



*Florida Department of Transportation*

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SECRETARY

December 28, 2015

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

Re: State Specifications Office  
Section **462**  
Proposed Specification: **4620100 Post-Tensioning.**

Dear Mr. Nguyen:

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

The changes are proposed by Amy Tootle of the State Construction Office to require all construction-related documentation to be submitted by electronic means for consistency with the State Construction Office e-Construction initiative.

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

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

Sincerely,

Signature on file

Daniel Scheer, P.E.  
State Specifications Engineer

DS/dt

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**POST-TENSIONING.**  
**(REV 10-16-15)**

ARTICLE 462-1 is deleted and the following substituted:

**462-1 Description.**

1. Furnish, transport, store, handle, and install all components of Post-Tensioning (PT) systems, in accordance with the requirements of this Section and the component manufacturer's recommendations. Constituent components of PT systems include, but are not limited to, anchorage assemblies, filler containment assemblies, filler material, and related steel reinforcement. Use the most stringent requirements, as determined by the Engineer, of those specified in this Section or the component manufacturer's recommendations for protecting components from damage due to environmental exposure, improper handling, or improper installation.

2. With the exception of mild reinforcing and prestressing steel, furnish all PT system components from a single supplier.

a. Use only approved PT systems meeting the requirements of Section 960 and selected from the Structures Design Office (SDO) website for Approved Post-Tensioning Systems.

b. Use only PT systems of appropriate type and size required to construct tendons shown in the Contract Documents.

c. With the exception of local zone reinforcement, do not substitute, modify, or delete any components of an approved PT system. Inclusion of all possible subcomponents is required for PT system and component testing; however, subcomponents of approved systems may be eliminated from final installations based on project-specific requirements, provided all component-to-component interface hardware are included as necessary to maintain connections and PT system integrity.

3. Install the PT tendon (e.g., strands, wires, or bars) in ducts. Stress the PT tendon to a predetermined load and anchor ends directly against hardened concrete. After anchoring the PT tendon, install permanent anchorage caps, inject ducts with filler to completely fill voids, and install protection at anchorages.

4. Submit all required documents in accordance with this Section and Section 5 to the Engineer for review and written approval.

5. Cable stays are not covered by this Specification.

6. Install duct filler in accordance with the requirements of this Section. Provide fully filled duct and anchorage assemblies free from leaks, blockages, and voids. ~~Provide~~ ~~Submit~~ ~~sufficient~~ test data to the Engineer to verify that the work meets the requirements of this Section. Perform filler injection operations in accordance with 462-4.

SUBARTICLE 462-6.2 is deleted and the following substituted:

**462-6.2 LOT Identification:**

1. Assign an individual LOT number and tag items shipped to project in a manner that allows each LOT to be clearly identified at project site for all PT system components, filler, bars of each size from each mill heat of steel, and all strands from each manufactured reel.

2. Submit records to the Engineer identifying assigned LOT numbers with heat or reel of material represented if applicable.
3. All unidentified prestressing components, strands, wires, bars, or filler received at the site will be rejected.
4. Loss of positive identification of these items at any time will be cause for rejection.
5. ~~Provide-Submit a copy of~~ filler Quality Control Data Sheets ~~received~~ from the manufacturer, to the Engineer for each LOT of filler on the project.
6. Material with a total time from manufacture in excess of six months must be retested and certified by supplier before use or be removed from project and replaced with new material.

SUBARTICLE 462-7.1 is deleted and the following substituted:

**462-7.1 General:**

1. ~~Furnish-Submit to~~ the Engineer ~~with~~ written certification from PT supplier (vendor) that PT system chosen for the project meets requirement of this Section, Section 960, and is a Department approved PT system prior to installing any PT hardware.
2. ~~Provide-Submit~~ a list of PT system components and reference drawings to the Engineer.
3. Use methods to place and consolidate concrete that will not displace or damage any PT ducts, anchorage assemblies, splices and connections, reinforcement, or other embedded items.
4. Conduct all stressing and filler injection operations in the presence of the Engineer.

SUBARTICLE 462-7.3.1.2 is deleted and the following substituted:

**462-7.3.1.2 Calibration:**

1. Calibrate each jack and its gauges as a unit.
2. Calibration must consist of three test cycles with cylinder extension of jack in various positions (e.g., two-inch, four-inch, eight-inch stroke).
3. At each pressure increment, average forces from each test cycle to obtain an average force.
4. Perform calibration with equipment (e.g., jack, pump, hoses, etc.) setup in same configuration intended for use on Project.
5. Jack and gauge calibration is to be initially performed by PT supplier or an independent laboratory.
6. Use load cells calibrated within the past 12 months to calibrate stressing equipment.
7. Supply documentation denoting the load cells calibration date and tractability to National Institute of Standards and Technology (NIST) along with jack/gauge calibration.

8. ~~Provide-Submit to~~ the Engineer ~~with~~ certified calibration charts and curves for each jack and gauge unit used on the project prior to start of work and every six months thereafter or as requested by the Engineer.

9. Calibrations subsequent to initial calibration with a load cell may be accomplished with use of a master gauge. Supply master gauge to the Engineer in a protective waterproof container capable of protecting calibration of gauge during shipment to a laboratory. Provide a quick-attach hydraulic manifold to enable quick and easy installation of master gauge to verify permanent readings. Master gauge will remain in the possession of the Engineer for duration of project and will be returned to the Contractor after final acceptance of project by the Engineer.

10. Any jack repair, such as replacing seals or changing length of hydraulic lines, requires recalibration using a load cell.

11. No extra compensation will be allowed for initial or any subsequent calibrations or use of master gauge required by the Engineer.

SUBARTICLE 462-7.3.2.8 is deleted and the following substituted:

**462-7.3.2.8 Post-Tensioning Operations Record:**

1. Keep a record of these PT operations for each tendon installed:
  - a. Project name, Financial Project ID (FPID);
  - b. Contractor and/or subcontractor;
  - c. Tendon location, size, and type;
  - d. Date tendon was first installed in duct;
  - e. Reel number for strands and wires and heat number for bars;
  - f. Tendon cross-sectional area;
  - g. Modulus of elasticity;
  - h. Date stressed;
  - i. Jack and Gauge numbers per tendon end;
  - j. Required jacking force;
  - k. Gauge pressures;
  - l. Elongations (theoretical and actual);
  - m. Anchor sets (anticipated and actual);
  - n. Stressing sequence (i.e., sequential order of tendon stressing by number);
  - o. Stressing mode (single-end, dual-end, simultaneous);
  - p. Witnesses to stressing operations (Contractor and Inspector);
  - q. Any other relevant information.
2. ~~Provide-Submit to~~ the Engineer ~~with~~ a complete copy of all set of stressing operation records within five days of completed tendon installation.

SUBARTICLE 462-7.4.1.5.6 is deleted and the following substituted:

**462-7.4.1.5.6 Grouting Operations Report:**

1. ~~Provide~~ Submit grouting report signed by the grouting Contractor within five days of each grouting operation for review by the Engineer.
2. Record theoretical quantity of grout anticipated as compared to actual quantity of grout used to fill duct. Notify the Engineer immediately of shortages or overages.
3. Information to be noted in this report must include at a minimum, but not necessarily be limited to:
  - a. identification of tendon;
  - b. date grouted;
  - c. number of days from tendon installation to grouting;
  - d. type of grout;
  - e. injection end and applied grouting pressure;
  - f. ratio of actual to theoretical grout quantity;
  - g. number of grout bags mixed;
  - h. total quantity of water used to mix grout;
  - i. summary of any problems encountered; and,
  - j. corrective action taken,
  - k. description and results of the post grouting operationsand inspection.

SUBARTICLE 462-7.4.2.1.5.4 is deleted and the following substituted

**462-7.4.2.1.5.4 Wax Injection Operations Report:**

1. ~~Provide~~ Submit wax injection report signed by the wax injection Contractor within five days of each wax injection operation for review by the Engineer.
2. Record theoretical quantity of wax anticipated as compared to actual quantity of wax used to fill duct. Notify the Engineer immediately of shortages or overages.
3. Information to be noted in this report must include at a minimum, but not necessarily be limited to:
  - a. Identification of duct;
  - b. Date of duct pressure test;
  - c. Date wax injected;
  - d. Number of days from tendon installation to wax injection;
  - e. Wax product identification;
  - f. Final locking pressure of wax in PT system;
  - g. Reservoir temperature at time of initiation of wax injection;
  - h. Theoretical volume of wax required to completely fill the duct;
  - i. Volume of wax injected into duct;
  - j. Volume of wax collected at discharge points;

inlet opening and closing;

and any deviations from the Wax Injection Operations Plan;

injection operations and inspection;

vacuum in duct prior to injection;

k. Injection rate including timing of duct

l. Ambient temperature;

m. Summary of any problems encountered

n. Corrective action taken;

o. Description and results of the post wax

p. Vacuum gauge pressure and percent

4. Maintain daily wax injection operations reports at the job site for review by the Engineer. ~~Provide~~ Submit all daily reports to the Engineer on a weekly basis or ~~more frequently~~ as directed by the Engineer.

SUBARTICLE 462-7.4.2.1.6 is deleted and the following substituted

**462-7.4.2.1.6 Manufacturer's Installation Technician:**

Provide for a PT system vendor installation technician, certified by the vendor as having sufficient knowledge and expertise to oversee the wax injection personnel. The vendor's technician shall be under the direct employ of the vendor and shall be present for all wax injection activities for a minimum of the first two days of wax injection for each of the Contractor's wax injection crews. The vendor's technician shall ~~provide~~ submit written certification to the Engineer that the Contractor's installation process is in conformance with the approved Wax Injection Operations Plan.

SUBARTICLE 462-8.1.3 is deleted and the following substituted:

**462-8.1.3 Required Reports:**

1. Submit ~~two copies of~~ the test report for "Tendon Modulus of Elasticity Test" to the Engineer at least 30 days before installing tendon.
2. Submit ~~two copies of~~ the test report for "In-Place Wobble and Friction Test" to the Engineer within two weeks after successful installation of tested tendon.

**POST-TENSIONING.**  
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3. Install the PT tendon (e.g., strands, wires, or bars) in ducts. Stress the PT tendon to a predetermined load and anchor ends directly against hardened concrete. After anchoring the PT tendon, install permanent anchorage caps, inject ducts with filler to completely fill voids, and install protection at anchorages.

4. Submit all required documents in accordance with this Section and Section 5 to the Engineer for review and written approval.

5. Cable stays are not covered by this Specification.

6. Install duct filler in accordance with the requirements of this Section. Provide fully filled duct and anchorage assemblies free from leaks, blockages, and voids. Submit test data to the Engineer to verify that the work meets the requirements of this Section. Perform filler injection operations in accordance with 462-4.

SUBARTICLE 462-6.2 is deleted and the following substituted:

**462-6.2 LOT Identification:**

1. Assign an individual LOT number and tag items shipped to project in a manner that allows each LOT to be clearly identified at project site for all PT system components, filler, bars of each size from each mill heat of steel, and all strands from each manufactured reel.

2. Submit records to the Engineer identifying assigned LOT numbers with heat or reel of material represented if applicable.
3. All unidentified prestressing components, strands, wires, bars, or filler received at the site will be rejected.
4. Loss of positive identification of these items at any time will be cause for rejection.
5. Submit filler Quality Control Data Sheets from the manufacturer to the Engineer for each LOT of filler on the project.
6. Material with a total time from manufacture in excess of six months must be retested and certified by supplier before use or be removed from project and replaced with new material.

SUBARTICLE 462-7.1 is deleted and the following substituted:

**462-7.1 General:**

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2. Submit a list of PT system components and reference drawings to the Engineer.
3. Use methods to place and consolidate concrete that will not displace or damage any PT ducts, anchorage assemblies, splices and connections, reinforcement, or other embedded items.
4. Conduct all stressing and filler injection operations in the presence of the Engineer.

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**462-7.3.1.2 Calibration:**

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2. Calibration must consist of three test cycles with cylinder extension of jack in various positions (e.g., two-inch, four-inch, eight-inch stroke).
3. At each pressure increment, average forces from each test cycle to obtain an average force.
4. Perform calibration with equipment (e.g., jack, pump, hoses, etc.) setup in same configuration intended for use on Project.
5. Jack and gauge calibration is to be initially performed by PT supplier or an independent laboratory.
6. Use load cells calibrated within the past 12 months to calibrate stressing equipment.
7. Supply documentation denoting the load cells calibration date and tractability to National Institute of Standards and Technology (NIST) along with jack/gauge calibration.
8. Submit to the Engineer certified calibration charts and curves for each jack and gauge unit used on the project prior to start of work and every six months thereafter or as requested by the Engineer.

9. Calibrations subsequent to initial calibration with a load cell may be accomplished with use of a master gauge. Supply master gauge to the Engineer in a protective waterproof container capable of protecting calibration of gauge during shipment to a laboratory. Provide a quick-attach hydraulic manifold to enable quick and easy installation of master gauge to verify permanent readings. Master gauge will remain in the possession of the Engineer for duration of project and will be returned to the Contractor after final acceptance of project by the Engineer.

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SUBARTICLE 462-7.3.2.8 is deleted and the following substituted:

**462-7.3.2.8 Post-Tensioning Operations Record:**

1. Keep a record of these PT operations for each tendon installed:
  - a. Project name, Financial Project ID (FPID);
  - b. Contractor and/or subcontractor;
  - c. Tendon location, size, and type;
  - d. Date tendon was first installed in duct;
  - e. Reel number for strands and wires and heat number for bars;
  - f. Tendon cross-sectional area;
  - g. Modulus of elasticity;
  - h. Date stressed;
  - i. Jack and Gauge numbers per tendon end;
  - j. Required jacking force;
  - k. Gauge pressures;
  - l. Elongations (theoretical and actual);
  - m. Anchor sets (anticipated and actual);
  - n. Stressing sequence (i.e., sequential order of tendon stressing by number);
  - o. Stressing mode (single-end, dual-end, simultaneous);
  - p. Witnesses to stressing operations (Contractor and Inspector);
  - q. Any other relevant information.
2. Submit to the Engineer a complete set of stressing operation records within five days of completed tendon installation.

SUBARTICLE 462-7.4.1.5.6 is deleted and the following substituted:

**462-7.4.1.5.6 Grouting Operations Report:**

1. Submit grouting report signed by the grouting Contractor within five days of each grouting operation for review by the Engineer.

2. Record theoretical quantity of grout anticipated as compared to actual quantity of grout used to fill duct. Notify the Engineer immediately of shortages or overages.

3. Information to be noted in this report must include at a minimum, but not necessarily be limited to:

- a. identification of tendon;
- b. date grouted;
- c. number of days from tendon installation to grouting;
- d. type of grout;
- e. injection end and applied grouting pressure;
- f. ratio of actual to theoretical grout quantity;
- g. number of grout bags mixed;
- h. total quantity of water used to mix grout;
- i. summary of any problems encountered; and,
- j. corrective action taken,
- k. description and results of the post grouting operations

and inspection.

SUBARTICLE 462-7.4.2.1.5.4 is deleted and the following substituted

**462-7.4.2.1.5.4 Wax Injection Operations Report:**

1. Submit wax injection report signed by the wax injection Contractor within five days of each wax injection operation for review by the Engineer.

2. Record theoretical quantity of wax anticipated as compared to actual quantity of wax used to fill duct. Notify the Engineer immediately of shortages or overages.

3. Information to be noted in this report must include at a minimum, but not necessarily be limited to:

- a. Identification of duct;
- b. Date of duct pressure test;
- c. Date wax injected;
- d. Number of days from tendon installation
- e. Wax product identification;
- f. Final locking pressure of wax in PT
- g. Reservoir temperature at time of initiation
- h. Theoretical volume of wax required to
- i. Volume of wax injected into duct;
- j. Volume of wax collected at discharge
- k. Injection rate including timing of duct
- l. Ambient temperature;

to wax injection;

system;

of wax injection;

completely fill the duct;

points;

inlet opening and closing;

and any deviations from the Wax Injection Operations Plan;

injection operations and inspection;

vacuum in duct prior to injection;

m. Summary of any problems encountered

n. Corrective action taken;

o. Description and results of the post wax

p. Vacuum gauge pressure and percent

4. Maintain daily wax injection operations reports at the job site for review by the Engineer. Submit all daily reports to the Engineer on a weekly basis or as directed by the Engineer.

SUBARTICLE 462-7.4.2.1.6 is deleted and the following substituted

**462-7.4.2.1.6 Manufacturer's Installation Technician:**

Provide for a PT system vendor installation technician, certified by the vendor as having sufficient knowledge and expertise to oversee the wax injection personnel. The vendor's technician shall be under the direct employ of the vendor and shall be present for all wax injection activities for a minimum of the first two days of wax injection for each of the Contractor's wax injection crews. The vendor's technician shall submit written certification to the Engineer that the Contractor's installation process is in conformance with the approved Wax Injection Operations Plan.

SUBARTICLE 462-8.1.3 is deleted and the following substituted:

**462-8.1.3 Required Reports:**

1. Submit the test report for "Tendon Modulus of Elasticity Test" to the Engineer at least 30 days before installing tendon.

2. Submit the test report for "In-Place Wobble and Friction Test" to the Engineer within two weeks after successful installation of tested tendon.