as soon as the maximum test load is applied, and measure and record the prestressed soil anchor movement, with respect to an independent fixed reference, at 1, 2, 3, 4, 5, 6, and 10 minutes. If the prestressed soil anchor movement between 1 minute and 10 minutes exceeds 0.04 inches, hold the maximum test load for an additional 50 minutes. If extending the load-hold, record the prestressed soil anchor movements at 15 minutes, 20, 25, 30, 40, 50 and 60 minutes.

**451-7.2.1 Performance Test:** Perform the performance test by incrementally loading and unloading the prestressed soil anchor in accordance with the following schedule:

Performance Test Schedule	
Load	Load
AL	AL
0.20 DL*	0.20 DL
AL	0.40 DL

Performance Test Schedule	
Load	Load
0.20 DL	0.60 DL
0.40 DL*	0.80 DL
AL	0.90 DL*
0.20 DL	AL
0.40 DL	0.20 DL
0.60 DL*	0.40 DL
AL	0.60 DL
0.20 DL	0.80 DL
0.40 DL	0.90 DL
0.60 DL	1.00 DL*
0.80 DL*	Reduce to lock-off load
AL - is the alignment load.	
DL - is the prestressed soil anchor factored design load.	

Plot the prestressed soil anchor movement versus load for each load increment marked with an asterisk (\*) in the performance test schedule, and plot the residual movement of the tendon at each alignment load versus the highest previously applied load.

**451-7.2.2 Proof Test:** Perform the proof test by incrementally loading the prestressed soil anchor in accordance with the following schedule:

Proof Test Schedule	
Load	Load
AL	0.80 DL
0.20 DL	0.90 DL
0.40 DL	1.00 DL
0.60 DL	Reduce to lock-off load

Compare the proof test results to the performance test results. If there is any significant variation from the performance test results, perform a performance test on the next anchor.

Plot the prestressed soil anchor movement versus load for each load increment in the proof test.

SUBARTICLE 451-7.3 is deleted and the following substituted:

**451-7.3 Criteria for Performing a Creep Test:** Perform the creep test by incrementally loading and unloading the prestressed soil anchor in accordance with the performance test schedule given above. At the end of each loading cycle, hold the load constant for the observation period indicated in the creep test schedule below. Use the following times for reading and recording the prestressed soil anchor movement during each observation period: 1, 2, 3, 4, 5, 6, 10, 15, 20, 25, 30, 40, 50, 60, 75, 90, 100, 120, 150, 180, 210, 240, 270, and 300 minutes as appropriate. Start each load-hold period as soon as applying the test load. Pump the jack as necessary in order to maintain a constant load.

Plot the prestressed soil anchor movement and the residual movement measured in a creep test as described for the performance test above, and plot the creep movement for each load-hold as a function of the logarithm of time.

Creep Test Schedule	
Load	Observation Period (minutes.)
AL	
0.20 DL	10
0.40 DL	30
0.60 DL	30
0.80 DL	40
0.90 DL	60
1.00 DL	300