Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

July 1, 2016

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

Re: State Specifications Office
Section **002**
Proposed Specification: **0020400-60day Proposal Requirements and Conditions – Examination of Contract Documents and Site of Work.**

Dear Mr. Nguyen:

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

The changes are proposed by Alan Autry of the State Contracts Administration Office to update the link for the online Prebid Question and Answer web site and to establish a deadline of 10 calendar days prior to bid opening for submittal of prebid questions on 60-day ad contracts.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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/ft
Attachment
cc: Florida Transportation Builders' Assoc.
State Construction Engineer

PROPOSAL REQUIREMENTS AND CONDITIONS - EXAMINATION OF CONTRACT DOCUMENTS AND SITE OF WORK.

(REV ~~11-3-15~~*4-11-16*) ~~(FA 1-27-16) (7-16)~~

ARTICLE 2-4 is deleted and the following substituted:

2-4 Examination of Contract Documents and Site of Work.

Examine the Contract Documents and the site of the proposed work carefully before submitting a Proposal for the work contemplated. Investigate the conditions to be encountered, as to the character, quality, and quantities of work to be performed and materials to be furnished and as to the requirements of all Contract Documents.

Direct all questions to the Department by posting them to the Department's website at the following URL address:
~~https://www3b.dot.state.fl.us/BidQuestionsAndAnswers/Proposal.aspx/SearchProposal~~
https://fdotwp1.dot.state.fl.us/BidQuestionsAndAnswers/Proposal.aspx/SearchProposal
Questions posted to this site before 5:00 P.M. (EST) on the ~~seventh calendar day prior to the bid opening, or~~ tenth calendar day prior to the ~~December~~ bid opening, will be responded to by the Department. For questions posted after ~~these~~ *this* ~~times~~*deadline*, an answer cannot be assured. For all questions posted before the deadline, the Department will provide and post responses at the same website before 8:00 A.M. (EST) on the second calendar day prior to bid opening. Take responsibility to review and be familiar with all questions and responses posted to this website and to make any necessary adjustments in the proposal accordingly. If the Department's web site cannot be accessed, contact _____ at _____.

When, in the sole judgment of the Department, responses to questions require plans revisions, specifications revisions and/or addenda, the Contracts Office will issue them as necessary.

The Department does not guarantee the details pertaining to borings, as shown in the Plans, to be more than a general indication of the materials likely to be found adjacent to holes bored at the site of the work, approximately at the locations indicated. The Bidder shall examine boring data, where available, and make their own interpretation of the subsoil investigations and other preliminary data, and shall base their bid solely on their own opinion of the conditions likely to be encountered.

The Bidder's submission of a Proposal is prima facie evidence that the Bidder has made an examination as described in this Article.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

April 18, 2016

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

Re: State Specifications Office
Section **003**
Proposed Specification: **0030501 Award and Execution of Contract.**

Dear Mr. Nguyen:

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

The changes are proposed to implement changes required by State law. Chapter 2016-239, Laws of Florida (formerly House Bill 7061) was signed by the Governor on April 14, 2016. Included in the implemented language are changes related to the conditions the Department may waive Contract Bond requirements.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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

AWARD AND EXECUTION OF CONTRACT.
(REV 4-18-16)

SUBARTICLE 3-5.1 is deleted and the following substituted:

3-5.1 General Requirements of the Contract Bond: Upon award, furnish to the Department, and maintain in effect throughout the life of the Contract, an acceptable Contract Bond in a sum at least equal to the amount of the Contract. Execute such Contract Bond on Department Form 375-020-27. Obtain the Contract Bond from a Surety licensed to conduct business in the State of Florida, meeting all of the requirements of the laws of Florida and the regulations of the Department, and having the Department's approval. Ensure that the Surety's Florida Licensed Insurance Agent's name, address, and telephone number is clearly stated on the Contract Bond form.

~~On Contracts of $250,000 or less, t~~The Department may waive the requirement for all or a portion of a Contract Bond if:

1. The Contract amount is $250,000 or less, ~~it~~and the Department determines that the project is of a noncritical nature and that nonperformance will not endanger the public health, safety, or property~~.~~;

2. The Contractor is a qualified nonprofit agency for the blind or for the other severely handicapped under Section 413.036(2), Florida Statutes; or,

3. The Contractor uses a subcontractor that is a qualified nonprofit agency for the blind or for the other severely handicapped under Section 413.036(2), Florida Statutes. However, the Department may not waive more than the amount of the subcontract.

The Department may require alternate means of security if it waives the requirement for a Contract Bond.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

May 23, 2016

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

Re: State Specifications Office
Section **003**
Proposed Specification: **0030900 Award and Execution of Contract – Public Records.**

Dear Mr. Nguyen:

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

On March 8, Governor Scott signed HB 273 into law. This legislation, among other things, requires that the language provided in the Special Provision be inserted into public agency contracts. This bill requires a change to Standard Specification 3-9.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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/ft
Attachment
cc: Florida Transportation Builders' Assoc.
State Construction Engineer

AWARD AND EXECUTION OF CONTRACT – PUBLIC RECORDS.
(REV 5-20-16)

ARTICLE 3-9 is deleted and the following substituted:

3-9 Public Records.

The Contractor shall comply with Chapter 119, Florida Statutes. Specifically, if the Contractor is acting on behalf of the Department the Contractor shall: ~~Allow public access to all documents, papers, letters, or other material subject to the provisions of Chapter 119, Florida Statutes, made or received by the Contractor in conjunction with this Contract. Specifically, if the Contractor is acting on behalf of a public agency, the Contractor must:~~

1. Keep and maintain public records ~~that ordinarily and necessarily would be~~ required by the Department ~~in order~~ to perform the services being performed by the Contractor.

2. *Upon request from the Department's custodian of public records,* ~~P~~*p*rovide the *Department* public with ~~access~~ *a copy of the requested records or allow the* ~~to~~ records *to be inspected or copied within a reasonable time* ~~on the same terms and conditions that the Department would provide the records and~~ at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes, or as otherwise provided by rule or law.

3. Ensure that records exempt or confidential and exempt from disclosure requirements are not disclosed except as authorized by law *for the duration of the contract term and following completion of the Contract if the Contractor does not transfer the records to the Department*.

~~4. Meet all requirements for retaining public records.~~

~~5~~*4*. Upon ~~termination~~ *completion* of the Contract, transfer at no cost to the Department, all public records in possession of the Contractor *or keep and maintain public records required by the Department to perform the service. If the Contractor transfers all public records to the Department upon completion of the Contract, the Contractor shall* ~~and~~ destroy any duplicate records that are exempt or confidential and exempt from public records disclosure requirements. *If the Contractor keeps and maintains public records upon comlletion of the Contract, the Contractor shall meet all applicable requirements for retaining public records.* All records stored electronically must be provided to the Department*, upon request from the Department's custodian of public records,* in a format that is compatible with the information technology systems of the Department.

~~The Contractor shall promptly provide the Department with a copy of any request to inspect or copy public records in possession of the Contractor and shall promptly provide the Department a copy of the Contractor's response to each such request.~~ Failure to *comply with Chapter 119, Florida Statutes, and the Article 3-9,* ~~grant such public access will~~*shall* be grounds for immediate *unilateral* termination of this Contract by the Department pursuant to 8-9.1.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT:

District 1

863-519-2623
D1prcustodian@dot.state.fl.us
Florida Department of Transportation
District 1 – Office of General Counsel
801 N. Broadway
Bartow, FL 33827

District 2
386-758-3727
D2prcustodian@dot.state.fl.us
Florida Department of Transportation
District 2 - Office of General Counsel
1109 South Marion Avenue, MS 2009
Lake City, FL 32025

District 3
850-330-1391
D3prcustodian@dot.state.fl.us
Florida Department of Transportation
District 3 - Office of General Counsel
1074 Highway 90 East
Chipley, FL 32428

District 4
954-777-4529
D4prcustodian@dot.state.fl.us
Florida Department of Transportation
District 4 – Office of General Counsel
3400 West Commercial Blvd.
Fort Lauderdale, FL 33309

District 5
386-943-5000
D5prcustodian@dot.state.fl.us
Florida Department of Transportation
District 5 – Office of General Counsel
719 South Woodland Boulevard
Deland, FL 32720

District 6

305-470-5453
D6prcustodian@dot.state.fl.us
Florida Department of Transportation
District 6 – Office of General Counsel
1000 NW 111 Avenue
Miami, FL 33172-5800

District 7
813-975-6491
D7prcustodian@dot.state.fl.us
Florida Department of Transportation
District 7 - Office of General Counsel
11201 N. McKinley Drive, MS 7-120
Tampa, FL 33612

Florida's Turnpike Enterprise
407-264-3170
TPprcustodian@dot.state.fl.us
Turnpike Enterprise Chief Counsel
Florida Turnpike – Office of General Counsel
Turnpike Mile Post 263, Bldg. 5315
Ocoee, FL 34761

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

July 19, 2016

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

Re: State Specifications Office
Section **007**
Proposed Specification: **0071104RR Legal Requirements and Responsibility to the Public – Operations within the Railroad Right-Of-Way.**

Dear Mr. Nguyen:

We are submitting, for your approval, two copies of the above referenced Special Provision.

The changes are proposed by Scott Allbritton of the State Rail Office to restrict work within CSX right-of-way during CSX recognized holidays.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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/ot
Attachment
cc: Florida Transportation Builders' Assoc.
State Construction Engineer

LEGAL REQUIREMENTS AND RESPONSIBILITY TO THE PUBLIC – OPERATIONS WITHIN THE RAILROAD RIGHT-OF-WAY.
(REV 3-11-16)

SUBARTICLE 7-11.4 is deleted and the following substituted:

7-11.4 Operations Within Railroad Right-of-Way:

7-11.4.1 Notification to the Railroad Company:

7-11.4.1.1 CSX Transportation (CSXT), Norfolk Southern (NS), and Department-Owned Rail Corridors: Submit written notification to the Engineer at least 72 hours before beginning any operation within the limits of the railroad right-of-way; any operation requiring movement of employees, trucks, or other equipment across the tracks of the railroad company at other than an established public crossing; and any other work that may affect railroad operations or property.

7-11.4.1.2 Florida East Coast Railway (FEC): Submit written notification to the Chief FEC Engineer or authorized Railway Representative at least 72 hours before beginning any operation within the limits of the railroad right-of-way; any operation requiring movement of employees, trucks, or other equipment across the tracks of the railroad company at other than an established public crossing; and any other work that may affect railroad operations or property.

Contact the FEC Signal Office at 904-279-3182 at least 30 days prior to any traffic signal work within 500 feet of a signalized, at-grade, rail-highway crossing.

7-11.4.2 Contractor's Responsibilities: Comply with requirements deemed necessary by the railroad company's authorized representative to safeguard the railroad's property and operations. Do not perform temporary lane closures, lane shifts or detour routes within the railroad company right-of-way without railroad approval.

The Contractor is responsible for all damages, delays, or injuries and all suits, actions, or claims brought on account of damages or injuries resulting from the Contractor's operations within or adjacent to railroad company right-of-way.

7-11.4.2.1 CSXT: Comply with the Construction Submission Criteria of the CSXT Public Project Information document and Construction Requirements sections of the CSXT Pipeline and Wireline Design and Construction Specifications prior to beginning work. These documents are available at the following URL: http://www.dot.state.fl.us/programmanagement/Implemented/URLinSpecs/CSXT.shtm.

Perform no work within the limits of the railroad right-of-way on CSXT holidays. CSXT holidays are New Year's Day, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and the following Friday, Christmas Eve, Christmas Day, and New Year's Eve. Holidays falling on Saturday are observed on Friday and those falling on Sunday are observed on Monday.

7-11.4.2.2 NS: Comply with the NS Special Provisions for Protection of Railway Interests (Appendix E) and the Construction Requirements (Appendix 4.3) of the NS Public Projects Manual document prior to beginning and during all work. These documents are available at the following URL: http://www.nscorp.com/content/dam/nscorp/ship/shipping-tools/Public_Projects_Manual.pdf.

7-11.4.2.3 FEC: Complete the On-Track Contractor Roadway Worker Training Course for FEC Railway. Contact FEC Railway at 1-800-342-1131 for training information.

Costs incurred by the railroad for Contractor caused delays that adversely impact railway operations will be forwarded to the Contractor for payment. If the Contractor fails to pay said costs, the Department will deduct the amount from payments to be made to the Contractor.

7-11.4.3 Watchman or Flagging Services:

7-11.4.3.1 CSXT, NS, and FEC:

7-11.4.3.1.1 General: The railroad company will furnish protective services (i.e., watchman or flagging services) to ensure the safety of railroad operations during certain periods of the project. The Department will reimburse the railroad company for the cost thereof. Schedule work that affects railroad operations so as to minimize the need for protective services by the railroad company.

7-11.4.3.1.2 CSXT: Submit schedules and schedule changes to the Engineer so the Department can coordinate the scheduling of flagging resources. Projects with less than 20 consecutive days of flagging services require a CSXT short-term flagger and 45 days written advance notice. Submit the 45 days written advance notice to the Engineer. Projects with 20 or more consecutive days of flagging services require a CSXT long term flagger. The Department will submit the 6 months written advance notice to CSXT.

7-11.4.3.1.3 NS: Submit schedules and schedule changes to the Engineer so the Department can coordinate the scheduling of flagging resources. Projects with less than 20 consecutive days of flagging services require a NS short-term flagger and 45 days written advance notice. Submit the 45 days written advance notice to the Engineer. Projects with 20 or more consecutive days of flagging services require a NS long term flagger. The Department will submit the 6 months written advance notice to NS.

7-11.4.3.1.4 FEC: Contact FEC Railway at 1-800-342-1131, ext. 2377, to request signal locates and railroad watchmen or flagging services at least 72 hours prior to railroad right-of-way encroachments. When requesting railroad watchman or flagging services, identify the work as a Florida Department of Transportation project.

7-11.4.3.2 Department-Owned Rail Corridors: The Department will furnish protective services (i.e., watchman or flagging services) to ensure the safety of railroad operations during certain periods of the project.

For projects involving the South Florida Rail Corridor (SFRC), contact the South Florida Regional Transportation Authority (SFRTA) at 954-788-1788 at least 30 days prior to rail corridor right-of-way encroachments to coordinate the scheduling of flagging resources.

For projects involving the Central Florida Rail Corridor (CFRC), submit written advance notice to the Engineer at least 30 days prior to rail corridor right-of-way encroachments so the Department can coordinate the scheduling of flagging resources.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

April 15, 2016

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

Re: State Specifications Office
Section
Proposed Specification: **0071105FGT Legal Requirements and Responsibility to the Public – Utilities.**

Dear Mr. Nguyen:

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

The changes are administrative changes to clarify that the requirements of Subarticle 7-11.5.5.2 are applicable only when there is an FDOT/FGT Encroachment Agreement and to update the link to the website where the Encroachment Agreement is available.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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/ot
Attachment
cc: Florida Transportation Builders' Assoc.
State Construction Engineer

LEGAL REQUIREMENTS AND RESPONSIBILITY TO THE PUBLIC – UTILITIES. (REV 4-6-16)

SUBARTICLE 7-11.5 is expanded by the following Subarticle:

7-11.5.5 Florida Gas Transmission Company, LLC (FGT) Facilities:

7-11.5.5.1 General: Waive any and all claims for relief, whether in contract, tort or otherwise, against FGT arising out of the Buy America requirements set forth in 23 U.S.C. 313, as amended, and 23 CFR 635.410, as amended. Include this provision in all subcontracts, and require all subcontractors to include it in their subcontracts with others.

Unless FGT facilities are located at a depth greater than eight feet, do not rely on as-built data or drill coordinates provided by FGT. Use soft dig field locates for FGT facilities.

Obtain approval from the Engineer prior to the use of any area *located* over any of FGT's pipelines for temporary construction space.

7-11.5.5.2 FGT Encroachment Agreements: *When there is a FDOT/FGT Encroachment Agreement* ~~When~~ *and the work includes* performing installation, construction, excavation, repair, or demolition ~~work~~ in the Encroachment Area, meet the requirements of this ~~subarticle~~ *Subarticle* and 7-11.5.5.1. ~~*A list of projects with*~~ *FDOT/FGT Encroachment Agreements* ~~*is*~~*are available at the following URL: http://www.dot.state.fl.us/programmanagement/utilities/FGT-Encroach-Agreements.shtm.*

Notify FGT and the Engineer at least 48 hours before entering the limits of the Encroachment Area. Send notification to FGT by overnight next day courier service, certified mail, return receipt requested or email transmission. Do not enter into the Encroachment Area until the FGT representative is present.

Comply with the requirements of the FGT representative to safeguard FGT's property and operations. Specifically, comply with the Engineering and Construction Specifications in Attachment C of the FDOT/FGT Encroachment Agreement for ~~this~~ *the* project. ~~These documents are available at the following URL: *http://www.dot.state.fl.us/programmanagement/utilities/FGT-Encroach-Agreements.shtm*~~ftp://ftp.dot.state.fl.us/permitsandorutilityworkschedules/~~.~~

Invite the FGT representative to safety meetings.

Provide FGT access to the Encroachment Area and FGT pipeline facilities at all times.

Perform no work within the Encroachment Area on Saturday, Sunday or holidays, unless otherwise authorized by the Engineer.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

August 8, 2016

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

Re: State Specifications Office
Section **105**
Proposed Specification: **1050807 Contractor Quality Control General Requirements.**

Dear Mr. Nguyen:

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

The changes are proposed by Charles Boyd of the State Structures Design Office to require grouting technicians to have ASBI flexible filler injection training which will be available in the near future.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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/ot
Attachment
cc: Florida Transportation Builders' Assoc.
State Construction Engineer

CONTRACTOR QUALITY CONTROL GENERAL REQUIREMENTS.
(REV 5-31-16)

SUBARTICLE 105-8.7.7.3 is deleted and the following substituted:

105-8.7.7.3 Flexible Filler Injection: Perform all filler injection operations under the direct supervision of a Filler Injection Foreman who has American Segmental Bridge Institute (ASBI) certification in the flexible filler process. Provide at least two CTQP Qualified Grouting Technicians *with ASBI certification in the flexible filler process~~,~~;* one of whom must be a Level II CTQP Qualified Grouting Technician*~~, both of whom must have~~* ~~with ASBI certification in the flexible filler process~~. Both technicians must be present at the site of the flexible filler injection work during the entire duration of the operation.

Provide a Filler Injection Quality Control (QC) Inspector who has ASBI certification in the flexible filler process. The Filler Injection QC Inspector must be present at the site of the flexible filler injection work during the entire duration of the operation.

Verifiable experience performing injection of similar flexible filler on at least two projects is acceptable in lieu of ASBI certification in the flexible filler process.

Perform all flexible filler repair operations under the direct supervision of a crew foreman who has been trained and has verifiable experience in the use of vacuum flexible filler repair equipment and procedures. Submit the crew foreman's training and experience records to the Engineer prior to performing any flexible filler operation.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

May 11, 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: **4510200 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 related to acceptance 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.

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 ~~3-24-16~~5-11-16)

ARTICLE 451-2 is deleted and the following substituted:

451-2 Definitions.

1. Anchorage Devices: The anchor head wedges or nuts which grip the prestressing steel.
2. Bearing Plate: The steel plate which distributes the prestressed soil anchor force to the structure.
3. Bond Length: The length of the prestressed soil anchor which is bonded to the ground and transmits the tensile force to the soil or rock. For a compression prestressed soil anchor, the bond length will be different from the tendon bond length.
4. Factored Design Load: The maximum anticipated load that will be applied to the prestressed soil anchor during its service life after completing stressing and testing. The factored design load includes appropriate load factors to ensure that the overall structure has adequate strength for its intended use.
5. Fine-grained Soils: Soils with at least 50% of the material smaller than the No. 200 sieve size.
6. Tendon: The complete anchor assembly, excluding grout, consisting of anchorage and prestressing steel with sheathing and coating when required.
7. Coupling: The means by which the prestressing force may be transmitted from one partial-length of prestressing tendon to another.
8. Sheathing: Enclosure around the prestressing steel to avoid temporary or permanent bond between the prestressing steel and the surrounding grout or to provide corrosion protection.
9. Coating: Material used to protect against corrosion or lubricate the prestressing steel.
10. Anchor Grout: Portland cement grout that is injected into the anchor hole to provide anchorage at the bond length of the tendon.
11. Proof Load: Temporary loading of an anchor to its factored design load for testing purposes.
12. Transfer (Lock-Off) Load: Prestressing force in an anchor after proof loading immediately after the force has been transferred from the jack to the stressing anchorage.
13. Stressing Anchorage: That portion of assembly not within the earth fill.
14. Alignment Load: A small load maintained on an anchor during testing sufficient to keep the testing equipment positioned.
15. Performance Test: Incremental test loading and unloading of a prestressed anchor recording the movement of the tendon at each increment.
16. Proof Test: Incremental loading of a prestressed anchor recording the movement of the tendon at each increment.
17. Creep Test: A test to determine the movement of the tendon at constant load during a certain period of time.
18. Lift-Off Reading: A check made to determine that the actual transfer load is within 10% of the desired transfer load. This check is made immediately after transferring the load to the stressing anchorage.
19. Residual Movement: The non-elastic (non-recoverable) movement of an anchor measured during soil anchor testing.

20. Elastic Movement: The recoverable movement of an anchor measured during soil anchor testing.

21. Prestressed Soil Anchor: A system, referred to as a tieback or a ground anchor, used to transfer tensile loads to soil or rock. A prestressed soil anchor includes all prestressing steel, anchorage devices, bearing plates, grout, coatings, corrosion protection, sheathings and couplers if used.

22. Minimum Specified Ultimate Tensile Strength: The minimum breaking strength of the prestressing steel as defined by the specified standard.

23. Tendon Bond Length: The length of the tendon which is bonded to the anchor grout.

24. Total Anchor Length: The unbonded length plus the tendon bond length.

25. Unbonded Length ~~(Stressing Length)~~: The length of the tendon which is not bonded to the grout ~~and free to elongate during stressing~~. The grout surrounding the unbonded length is a void filler and provides corrosion protection.

26. Service Load: The load anticipated to be applied to the prestressed soil anchor during its service life after completing stressing and testing in order to limit deflection. The service load does not include load factors.

27. Test Stressing Length: The unbonded length plus the length extending through the jack up to the anchorage devices during ~~an~~any anchor acceptance test (i.e. Performance Test, Proof Test or Creep Test).

SUBARTICLE 451-7.6 is deleted and the following substituted:

451-7.6 Prestressed Soil Anchor Load Test Acceptance Criteria: The Engineer will accept a performance or proof-tested prestressed soil anchor with a 10 minute load hold if the:

1. ~~p~~Prestressed soil anchor carries the maximum test load with less than 0.04 inches of movement between 1 minute and 10 minutes; and

2. For performance tests, ~~total~~net movement at the maximum test load cycle (movement between alignment load after 0.90 DL and the final movement reading at 1.00 DL) exceeds 80% of the theoretical elastic elongation of the ~~unbonded~~test stressing length. For proof tests, net movement at the maximum test load (movement between alignment load and the final movement reading at 1.00 DL) exceeds 80% of the theoretical elastic elongation of the test stressing length.

The Engineer will accept a performance or proof-tested prestressed soil anchor with a 60 minute load hold if the:

1. ~~p~~Prestressed soil anchor carries the maximum test load with a ~~creep~~deformation rate that does not exceed 0.08 inches~~/~~ in the last log cycle of time; and

2. For performance tests, ~~total~~net movement at the maximum test load cycle (movement between alignment load after 0.90 DL and the final movement reading at 1.00 DL) exceeds 80% of the theoretical elastic elongation of the ~~unbonded~~test stressing length. For proof tests, net movement at the maximum test load (movement between alignment load and the final movement reading at 1.00 DL) exceeds 80% of the theoretical elastic elongation of the test stressing length.

The Engineer will accept a creep tested prestressed soil anchor if the:

1. ~~p~~Prestressed soil anchor carries the maximum test load with a creep rate that does not exceed 0.08 inches/log cycle of time; and

2. ~~total~~Net movement at the maximum test load cycle (movement between alignment load after 0.90 DL and the final movement reading at 1.00 DL) exceeds 80% of the theoretical elastic elongation of the ~~unbonded~~test stressing length.

If the total movement of the prestressed soil anchors at the maximum test load does not exceed 80% of the theoretical elastic elongation of the ~~unbonded~~test stressing length, replace the prestressed soil anchor at no cost to the Department.

Stop the creep test as soon as the creep rate exceeds 0.08 inches/log cycle of time. Incorporate prestressed soil anchors which have a creep rate greater than 0.08 inches/log cycle of time in the finished work at a load equal to one-half its failure load. The failure load is the load carried by the prestressed soil anchor after the load has been allowed to stabilize for 10 minutes without exceeding 0.04 inches of movement between 1 and 10 minutes.

When a prestressed soil anchor does not satisfy the load test acceptance criteria, the Contractor may modify the design and/or the construction procedures. These modifications may include, but are not limited to, installing replacement prestressed soil anchors, reducing the factored design load by increasing the number of prestressed soil anchors, modifying the installation methods, increasing the bond length or changing the prestressed soil anchor type. Obtain the Engineer's approval prior to making any modification which requires changes to the structure. Perform any modifications at no additional cost to the Department. The Department will not allow additional Contract Time for modifications. The Engineer will not allow retesting of the failed prestressed soil anchor.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

August 8, 2016

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 Charles Boyd of the State Structures Design Office to revise the flexible filler injection requirements.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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/ot
Attachment
cc: Florida Transportation Builders' Assoc.
State Construction Engineer

POST-TENSIONING.
(REV ~~5-27*6-36*~~*8-5*-16)

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 *and extradosed bridges* 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 462-2.3.1 is deleted and the following substituted:

462-2.3.1 Grout:

1. Select grout for use in PT system by application: repair, horizontal, or vertical.

2. Mix grout per manufacturer's instructions with potable water meeting requirements of Section 923.

3. Do not combine different grout products.

SUBARTICLE 462-2.3.2 is deleted and the following substituted:

462-2.3.2 Flexible Filler: Prepare *flexible* filler for installation in accordance with the manufacturer's instructions. *Do not combine different flexible filler products.*

SUBARTICLE 426-2.4 is deleted and the following substituted:

462-2.4 Other Material References:

Meet the requirements of this Section, as well as the following:

Class 5 Applied Coating* .....Section 975
Elastomeric Coating System* .....Section 975
Epoxy Compound* .....Section 926
Magnesium Ammonium Phosphate Concrete* .....Section 930
Methacrylate* .....Section 413
Water .....Section 923
*Use products listed on the Department's Approved Product List (APL).

SUBARTICLE 462-2.5.3 is deleted and the following substituted:

462-2.5.3 Flexible Filler:

1. The Engineer may sample flexible filler at random, not to exceed a total quantity of one gallon per LOT. A LOT is defined as a *quantity of material from a* single production batch or shipment not to exceed 1,000 gallons.

2. Sample may be virgin product in liquefied state or solid state. The Engineer will determine at what frequency, interval, sample phase (liquid or solid) and location those samples will be recovered from the project.

3. Sample, properly identified and tagged per 462-6, will be stored by the Engineer.

ARTICLE 462-3 is deleted and the following substituted:

462-3 Alternate PT System Designs.

Designs using a PT scheme different from that shown in the Contract Documents may be submitted for the Engineer's approval provided proposed scheme fulfills *the design requirements*, and the Contractor demonstrates~~,~~ compliance with these requirements:

1. PT system type and size meets all requirements of this Section.

2. Net compressive stress in the concrete after all prestress losses is equivalent to or greater than that provided by the PT scheme shown in original Contract Documents.

3. Distribution of individual tendons at each cross section generally conform to the distribution shown in original Contract Documents.

4. Proposed PT scheme meets the ultimate strength requirements of the American Association of State Highway and Transportation Officials Load and Resistance Factor Design, AASHTO LRFD Bridge Design Specifications Section 5, and is equivalent to or greater than service and strength limit states provided in original Contract Documents.

5. Stresses in concrete and PT steel at all sections and at all stages of construction meet requirements of the Design Criteria shown in original Contract Documents.

6. All Design Criteria provisions noted in original Contract Documents are satisfied.

7. Show complete design and detail of all elements for proposed locations of alternate PT scheme.

8. Submit the following for the Engineer's approval:

a. design calculations including short and long term prestress losses

b. complete shop drawings including PT scheme and system, reinforcing steel, and concrete cover

9. Any alternate PT system approved by the Engineer resulting in a change in quantity from that shown in the Contract Documents is paid based on comparison of the following:

a. quantity actually used and accepted or original plan quantity, whichever is less, and

b. unit bid price.

If approved alternate PT scheme or system is under a Cost Savings Initiative Proposal (CSIP), method of payment will be in compliance with CSIP agreement.

10. Submit alternate PT scheme signed and sealed by the Contractor's Engineer of Record.

SUBARTICLE 462-6.4 is deleted and the following substituted:

462-6.4 Filler:

1. Maintain filler in environmental exposure conditions (e.g., temperature, humidity) in strict conformance with manufacturer's recommendations at all times from manufacture to installation.

2. Storage in the open must be on a raised platform and with adequate waterproof covering to protect the filler.

3. On site storage *of grout filler* is limited to a maximum period of one month.

4. Do not use stored filler that has exceeded the manufacturer's recommended usage date. Remove all such filler from the jobsite.

SUBARTICLE 462-7.2.1 is deleted and the following substituted:

462-7.2.1 Ducts:

1. Construct tendon ducts using the minimum number of splices as practical.

2. Accurately position and align ducts at locations shown in the Contract Documents, or according to approved shop or working drawings, or as approved in writing by the Engineer.

3. Securely fasten all internal ducts at regular intervals not exceeding 30 inches for steel pipes, 24 inches for round plastic ducts, and 12 inches for flat ducts to prevent movement, displacement, or damage from concrete placement and consolidation operations.

4. Show method and spacing of duct supports on appropriate shop drawings.

5. Ensure external tendon ducts are straight between connections to internal ducts at anchorages, diaphragms, and deviation saddles and are supported at intermediate locations according to the Contract Documents including approved shop drawings.

6. Ensure all alignments, including curves and straight portions, are smooth and continuous with no lips, kinks, or dents. This also applies to curves in pre-bent steel pipe.

7. Check and repair all ducts in accordance with 462-7.5 as necessary before placing any concrete.

8. Ensure ducts at end connections to anchorages, splices, inlets, outlets, drains, and all other duct openings are sealed at all times after installing ducts and until tendon installation is complete. Briefly open low point drains just prior to tendon installation and again just prior to filler injection to allow for drainage of any water that may be present within the duct.

9. Provide an absolute seal of anchorage and duct termination locations per the pre-approved system drawings.

10. Use of tape is not permitted to make connections *or sealing* for any reason.

11. Use heat welding techniques, in accordance with duct manufacturer's instructions, to make splices between sections of smooth plastic duct or make connection with electrofusion duct coupler meeting the material requirements of Section 960 and approved system drawings.

12. When connecting steel pipe to plastic pipe with a boot, use a 3/8 inches wide power seated band and clamps in accordance with 960-2.2 on each end of a duct boot to seal against filler leakage. Install band per manufacturer's instructions.

13. Ducts for prestressing used exclusively for temporary erection where PT will be removed from structure are not required to be coupled across segment joints.

462-7.2.1.1 Installation Tolerances:

1. Ensure final position of PT ducts is within the tolerances in the following table:

Table 7.2.1.1-1 Duct Installation Tolerances

Type	Vertical Position (inches)	Horizontal Position (inches)
Horizontal tendons in slabs or in slab regions of larger members	±1/4	±1/2
Longitudinal draped superstructure tendons in webs: Tendon over supports or in middle third of span	±1/4	±1/4
Tendon in middle half of web depth	±1/2	±1/4

Table 7.2.1.1-1 Duct Installation Tolerances		
Longitudinal, generally horizontal, superstructure tendons usually in top or bottom of member	±1/4	±1/4
Horizontal tendons in substructures and foundations	±1/2	±1/2
Vertical tendons in web	Longitudinal Position ±1	Transverse Position ±1/4
Vertical tendons in pier shafts	±1/2	±1/4
All other cases	±1/4	±1/4

2. Ensure entrance and exit angles of tendon paths at anchorages, duct joints, and/or at faces of concrete are within plus or minus 3 degrees of desired angle measured in any direction.

3. Accomplish any deviations in alignment with smooth unkinked transitions.

4. Locate anchorages within plus or minus 1/4 inches of desired position laterally and plus or minus 1 inch along tendon except that minimum cover requirements must be maintained.

5. Position anchorage confinement reinforcement in the form of spirals, multiple U-shaped bars, or links centered around duct and starting within 1/2 inches of the back of the main anchorage plate.

6. If conflicts exist between reinforcement and a PT duct, position of duct prevails. Adjust local reinforcement with the Engineer's written approval.

SUBARTICLE 462-7.2.3 is deleted and the following substituted:

462-7.2.3 Inlets, Outlets, and Drains:

1. Place filler inlets/outlets and drains at locations shown in the Contract Documents including approved shop drawings.

2. Equip all filler inlets/outlets and drains with approved positive shut-off devices (e.g., valves).

3. At a minimum, place filler inlets/outlets in the following positions and those shown in Design Standards, Index No. 21801:

a. Top of tendon anchorage;

b. Top of anchorage cap;

c. At high points of duct profile when vertical distance between highest and lowest point is more than 2~~' 0"~~ ~~inches~~*feet*;

d. At major change in duct cross section; and,

e. At other locations required by the Engineer.

4. For all tendons other than grouted top slab transverse tendons in box girders, place drains at the geometric low points of all duct profiles, or as close as is practical to the geometric low points of all duct profiles, except where an inlet, outlet or anchorage that can serve as a drain is located at a low point. Locate drains, and inlets and outlets serving as drains, at the bottom of the duct cross section.

5. Extend filler and drain tubes a sufficient distance out of concrete member to allow for proper closing of valves.

6. Direct inlets, outlets and drains exiting on vertical or predominantly vertical surfaces of box and I-girders toward the inside face of exterior I-girders or toward the interior of box girders.

SUBARTICLE 462-7.3.2.2 is deleted and the following substituted:

462-7.3.2.2 Initial and Permanent Stresses:

1. PT steel must be anchored at initial stresses resulting in long term retention of permanent stresses or forces of no less than those shown in the Contract Documents.

2. Unless otherwise approved by the Engineer in writing, initial stress after anchor set must not exceed 70% of GUTS *at anchorages and 74% of GUTS at all other locations between anchorages*.

3. Permanent stress and permanent force are stress and force remaining in PT steel after all losses, including long term creep and shrinkage of concrete, elastic shortening of concrete, relaxation of steel, losses in PT steel from sequence of stressing, friction, and unintended wobble of ducts, anchor set, friction in anchorages, and all other losses particular to the specific PT system.

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 *at the pump and at the inlet*;
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 462-7.3.3~~.2~~ is deleted and the following substituted:

462-7.3.3 System Protection:

462-7.3.3.1 Tendon:

1. ~~Install anchorage caps and s~~*S*eal all other duct openings *other than installing anchorage caps* within four hours after *tendon* stressing.

2. *Install anchorage caps after tendon has been accepted.* ~~Seal all openings and temporarily weatherproof open ends of anchorage i~~*I*f acceptance of tendon ~~is~~ *will be* delayed *more than four hours after stressing, immediately provide temporary weatherproofing of tendons at open ends of anchorages. If tendons and anchorages are temporarily weatherproofed, install anchorage caps within 1 day of tendon being accepted*.

3. If tendon contamination occurs and if directed by the Engineer, remove tendon, flush duct with potable water per 462-7.2.4, and replace with new tendon.

462-7.3.3.2 Anchorage:

1. *Provide the following at anchorages as shown on Design Standards, Index No. 21802:*~~Protect PT strand, wire, and bar anchorages as indicated in the Contract Documents within seven days of completing filler injection operations (see 462-7.4 for filler injection operations).~~

a. Temporary drain holes at the bottom of open top blockouts.

b. Temporary weatherproof plugs for upwardly oriented access or vent holes.

2. Cap all filler inlets/outlets with plugs meeting the requirements of Section 960.

3. *Construct anchorage pour-backs and place elastomeric coatings at anchorages as indicated in the Contract Documents and as shown on Design Standards, Index No. 21802 within seven days of completing filler injection operations (see 462-7.4 for filler injection operations).* Construct anchorage pour-backs *using*~~with~~ *reinforced concrete, magnesium ammonium phosphate concrete, or* a Type Q epoxy grout ~~per~~ *meeting the requirements of* Section 926 ~~within 28 days of permanently affixing all anchorage caps within each individual pour-back~~.

a. Remove all laitance, grease, curing compounds, surface treatments, coatings, and oils by grit blasting or water blasting. Flush surface with water and blow dry. Surfaces must be clean, sound, and without any standing water. Test substrate at all pour-back locations using ACI 503 and develop a minimum of 175 psi tension (e.g., pull-off value). Testing frequency may be reduced, as determined by the Engineer, after the Contractor has demonstrated an ability to prepare substrate surfaces for bonding as indicated by the result of the ACI 503 test.

b. Mix and apply epoxy grout *and magnesium ammonium phosphate concrete* in accordance with the manufacturer's current standard technical guidelines. Construct all pour-backs in leak proof forms creating neat lines. Epoxy grout may require pumping for proper installation. Construct forms to maintain a liquid head to ensure intimate

contact with concrete surface. Use vents as needed to provide for escape of air to ensure complete filling of forms.

4. Coat exposed surfaces of ~~all~~ pour-backs and anchorage caps *as shown on Design Standards, Index No. 21802* with an elastomeric coating system meeting requirements of Section 975 and having a thickness of 30 mils to 45 mils. ~~Assure~~ *Ensure* concrete, anchorage caps, or other substrates are structurally sound, clean, and dry. Concrete must be a minimum of 28 days old. Remove all laitance, grease, curing compounds, surface treatments, coatings, and oils by grit blasting or water blasting using a minimum ~~10~~*3*,000 psi nozzle pressure. Blow surface with compressed air to remove dust or water. Apply the elastomeric coating within 90 days of filler injection. Apply a manufacturer's approved primer over the elastomeric coating before applying Class 5 coating, if required.

5. Prior to application of elastomeric coating, construct a 2 foot x 4 foot concrete test block with a similar surface texture to surfaces to be coated. Coat a vertical face with chosen elastomeric coating system. Determine number of coats required to achieve the specified thickness without runs and drips. Mix and apply elastomeric coating as per manufacturer's current standard technical specifications. Spray application is preferred; roller application is permitted. Have coating manufacturer representative on site to supervise and comment on application of elastomeric coating onto test block. Apply coating using approved and experienced personnel with a minimum of three years experience applying similar polyurethane systems. Submit credentials of these persons to the Engineer for review and consideration for approval.

SUBARTICLE 462-7.4.1.1 is deleted and the following substituted:

462-7.4.1.1 Plan:

1. Submit a Grouting Operations Plan to the Engineer for approval at least six weeks in advance of any scheduled grouting operation.

2. Written approval of Grouting Operations Plan by the Engineer is required before any grouting of permanent structure takes place.

3. At minimum, Grouting Operations Plan will address and provide:

a. Names and proof of training for grouting crew and crew supervisor in conformance with this Specification;

b. Type, quantity, and brand of materials to be used in grouting, including all required certifications;

c. Type of equipment to be used, including capacity in relation to demand and working conditions, as well as, standby equipment and spare parts;

d. General grouting procedure;

e. Duct pressure test and repair procedures;

f. Method to be used to control rate of flow within ducts;

g. Theoretical grout volume calculations;

h. Mixing and pumping procedures in accordance with the manufacturer's recommendations;

i. Direction of grouting accounting for grade and/or slope of tendon;

j. Sequence of inlet and outlet pipes use;

k. Procedures for handling blockages;

l. Procedures for possible post grouting repair.

4. Conduct a joint meeting of the Contractor, grouting crew, and the Engineer before grouting operations begin. Discuss Grouting Operations Plan, required testing, corrective procedures, and any other relevant issues at the meeting.

5. Demonstrate, to the Engineer's satisfaction, grouting of ~~a longitudinal~~ tendon*s* by constructing ~~a~~ full-scale mockup*s* with all associated PT system components ~~of a typical longitudinal~~*using the mockup* tendon profile*s shown in the Plans* ~~on the project~~. Utilize 'clear' duct for the mockup*s* to facilitate visual inspection and verification that no voids or bleed are present in the tendon mockup*s* after grouting. Place a non-stressed PT ~~strand~~ *tendon* equivalent to the ~~typical longitudinal~~ tendon size inside the duct to simulate in-place PT ~~strand~~*tendon*.

SUBARTICLE 462-7.4.1.4.2 is deleted and the following substituted:

462-7.4.1.4.2 Pumps:

1. Provide pumping equipment capable of:
   a. continuous operation which includes a system for circulating and agitating grout when actual grouting is not in progress,
   b. maintaining pressure on grouted ducts,
   c. fitted with a valve that can be closed off without loss of pressure in duct.
2. Grout pumps will:
   a. be positive displacement type,
   b. provide a continuous grout flow
   c. be able to maintain a discharge pressure of at least 145 psi.
3. Use pumps constructed with seals to prevent oil, air, or other foreign substances from contaminating grout and prevent loss of grout or water.
4. Specify pump capacity adequate to maintain the specified grouting rate.
5. Place pressure gauge*s* with full scale reading of no more than 300 psi at *the pump and at the* duct inlet. ~~If long hoses (in excess of 100 feet) are used, provide two gauges: one at pump and one at inlet.~~
6. Grout hoses to be compatible with pump output (diameter and pressure rating).

SUBARTICLE 462-7.4.1.5.4 is deleted and the following substituted:

462-7.4.1.5.4 Operations:

1. Open all grout outlets before starting grouting operation.
2. Inject grout into duct in accordance with approved Grouting Operations Plan.
3. Pump grout at the lowest possible pressure practical.
4. Conduct normal grouting operations at a pressure range of 10 psi to 50 psi measured at grout inlet.

5. Do not exceed ~~maximum~~ *a* pumping pressure of 145 psi *anywhere within the system. Do not exceed a pumping pressure of 75 psi* at *the* grout inlet for ~~round ducts and 75 psi for~~ flat ducts.

6. Use grout pumping methods that ensure complete filling of ducts and complete encasement of steel.

7. Grout must flow from first and subsequent outlets until any residual water or entrapped air has been removed prior to closing outlet.

8. Pump grout through duct and continuously discharge it at anchorage and anchorage cap outlets until all free water and air are discharged and consistency of grout is equivalent to that of grout being pumped into inlet. Close anchorage outlet and discharge a minimum of two gallons of grout from anchorage cap into a clean receptacle. Close anchorage cap outlet.

9. Elevate grout pressure to the equivalent realized pumping pressure while grouting the duct, seal inlet valve, and wait two minutes to determine if any leaks exist after all outlets have been bled and sealed. If leaks are present repair all identified leaks using methods pre-approved by the Engineer and repeat steps until no leaks are present. Bleed pressure to 5 psi and wait a minimum of ten minutes for any entrapped air to flow to high points if no leaks are present. Increase pumping pressure not to exceed actual realized pumping pressure of duct and discharge grout at each high point outlet to eliminate any entrapped air or water after specified ten minute period has expired. Complete process by locking a pressure of 30 psi into tendon duct.

10. If actual grouting pressure exceeds maximum allowed, close inlet and pump grout at next outlet which has just been closed or is ready to be closed as long as a one-way flow is maintained. Do not pump grout into a succeeding outlet from which grout has not yet flowed. Fit outlet/inlet to be used for pumping with a positive shut-off valve as shown in the approved system drawings and pressure gauge if this procedure is used.

11. Stop grouting operation if complete grouting of tendon cannot be achieved by the steps stated and in compliance with the approved Grouting Operations Plan. After waiting 48 hours, vacuum grout duct in accordance with this Section.

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. pressure gauge readings at the pump and at the inlet;

~~f~~*g*. ratio of actual to theoretical grout quantity;
~~g~~*h*. number of grout bags mixed;
~~h~~*i*. total quantity of water used to mix grout;
~~i~~*j*. summary of any problems encountered; and,
~~j~~*k*. corrective action taken,
~~k~~*l*. description and results of the post grouting operations and inspection.

SUBARTICLE 462-7.4.2 is deleted and the following substituted:

462-7.4.2 Flexible Filler Operations:

1. Inject flexible filler with or without using vacuum assistance for tendons with vertical or predominately vertical profiles as shown on Design Standards, Index No. 21801.

2. Inject flexible filler using vacuum assistance for all other tendon profiles shown on Design Standards, Index No. 21801.

462-7.4.2.1 Microcrystalline Wax: Conduct all wax injection operations, repairs, and inspections in the presence of the ~~Wax~~ *Filler* Injection Foreman, ~~Wax~~ *Filler* Injection QC Inspector and the Engineer.

462-7.4.2.1.1 Wax Injection Operations Plan:

1. Prepare a Wax Injection Operations Plan in cooperation with the PT system vendor and the PT wax manufacturer.

2. Submit the Wax Injection Operations Plan to the Engineer for approval at least six weeks in advance of any scheduled injection operation.

3. Written approval of the Wax Injection Operations Plan by the Engineer is required before any injection of permanent structure can begin.

4. At a minimum, the Wax Injection Operations Plan will address and provide the following:

a. .Names and qualifications for wax injection crew and crew supervisor in conformance with this Specification;

b. Type, quantity, and brand of materials to be used in wax injection including all required certifications;

c. Type of equipment to be used, including capacity in relation to demand and working conditions, as well as, standby equipment and spare parts;

d. Location and sequence of ducts to be injected;

e. Calculation of temporary elongation of tendons due to wax injection temperature;

~~d~~*f*. General wax injection procedure for all duct geometries and types;

~~e~~*g*. Duct pressure test and repair procedures;

~~f~~*h*. Method to be used to control rate of flow within ducts and anchorage assembly;

~~g~~*i*. Theoretical wax volume calculations;

~~h~~*j*. Injection rate;

~~i~~*k*. Maximum injection pressure during injection and locking pressure;

~~j~~*l*. Vacuum (gauge) pressure requirements, vacuum tests and repair procedures;

~~k~~*m*. Heating, mixing and pumping procedures in accordance with the manufacturer's recommendations;

~~l.~~*n* Direction of wax injection accounting for grade and/or slope of tendon;

~~m~~*o*. Location of all high points and all low points accounting for grade and/or slope of tendon;

~~n~~*p*. Sequence of valve operations at PT system inlets and outlets, including minimum wax discharge quantities;

~~o~~*q*. Procedures for handling blockages;

~~p~~*r*. Procedure for sealing duct after wax injection;

~~q~~*s*. Procedure for inspecting the PT system after wax injection, filling voids created by inspection procedures, and sealing duct after PT system inspection;

~~r~~*t*. Procedures for possible post injection repair;

~~s~~*u*. Method(s) and material(s) that will be used to protect concrete surfaces from wax spills, leaks, etc. during wax injection, post injection inspection and post injection repair;

~~t~~*v*. Safety and clean-up procedures;

5. Conduct a joint meeting of the Contractor, wax injection crew, and the Engineer before wax injection operations begin. Discuss Wax Injection Operations Plan, required testing, corrective procedures, and any other relevant issues at the meeting.

6. Demonstrate, to the Engineer's satisfaction, wax injection of a duct by constructing ~~a~~ full-scale mockup*s* with all associated PT system components ~~of a typical duct profile on the project~~*using the mockup tendon profiles shown in the Plans*. Utilize the same type of duct and wax injection equipment as used on project. Place a non-stressed PT ~~strand~~ *tendon* equivalent to the typical ~~longitudinal~~ tendon size inside the duct to simulate *an* in-place PT ~~strand~~*tendon*. Assist the Engineer in the inspection and disassembly of the PT system after wax has congealed.

462-7.4.2.1.2 Inlets and Outlets:

1. Ensure connections from wax pump hose to inlets are free of dirt and are air-tight.

2. Inspect valves to ensure they can open and close properly.

3. Provide clear hose and connections to outlet valves compatible with heated wax injection for discharging excess wax. Kinks and clogs in the vent hoses are not permitted during pumping operations.

462-7.4.2.1.3 Supplies:

1. Provide an adequate supply of compressed air for clearing and testing ducts before wax injection operations start.

2. Provide clean receptacles for collecting excess wax at outlet locations.

3. Provide supplies for stopping wax leaks *including rags and buckets of cold water*.

462-7.4.2.1.4 Equipment:

1. Provide equipment consisting of measuring devices for wax, wax melting unit(s), wax mixer for maintaining uniform temperature, a storage holding

reservoir, pump, and volumetric flow rate and displacement volumetric meters with all necessary connecting hoses, valves, pressure gauges, timer, and temperature gauge.

2. Provide pumping equipment with sufficient capacity to ensure PT ducts can be filled and vented in not more than time specified by the wax manufacturer and this Specification.

3. Provide an air compressor and hoses with sufficient output to perform required functions.

4. For filling of air voids in an incomplete wax injection, have vacuum wax injection equipment (i.e., volumetric measuring type) and experienced operators available not less than 48 hours prior to the maximum number of calendar days allowed in 462-7.2.4, between first installation of prestressing steel within the duct and completion of the stressing and wax injection operation for PT. If the maximum number of days in 462-7.2.4 have been exceeded, have available vacuum wax injection equipment and experienced operators available within 48 hours notice.

5. For vacuum assisted injection, provide vacuum pump equipment able to measure and have sufficient capacity to ensure a minimum of 90% vacuum in the PT system prior to filler injection. Provide continuously running vacuum pump or vacuum reservoir capable of maintaining vacuum during the wax injection process.

6. Ensure that all injection and inspection equipment is maintained in accordance with equipment manufacturer's instructions and is calibrated and in good working condition.

7. Provide equipment for dislodging congealed wax blockages.

8. Provide standby pumping and vacuum equipment on the project site during injection operations.

462-7.4.2.1.4.1 Storage Reservoir and Mixing:

1. Provide heated holding tanks for wax injection.

a. Holding tanks must be equipped with a heating system capable of producing a melted wax free of lumps within the temperature limits specified by the manufacturer.

b. Holding tanks must be kept at least 10% full at all times during pumping operations to prevent clogs and air from being drawn into duct

c. Holding tanks must have at time of injection a quantity of heated wax required to inject the PT system. The quantity of heated wax required to inject the PT system is calculated as 25% more than the total quantity to fill the duct and anchorages, to discharge wax at outlets, to fill pumping equipment and hoses, and to maintain the minimum amount of wax in the holding tanks during pumping operations.

2. Provide equipment to ensure uniform temperature of heated wax, either by mixing or other methods.

462-7.4.2.1.4.2 Pumps:

1. Provide pumping equipment capable of the following:

a. continuous operation which includes a system for heating pump components when wax injection is not in progress;

b. maintaining pressure on wax injected ducts;

c. fitted with a valve that can be closed off without loss of pressure in duct.

2. Wax pumps will:

a. be positive displacement type;

b. provide a continuous wax flow;

c. be able to maintain a discharge pressure of at least 75 psi;

d. provide an injection of filler into duct in a velocity range of 40-70 ft/min.

3. Use pumps constructed with seals to prevent oil, air, or other foreign substances from contaminating wax and prevent loss of wax.

4. Pumps with hoppers are not permitted.

5. Specify pump capacity adequate to maintain the wax injection rate.

6. Place pressure gauge with full scale reading of no more than ~~150~~ *300* psi at *pump and* duct inlet*s*. ~~If long hoses (in excess of 100 feet) are used, or if the duct injection port is more than 50 feet above the pump, provide two gauges: one at pump and one at inlet.~~

7. Wax injection hoses to be compatible with pump output (diameter, pressure rating and temperature).

462-7.4.2.1.4.3 Vacuum Wax Injection:

1. For filling voids in incomplete wax filling operations, provide vacuum wax injection equipment meeting these minimum requirements:

a. Volumeter for measurement of void volume;

b. Vacuum pump with a minimum capacity of ten cubic feet of air per minute and equipped with a flow-meter, graduated reservoir, or other acceptable means approved by the Engineer capable of measuring the amount of wax being injected.

c. Mixers and heaters, or other mixing and heating methods recommended and approved by the wax manufacturer, in writing, for the specific project covered by this Section.

2. For vacuum assisted injection, provide vacuum wax injection equipment meeting these minimum requirements:

a. Vacuum pump with a minimum capacity of ten cubic feet of air per minute *(free air)* with the capability of removing 90% of standard atmospheric pressure within the PT system and equipped with a vacuum pressure gauge;

b. Hoses, vacuum reservoirs, and connections required for attachment to the PT system.

462-7.4.2.1.4.4 Heaters: Use a heater and temperature monitoring system capable of liquefying the entire mass of PT wax to be used for a given injection operation within the temperature limits specified by the PT wax manufacturer. The heater systems must apply a uniform heat to the PT wax and avoid locally high temperatures that may damage the PT wax or container. Use a heater and temperature monitoring system which complies with the recommendations of the PT wax manufacturer.

462-7.4.2.1.5 Wax Injection:

1. Maintain wax temperature in strict compliance with the wax manufacturer's published product data sheet *and within the limits of this Section*.

2. Perform wax injection in accordance with procedures set forth in approved Wax Injection Operations Plan.

3. Inject *hot wax into specified* duct *inlet*.

462-7.4.2.1.5.1 Temperature:

1. Condition wax to maintain its temperature during injection between 212°F and 240°F ~~unless proven acceptable otherwise~~.

2. Wax injection operations are not permitted when ambient temperature is below minimum temperatures specified by the wax manufacturer.

462-7.4.2.1.5.2 Production Test:

1. Check wax temperature to verify it is within established limits during operations.

2. Do not start operations until such time that testing shows wax meets specified requirements.

462-7.4.2.1.5.3 Operations:

1. Open all inlets, outlets and drains before beginning wax injection operation to remove standing water from duct.

2. Protect concrete surfaces from wax spills, leaks, etc.

3. Inject wax in accordance with approved Wax Injection Operations Plan.

4. Use pumping methods that ensure complete filling of ducts and anchorage assembly with wax.

5. Ensure the entire mass of wax is fully liquefied prior to and throughout injection operations. Establish a non-turbulent, laminar system circulation by continuously recirculating the wax between the pump and the storage container prior to injecting the wax into the duct. Pump components must be at wax injection temperature prior to wax injection into duct. Do not allow wax to free fall during recirculation or injection operations. Maintain a positive head of liquid wax above all withdrawal and recirculation ports and do not allow air intrusion into the pumping system. Do not pour liquid wax into an open pump or hopper.

6. Inject PT wax at a continuous and steady rate in accordance with the approved Wax Injection Operations Plan at a flow rate through duct at a velocity between 40 and 70 feet per minute and pressure~~s~~ limited to 75~~-~~ psi *at the duct inlet and 145~~-~~ psi at the pump*. ~~If pressure gauges are utilized at the pump and at the injection port, ensure that pressures at both locations are within the limits put forth in this Section.~~

7. For *tendons in which* vacuum assisted injection *is used*, provide a minimum of 90% vacuum in the duct prior to injection. *After the vacuum is established, lock off the air supply to the duct and monitor the vacuum for 1~~-~~ minute. If the loss of vacuum after 1~~-~~ minute exceeds 10%, repair leaks as directed by the Engineer and retest the duct. If the results are acceptable, reestablish and maintain a minimum 90% vacuum using the outlet at the higher end anchorage shown on Design Standards, Index No.~~ 21801 while ~~I~~inject*ing*~~ion of filler~~ *wax using ~~at~~ the inlet at the lower end anchorage shown on the same ~~s~~Standard~~locations and provide required vacuum at the outlet locations shown on Design Standards, Index No. 21801~~.~~may occur at an anchorage port. Vacuum through anchorage cap*

~~outlet at opposite end of duct from the injection anchorage port. If injection location does not occur at anchorage port, provide required vacuum through both anchorage caps.~~ *Close* ~~A~~*a*ll outlets, inlets, and vents other than *at injection and* vacuum locations ~~and injection location must be closed~~ during injection procedure. Pump *wax*~~filler~~ into inlet and continuously vacuum air *at the outlet* until duct is fully injected with ~~filler~~*wax*. Close outlet valve at anchorage ~~cap~~ when filled with ~~filler~~*wax*. Close inlet valve with locking pressure between 30 psi and 45 psi. *Do not reuse discharged wax.*

8. For *tendons in which vacuum assisted injection is not used, inject wax under pressure at locations shown on Design Standards, Index No. 21801.* ~~vented filler injection, a~~*A*llow wax to flow from duct and anchorage discharge points until a steady flow of wax free from air is continuously discharged. Collect a minimum of two gallons of continuously flowing wax free from air at discharge point before closing outlet valve. Do not reuse discharged wax. After all outlets are closed, close the inlet valve at locking pressure between 30 and 45 psi. ~~For tendon profiles with high point vents as labeled in Design Standards, Index No. 21801, continue with the following procedure:~~

~~a. Wait 30 to 60 seconds after outlet valves and inlet valve are closed.~~

~~b. Open high point outlet valves and inlet valve, and inject wax through duct.~~

~~c. Close each high point valve after wax flows through outlet continuously free from air. After all high point valves are closed, increase pressure to locking pressure between 30 and 45 psi and close inlet valve.~~

9. Record the total volume of wax injected into the system.

10. Upon completion of wax injection, seal the duct in accordance with the approved PT system drawings. Remove all excess wax from exposed surfaces.

462-7.4.2.1.5.4 Wax Injection Operations Report:

1. Submit the 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. ~~p~~Pressure gauge readings at the pump and at the inlet;
~~f~~*g*. Final locking pressure of wax in PT system;

~~g~~*h*. Reservoir temperature at time of initiation of wax injection;

~~h~~*i*. Theoretical volume of wax required to completely fill the duct;

~~i~~*j*. Volume of wax injected into duct;

~~j~~*k*. Volume of wax collected at discharge points;

~~k~~*l*. Injection rate including timing of duct inlet opening and closing;

~~l~~*m*. Ambient temperature;

~~m~~*n*. Summary of any problems encountered and any deviations from the Wax Injection Operations Plan;

~~n~~*o*. Corrective action taken;

~~o~~*p*. Description and results of the post wax injection operations and inspection;

~~p~~*q*. Vacuum gauge pressure and percent vacuum in duct prior to injection;

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.

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 462-7.5.3 is deleted and following substituted:

462-7.5.3 Duct:

1. *Repair the following ducts using h*~~H~~eat-shrink wrap material designed for duct repair*:* ~~may be used with approval of the Engineer in writing.~~

a. Smooth plastic ducts that will be encased in concrete;

b. Corrugated plastic ducts;

c. External smooth plastic ducts after the flexible filler injection procedure has been completed.

Install heat-shrink wrap in accordance with manufacturer's instructions.

2. *Repair external smooth plastic ducts before the flexible filler injection procedure has been completed using elastomer sleeves and stainless steel band clamps.*~~Use approved heat-shrink sleeve material to repair ducts. Install in accordance with manufacturer's instructions~~.

SUBARTICLE 462-8.2.1 is deleted and the following substituted:

462-8.2.1 Prior to Concrete Placement:

462-8.2.1.1 All Tendons Except as Noted:

1. *Test* ~~Types of systems to be tested include~~ all PT system components utilized on the project ~~for, but not limited to, transversely post-tensioned slabs, longitudinally post-tensioned girders, transverse post-tensioning in box girder segments, pier and bent caps, and columns~~, *except those used for internal*~~.~~ ~~Longitudinal~~ *longitudinal* tendons in box-girder segments ~~(internal tendons) are exempt from this testing~~.

2. In the formwork, pressure test each different type and size of duct assemblies with all assemblies used in a single structural component (e.g. segment, beam, etc.) constructed for first time on project.

3. One system per group, but not less than a total of two per project, will be randomly chosen by the Engineer for testing.

4. When required by the Engineer, test assemblies in their final position just prior to concrete placement by sealing them at their anchorages or construction joint termini and then applying compressed air in accordance with this Section to determine if assembly connections are pressure tight.

~~a.~~ In presence of the Engineer, pressurize duct to ~~1~~*7*.5 psi and lock-off outside air source.

~~b.~~ Record pressure loss for one minute.

~~c.~~ If pressure loss exceeds 0.~~15~~ *75* psi, or 10%, find and repair leaks in duct assembly using repair methods approved by the Engineer and retest.

462-8.2.1.2 Tendons For Which Vacuum Assisted Filler Injection Will Be Used:

1. Test all PT system components utilized on the project except those used for internal longitudinal tendons in box-girder segments.

2. In the formwork, perform a vacuum test for each different type and size of duct assemblies with all assemblies used in a single structural component (e.g. segment, beam, etc.) constructed for first time on the project.

3. One system per group, but not less than a total of two per project, will be randomly chosen by the Engineer for testing.

4. When required by the Engineer, test assemblies in their final position just prior to concrete placement by sealing them at their anchorages or construction joint termini and then applying a vacuum in accordance with this Section to determine if assembly connections are pressure tight.

~~*a.*~~ *In presence of the Engineer, apply a 90% vacuum and lock-off outside air source.*

~~*b.*~~ *Record vacuum loss for five minutes.*

~~*c.*~~ *If vacuum loss exceeds 10%, find and repair leaks in duct assembly using repair methods approved by the Engineer and retest.*

SUBARTICLE 462-8.3.2.2.1 is deleted and the following substituted:

462-8.3.2.2.1 Microcrystalline Wax:

1. Inspect PT system.

2. Do not open or remove inlets and outlets until wax has cooled for a minimum of 24 hours and complete tendon inspections within 96 hours.

3. Perform inspections within one hour after removal of all inlets/outlets located at anchorages and high points along the tendon.

4. Visually inspect existing ports at all high points along tendon as well as inlets or outlets located at anchorages. Repair wax leaks according to the Wax Injection Operations Plan.

5. Between 24 and 48 hours following wax injection, perform the following inspection operations for each tendon:

a. Sound external ducts with a rubber mallet to ensure the system is free from voids,

b. Remove all inspection port caps and visually inspect to ensure the system is free from voids,

c. If *a* void~~s greater than 12 cubic inches are~~ *is* detected *and the void is deeper than 1/2 inch or if the strands are exposed and uncoated*, address *the* void~~s~~ using this section and methods described in the approved Wax Injection Operations Plan;

d. Fill voids created by inspection procedures and replace all inspection port caps and seal in accordance with the approved Wax Injection Operations Plan.

6. Fill voids ~~greater than 12 cubic inches~~ using volumetric measuring vacuum wax injection process not less than 48 hours prior to the maximum number of calendar days in 462-7.2.4 allowed between first installation of prestressing steel within duct and completion of the stressing and wax injection operation for PT. If the maximum number of days in 462-7.2.4 have been exceeded, have vacuum wax injection equipment and experienced operators available within 48 hours notice.

7. Seal and repair all anchorage and inlet/outlet voids that are produced for inspection purposes as described in the approved Wax Injection Operations Plan within four hours of completion of inspections if no additional voids are detected in tendon ducts or anchorages.

8. Inspect duct and explore voided areas with a borescope if wax injection operation was prematurely terminated prior to completely filling duct. Determine location and extent of all voided areas. Fill voids using volumetric measuring vacuum wax injection equipment in accordance with this Section.

ARTICLE 462-9 is deleted and the following substituted:

462-9 Method of Measurement.

1. Quantity of PT tendons to be paid for under this Section will be computed weight, in pounds, of permanent PT steel tendons installed in the completed structure and accepted.

2. Quantity is determined by theoretical plan length measured from anchorage to anchorage (measured from front face of bearing plate) with no allowance made for waste or extension past bearing faces.

3. No measurement will be made for temporary PT which is considered incidental to Pay Item 462-2, Post Tensioning Tendons.

4. Use these unit weights for quantity determination:

Table 9-1 PT Strand and Bar Weight per Unit Length	
Prestressing System	Weight per Unit Length, Lb/Ft
1/2 inch diameter 7-wire strand	0.52
0.6 inch diameter 7-wire strand	0.74
5/8 inch high strength deformed bar	*0.98*
3/4 inch high strength deformed bar	*1.49*
1 inch high strength deformed bar	3.01
1-1/4 inch high strength deformed bar	4.39
1-3/8 inch high strength deformed bar	5.56
1-3/4 inch high strength deformed bar	9.~~23~~*10*
2-1/2 inch high strength deformed bar	*18.20*
3 inch high strength deformed bar	*24.09*
Note: Weight per unit length of high strength deformed bars is based on values given in ASTM A722.	

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

June 3, 2016

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

Re: State Specifications Office
Section **515**
Proposed Specification: **5150100 Pedestrian/Bicycle Railings, Guiderails, and Handrails.**

Dear Mr. Nguyen:

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

This is an administrative change to modify the language for current Department practice.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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

METAL PEDESTRIAN/BICYCLE RAILINGS, GUIDERAILS, AND HANDRAILS. (REV 6-1-16)

ARTICLE 515-1 is deleted and the following substituted:

515-1 Description.

Furnish and install metal pedestrian/bicycle railings, including bullet rails, guiderails and handrails in accordance with the Plans and Design Standards.

Obtain rail components from producers currently on the Department's ~~list of~~ Producer~~s~~tion ~~with Accepted Quality Control Programs~~ Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

May 3, 2016

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

Re: State Specifications Office
Section **515**
Proposed Specification: **5150500 Metal Pedestrian/Bicycle Railings, Guiderails, and Handrails.**

Dear Mr. Nguyen:

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

The changes are proposed by Cheryl Hudson of the State Structures Design Office to modify the language for current Department practice.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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

METAL PEDESTRIAN/BICYCLE RAILINGS, GUIDERAILS, AND HANDRAILS. (REV 3-245-3-16)

ARTICLE 515-5 is deleted and the following substituted:

515-5 Installation.

515-5.1 General: Place a 1/8 inch thick bearing pad with dimensions matching the base plate between the base plate and concrete surface.

515-5.2 Bullet Railings: Install rail posts ~~normal~~perpendicular to the profile grade longitudinally and ~~vertical~~plumb transversely.

515-5.3 Pedestrian /Bicycle Railings and Guiderails: For locations other than bridges, fabricate and install posts plumb. On bridges, ~~F~~fabricate and install posts ~~on bridges normal~~perpendicular to the profile grade line longitudinally and ~~vertical~~plumb transversely ~~unless shown otherwise in the Plans. For other locations, fabricate and I~~install posts plumb. Use aluminum shim plates to make necessary adjustments. Bond stacked shim plates with adhesive bonding material and field trim shim plates to match the foundation contours. Beveled shim plates may be used in lieu of trimmed flat shim plates.

If shims greater than 1/2 inch total thickness are required, provide longer anchor bolts. Bolts must be long enough to secure washers and nuts and meet the minimum embedment length.

Post tolerance from plumb is plus or minus one inch, measured at 42 inches above the foundation. Rails must form a smooth continuous line without hills or dips greater than 1/2 inch between any three posts or side sway greater than 1/2 inch between post assemblies.

515-5.4 Anchoring:

515-5.4.1 General: Secure nuts to a snug tight condition. ~~Use self-locking hex nuts or tack weld the top of each hex nut to the bolt to prevent loosening. For nuts that are not t~~Tack welded~~,~~ nuts to stem or distort bolt ~~stems or~~ threads to prevent nut loosening and removal. Coat damaged galvanizing on bolt stems, nuts, and tack welds in accordance with Section 562.

515-5.4.2 Adhesive Anchors: Install anchors in accordance with Section 416.

515-5.4.3 C-I-P and Thru-Bolt Anchors: Use galvanized hex head anchor bolts. When thru-bolting is used, coat cut reinforcing steel inside the drilled hole with a zinc galvanizing compound in accordance with Section 562 prior to installing bolts.

515-5.4.4 Embedded Guiderail Posts: Core holes into the foundation concrete, then clean holes, in accordance with the manufacturer's instructions. At a minimum, use oil free compressed air to remove loose particles, brush the inside surface to free loose particles, then use compressed air again to remove any remaining particles.

Use a Type A, B, or F epoxy mortar to secure guiderail posts into the cored holes.

Florida Department of Transportation

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GOVERNOR

605 Suwannee Street
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JIM BOXOLD
SECRETARY

August 19, 2016

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

Re: State Specifications Office
Section: **548**
Proposed Specification: **5480000 Retaining Wall Systems- REVISED.**

Dear Mr. Nguyen:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification. Additional revisions were made in response to comments by Rafiq Darji. These revisions are highlighted.

The changes are proposed by Larry Jones of the State Structures Design Office to modify the language to include requirements for segmental block MSE walls SBW). This inclusion will eliminate the need for Dev548.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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

RETAINING WALL SYSTEMS.

(REV ~~5-17-16~~~~8-18-16~~8-19-16)

SECTION 548 is deleted and the following substituted:

SECTION 548
RETAINING WALL SYSTEMS

548-1 Description.

Construct permanent and temporary retaining wall systems in accordance with this Section and in conformance with the lines, grades, design, and dimensions shown in the Contract or established by the Engineer. ~~Unless otherwise noted in the Plans, provide a wall system listed on the Department's Approved Product List (APL) based on the Department's Wall Type shown in the Plans.~~ Sheet pile walls and cast-in-place walls are not included in this Section. ~~All other wall systems used to cut back existing slopes are paid for under the same pay item numbers shown in 548-12.~~ Construct all walls of a specific type (mechanically stabilized earth (MSE), counterfort, etc.), using the same wall system and supplier. If different types of wall systems must be used in such a manner that causes one wall to interact with or influence another wall, coordinate the detailing of these areas of interaction/influence with the assistance of the Contractor's Engineer of Record.

Obtain each reinforced concrete precast concrete retaining wall system from a plant that is currently on the Department's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105.

Ensure that each wall system component is ~~permanently and legibly~~ marked in accordance with 548-5.3.

Ensure that each shipment of products to the job site includes a signed or stamped delivery ticket in accordance with the Materials Manual, Section 8.2 Volume II, and the required written certification statement for each product shipped. Submit these tickets and certifications to the Engineer.

When shown in the Plans or approved by the Engineer, a segmental block MSE retaining wall (SBW) system may be provided as a substitute for a reinforced concrete panel MSE wall system. All SBW systems must comprise:

1. Unreinforced dry-cast masonry facing blocks in a running bond pattern meeting the requirements of 548-5.
2. Structural backfill reinforcement:
    a. Type R-3 geosynthetic backfill reinforcement placed in sheets full length without splices normal to the facing blocks and laterally without horizontal gaps, and with a vertical spacing of not more than every other course of blocks or 30 inches, whichever is less.
    ~~b. Type R-3 geosynthetic backfill reinforcement placed in strips full length without splices normal to the facing blocks with a vertical and lateral spacing of not more than every other block or 30 inches, whichever is less.~~
    ~~c~~b. Metallic reinforcement placed full length without splices normal to the facing blocks and spaced laterally and vertically not more than every other block or 30 inches, whichever is less, with a positive mechanical or shear connection to the facing blocks.
3. A mechanical shear connection to lock adjacent blocks together horizontally or vertically.

548-2 Materials.

Provide a wall system listed on the Department's Approved Product List (APL) based on the wall type shown in the Plans. Purchase ~~the precast~~ components, soil reinforcement, attachment devices, joint filler, filter fabric, and all necessary incidentals for each wall from the same wall supplier ~~chosen~~.

548-2.1 Concrete: Ensure that concrete utilized for all wall components ~~is as specified in the Contract and~~ is consistent with the concrete class, environmental classification and admixture requirements for durability as stated in the Contract Documents. Produce and supply concrete for all reinforced concrete wall components meeting the requirements of Section 346.

Produce and supply concrete for the leveling pad meeting the requirements of Section 347. Use Department approved mix designs.

548-2.2 Reinforcing Steel: Meet the requirements of Section 931 utilizing Grade 60 (Black) steel.

548-2.3 Backfill Reinforcement: For walls utilizing backfill reinforcement, use reinforcement consisting of steel wire mesh, metal strips or structural geosynthetics as required for the wall system chosen. Use backfill reinforcement of the same length from top to bottom of wall at any section. For tiered walls, use backfill reinforcement of the same length within the height of each tier at any section.

Use plain steel wire mesh and embedded loops shop fabricated from cold drawn steel wire and weld into the finished mesh fabric meeting the requirements of ASTM A1064. Use longitudinal and transverse wires of equal and constant diameter within a given piece of mesh reinforcement. Use steel strips hot rolled from bars to the required shape and dimensions with physical and mechanical properties meeting ASTM A572 Grade 65 or as shown in the Contract. Use shop-fabricated hot rolled steel tie straps meeting the minimum requirements of ASTM A1011/A1011 M, Grade 50, or as shown in the Contract.

Ensure that steel reinforcing strips, tie strips, reinforcing mesh and connectors used in permanent walls are galvanized in accordance with ASTM A123 or ASTM A153, as applicable. For typical applications, punch or drill holes in metal items before galvanizing. Field drilled holes for bin walls are permitted. Repair field drilled holes; field cut ends and other damage to galvanized surfaces in accordance with Section 562.

Use Type R-3 structural geosynthetics made of polypropylene, select high density polyethylene or high-tenacity polyester fibers having cross-sections sufficient to permit significant mechanical interlock with the backfill. Use geosynthetics having a high tensile modulus in relation to the backfill. Use geosynthetics having high resistance to deformation under sustained long term design load while in service and resistant to ultraviolet degradation, to damage under normal construction practices and to all forms of biological or chemical degradation normally encountered in the material being reinforced. Do not use uncoated polyester (PET) reinforcements or reinforcements weakened or damaged by high pH environments within any portion of the flowable fill, or within coarse aggregate backfill below the design high water elevation (DHW) shown in the Plans.

Store the geosynthetics in conditions above 20ºF and not greater than 140ºF. Prevent mud, wet cement, epoxy, and like materials from coming into contact with and affixing to the geosynthetic material. Rolled geosynthetic may be laid flat or stood on end for storage. Cover the geosynthetic and protect from sunlight prior to placement in the wall system.

Carefully inspect all reinforcement, steel and geosynthetics to ensure they are the proper size and free from defects that may impair their strength and durability.

548-2.4 Attachment Devices: Use backfill reinforcement attachment devices as required by the wall system chosen.

548-2.5 Joint Materials and Filter Fabrics:

548-2.5.1 Horizontal Joint Pads: Use elastomeric or polymeric pads in all horizontal joints between precast components as recommended by the wall manufacturer. Ensure that the pads are of sufficient size and hardness to limit vertical stresses on the pad and concrete surface and to prevent concrete to concrete contact at the joints.

548-2.5.2 Joint Covers for Non-SBW Walls: For walls supporting bridge abutments on spread footings, cover joints and other wall openings within a horizontal distance equal to the larger of:

1. the length of the reinforcement under the footing plus 25 feet, or
2. twice the maximum height of the footing above the leveling pad,

measured from the nearest edge of the footing, surrounding the reinforced backfill for the abutment with Type D-2 geotextile fabric meeting the requirements of Section 985.

Cover all joints and wall openings in portions of the wall backfilled with coarse aggregate with Type D-2 geotextile fabric meeting the requirements of Section 985. Cover all other joints and wall openings with Type D-2 or D-~~5~~3 geotextile fabric with a maximum apparent opening size (AOS)~~=~~ equal to US Sieve No. 70 meeting the requirements of Section 985. Apply an adhesive approved by the Engineer to the back of the precast component for attachment of the fabric material.

548-2.5.3 Alignment Pins: Ensure that pins used to align the precast components during construction are of the size, shape and material required for the wall system chosen.

548-2.5.4 Separation Geotextile: Provide a ~~separation~~ Type D-2, D-3, or D-~~3~~5 separation geotextile meeting the requirements of Section 985 between the coarse aggregate and the select backfill/embankment at the bottom, top and sides of the coarse aggregate.

548-2.6 Backfill Material:

548-2.6.1 General: Provide compacted select backfill or coarse aggregate backfill within the retaining wall volume as shown in the Plans. For permanent walls, provide coarse aggregate backfill in lieu of compacted select backfill to an elevation at least one foot above the DHW shown in the Plans when the DHW is above the lowest adjacent ground surface. Provide flowable fill within the retaining wall volume in lieu of compacted select backfill or coarse aggregate backfill only when the option for flowable fill is shown in the Plans. The retaining wall volume is defined to extend from the top of the leveling pad or footing, or bottom of walls which do not have footing or leveling pads, to the finish grade line and from the face of the wall to a vertical plane passing through the end of the extreme wall component (straps, counterforts, etc.) plus one foot.

548-2.6.2 Compacted Select Backfill: Meet the requirements of Sections 105 and 120 except as noted within this Section. Have the backfill material tested for every soil type for pH, resistivity, sulfate and chloride content by a Department approved independent testing laboratory prior to placement. Submit a ~~signed and sealed~~ certification, signed and sealed by a Professional Engineer registered in the State of Florida, that the results have met the requirements of this Section.

The pH, as determined by FM 5-550, shall not be lower than 5.0 and not higher than 9.0. Sources of select backfill material having a pH between 4.5 and 5.0 for wall utilizing metallic reinforcement and between 3.0 and 5.0~~0~~ for walls utilizing geosynthetic reinforcement with no metallic elements or pipes placed within the backfill, as determined by

FM 5-550, may be used provided the interior face of the MSE wall panels have three inches of concrete cover over the reinforcement and the concrete used in the panels contains the following ingredients and proportions:

1. The quantity of cement replaced with Type F fly ash is 10% to 20% by weight.
2. The quantity of cement replaced with slag is 50% to 60% by weight.
3. Portland cement is 30% by weight of total cementitious material.
4. The total weight of the Type F fly ash and slag does not exceed 70% of total cementitious material.

In lieu of the mix design described above, a mix design with a fast pozzolanic material meeting the requirements of 346-2.3(6) silica fume, metakaolin and ultrafine fly ash, can be substituted. Examples of mix designs meeting this requirement are:

1. 8% silica fume plus 20% fly ash
2. 10% metakaolin plus 20% fly ash.

Provide proper curing for these materials to prevent surface cracking.

Do not place metallic pipe in backfill materials having a pH less than 5.0.

In addition, for permanent walls utilizing metallic soil reinforcement, use backfill that meets the following electro-chemical test criteria for determining corrosiveness:

Criteria	Test Method
Resistivity: > 3000 ohm -·cm	FM 5-551
Soluble sulfate content: < 200 PPM	FM 5-553
Soluble chloride content < 100 PPM	FM 5-552

For constructing the retaining wall volume, do not use backfill material containing more than 2.0% by weight of organic material, as determined by FM 1-T267 and by averaging the test results for three randomly selected samples from each stratum or stockpile of a particular material. If an individual test value of the three samples exceeds 3%, the stratum or stockpile will not be suitable for constructing the retaining wall volume.

Ensure that the material is non-plastic as determined by AASHTO T90 and the liquid limit as determined by AASHTO T89 is less than 15.

For walls using soil reinforcement, use backfill that meets the following gradation limits determined in accordance with AASHTO T27 and FM 1-T011:

Sieve Size	Percent Passing
3-1/2 inches	100
3/4 inch	70-100
No. 4	30-100
No. 40	15-100
No. 100	0-65
No. 200	0-12

For walls not using soil reinforcement, use backfill that meets the following gradation limits determined in accordance with AASHTO T27 and FM 1-T 011:

Sieve Size	Percent Passing
3-1/2 inches	100
No. 200	0-12

548-2.6.3 Flowable Fill: Meet the requirements of Section 121 except as noted within this Section and the Plans.

548-2.6.4 Coarse Aggregate Backfill and Drainage Aggregate: Provide coarse aggregate comprised of natural stones meeting the requirements of Section 901 with a size distribution of any of the listed aggregate gradations from Size No 57 through Size No 89, inclusive, except as noted on the Plans. Have all coarse aggregate backfill materials tested for pH, resistivity, sulfate and chloride content by a Department approved independent testing laboratory prior to placement. Submit a ~~signed and sealed~~ certification, signed and sealed by a Professional Engineer registered in the State of Florida, that the results of these tests meet the requirements of 548-2.6.2.

For SBW systems, provide drainage aggregate comprised of coarse aggregate backfill and a drainage geotextile to separate the drainage aggregate from the reinforced backfill as specified ~~by the Specialty Engineer~~for each approved wall system.

548-3 Approved Product List (APL).

All proprietary retaining wall systems shall be listed on the APL. Manufacturers seeking evaluation of products for inclusion on the APL shall submit an application in accordance with Section 6, independently certified test reports, and calculations and drawings in accordance with the latest edition of the AASHTO LRFD Bridge Design Specifications and the Department's Structures Design Guidelines (SDG) signed and sealed by a Professional Engineer registered in the State of Florida. Submit calculations and drawings showing details, notes, materials, dimensions, sizes, and other information as described below for a complete description of the retaining wall system.

1. Soil ~~R~~reinforcement durability and/or corrosion data;
2. Differential settlement the wall system can tolerate without exceeding normal stress range of the soil reinforcement and wall facing, or the construction tolerances in this Section;
3. The effects of water flow;
4. Applicable environmental classifications as outlined in the SDG;
5. S~~ubmit s~~igned and sealed design calculations. Design calculations may be either by hand or by a wall company program with hand calculations verifying the program output. It is only necessary to include sample hand calculations for a 20 foot height for each soil condition.
6. Corrosion and durability design procedures for soil reinforcement elements;
7. Provide 11 inch x17 inch drawings showing:
    a. Notes specific to the wall system;
    b. Panel sizes and reinforcing;
    c. Soil reinforcement connection to wall facings;
    d. Wall panel abutment interfacing;
    e. Slip joints;
    f. Steps in leveling pad;
    g. Soil reinforcing details around all vertical obstructions;

h. Filter fabric placement at panel joints and around all obstructions;

i. Details for skewing soil reinforcement (15 degrees maximum) without cutting;

j. Corner elements (required at all angle breaks greater than 5 degrees);

k. Bin wall details for acute corners (required at all acute corners where interior corner angle is less than 70 degrees);

l. Details showing how to accommodate long term (post construction) wall settlement in excess of four inches without attaching soil reinforcement to the abutment; and,

m. Details of how to ground the wall system.

8. Pull-out test data for the proposed wall/reinforcement connection, and size and type of soil reinforcement for wall system. Testing shall be done by an independent soil testing laboratory or testing agency certified by the Department. Ensure test data includes all sizes and types of soil reinforcement to be utilized on Department projects. Default AASHTO values may be used for conventional soil reinforcement. For soil reinforcement grids, include all various configurations and combinations of longitudinal and transverse wires.

9. Other information pertinent to the design and performance of the wall system as necessary.

10. A field construction manual describing construction requirements and sequencing for the wall system. Submit manual in 8-1/2 inch x 11 inch format in either pdf or MS Word format.

548-4 Shop Drawings.

~~Provide~~Submit shop drawings and calculations in accordance with Section 5. Provide calculations and drawings showing details, notes, materials, dimensions, sizes and other information necessary for the complete fabrication and erection of the retaining wall system. As a minimum, provide the following:

1. Elevation view showing the final ground line and elevations of the top and bottom of wall at the begin and end of wall, all breaks in vertical alignment and all whole stations and 25 foot station increments.

2. Sections showing the length, size and designation of soil reinforcement.

3. Plan view showing the horizontal alignment and offsets from the horizontal control line to the exterior face of the wall; the location of utilities, drainage structures and other items that impact the wall; the limits of the reinforced soil volume; and, the location of piles within the reinforced earth volume.

4. Details for construction around utilities, drainage structures and other items that impact the wall; for placement of soil reinforcement at acute corners; for addressing conflicts between soil reinforcement and obstructions in the reinforced soil volume; for addressing different wall types intersecting and impacting each other.

5. General notes and design parameters including design soil characteristics; factored bearing resistance and factored bearing pressure for each wall height increment and other notes required for construction of the walls.

6. Design calculations for each wall height increment detailed in the shop drawings.

7. When the friction angle depicted in the shop drawings exceeds 30 degrees for sand backfill or 34 degrees for limerock backfill, provide laboratory test results in accordance with 548-9.5 verifying the backfill to be used for the wall meets the design soil characteristics for the shop drawings.

8. For SBW systems, include details for the placement of drainage aggregate, drainage pipes and separation geotextile. Drawings should be similar to details for Type II or Type III underdrains in Design Standards, Index No. 286. Do not directly cover perforated drainage pipes with a geotextile filter fabric (such as a filter sock).

9. When SBW systems use friction or semi-friction connections between geosynthetic reinforcement and the facing blocks, include the results of connection capacity testing. Tests must be performed using the materials to be used on the project and tested in accordance with ASTM D6638 to justify the short-term ultimate connection strength reduction factor (CR_u) used to determine the long-term connection strength reduction factor (CR_{cr}) value in the design calculations for each wall height increment detailed in the shop drawings.

548-5 Concrete Component Construction.

Construct reinforced concrete components in accordance with Section 400. Precast wall components are produced using certification acceptance; therefore, assume responsibility for performance of all quality control testing and inspections required by Sections 346 and 400 for the precast component construction. Perform all quality control (QC) inspection and testing using Construction Training and Qualification Program (CTQP) qualified personnel. Perform compressive strength testing in a laboratory meeting and maintaining at all times the qualification requirements listed in Section 105. The minimum time for form removal is 12 hours. Unless otherwise indicated in the Contract, apply a Class 3 finish to the concrete surface for the front face, and roughly screed the rear face to eliminate open pockets of aggregate and surface distortions in excess of 1/4 inch.

Construct unreinforced concrete SBW components (facing blocks) with a minimum compressive strength of 4,000 psi at 28 days and a maximum absorption of 6.5% in accordance with ASTM C140. Units must have a normal weight density classification meeting the requirements of ASTM C1372, except as modified in this Section.

548-5.1 Curing: Cure reinforced concrete components in accordance with Section 400.

548-5.2 Tolerances: Meet the following manufactured tolerances:

548-5.2.1 Reinforced Concrete Components:

1. Precast component dimensions: lateral position of soil reinforcement attachment devices - within 1 inch. ~~a~~All other dimensions - within 3/16 inch.

2. Precast component squareness: angular distortion of the component ~~shall~~must not exceed 0.2 inches in 5 feet.

3. Precast component surface finish: surface defects on smooth formed surfaces measured on a length of 5 feet ~~shall~~must not exceed more than 0.1 inches. Surface defects on textured finished surfaces measured on a length of 5 feet ~~shal~~lmust not exceed 5/16 inch.

548-5.2.2 Unreinforced Concrete SBW Components:

1. Length, width and height of each individual block must be within 1/16 inch of the specified dimension. Hollow units must have a minimum wall thickness of 1-1/4 inches.

~~2. Each individual block height must be within 1/16 inch of the specified dimension.~~

~~3~~2. All units must be free of defects that would interfere with proper placing of the unit or impair the integrity of the wall construction. Minor cracks with a width less than 1/32 inch and a length less than 25% of the unit height may be acceptable.

~~3~~3. Exposed facing blocks must be split face texture with a uniform wheat or tan color, unless shown otherwise in the Plans.

548-5.3 Marking of Precast Components:

548-5.3.1 Reinforced Concrete Components: Permanently and legibly mark the following information on the back of each reinforced precast wall panel by etching: the panel number or type, piece mark, project number (if applicable), date cast and precast manufacturer's name or symbol with the approved producer's QC stamp affixed.

548-5.3.2 Unreinforced Concrete SBW Components: Label each pallet of dry-cast unreinforced concrete SBW facing blocks with the component identification number or type, project number (if applicable), lot number, date cast, and the manufacturer's name or symbol. Labels must be clearly legible until the component is installed.

548-6 Repairs or Rejection of Precast Components.

548-6.1 Reinforced Concrete Components: For precast concrete wall components that have not been installed, evaluate cracks, spalls and other deficiencies in accordance with 450-12. Repair deficiencies in accordance with 450-13 or the plant's approved repair methods that are included as part of the Producer Quality Control Plan. ~~Ensure that t~~The original performance and durability of repaired wall components ~~are~~must be maintained. Use materials for concrete repair that ~~will~~ meet or exceed the strength requirement for the class of concrete used. Materials meeting the requirements of Section 930 may be substituted for non shrink grout when required by 450-13.

For precast concrete wall components that have been installed, the disposition of concrete cracks ~~sha~~will be determined in accordance with 400-21.

The Department will reject all precast concrete wall components not meeting the quality standard of this Section and referenced Specifications. In addition, any of the following defects will be sufficient cause for rejection by the Department:

1. Defects that indicate unsatisfactory molding.
2. Defects indicating honeycombed or open texture concrete.
3. Defects in the physical characteristics such as:
    a. Signs of aggregate segregation~~;~~
    b. Broken or cracked corners~~;~~
    c. Soil reinforcement attachment devices improperly installed/damaged~~;~~
    d. Lifting inserts not useable~~;~~
    e. Exposed reinforcing steel~~;~~
    f. Insufficient cover over reinforcing steel~~;~~
    g. Cracks at the alignment pipe or pin~~;~~
    ~~f~~h. Insufficient concrete compressive strength~~;~~
    ~~g~~i. Precast component thickness in excess of plus or minus 3/16 inch from that shown in the Contract~~;~~, ~~o~~r
    ~~h~~j. Stained front face, due to excess form oil or other reasons.

If the face of the precast component is stained or discolored to the point of rejection, the stain or discoloration may be removed, or a Department approved stain or a Class 5 finish may be applied to attain a uniform appearance for the entire structure, to the satisfaction of the Engineer.

548-6.2 Unreinforced Concrete SBW Components: The Department will reject all segmental retaining wall blocks not meeting the requirements of this Section and the Contract

Documents. In addition, any of the following defects will be sufficient cause for rejection of SBW facing blocks by the Department:

1. Defects that indicate unsatisfactory molding.
2. Defects indicating honeycombed or open texture concrete.
3. Defects in the physical characteristics such as:
    a. Signs of aggregate segregation
    b. Broken or cracked corners
    c. Insufficient concrete compressive strength
    d, Excessive concrete absorption
    e. Exceeding dimensional tolerances, or
    f. Discoloration.

Correct cracks or spalls occurring after installation in accordance with 400-21.

548-7 Handling Storage and Shipping.

Handle, store and ship all components in a manner that prevents chipping, cracks, fractures, excessive bending stresses, mud, dirt and debris. Support precast panel wall and counterfort components in storage on firm blocking located immediately adjacent to the attachment device.

Do not ship precast concrete wall components to the project site prior to the completion of the 72 hour curing period and attainment of the required 28 day strength.

The Contractor is permitted to verify the shipping strength test, before 28 days, by testing compressive strength cylinders that are cured under the conditions similar to the product or by testing temperature match cured cylinders. The shipping strength test is the average compressive strength of two test cylinders. Do not ship reinforced concrete products until accepted and stamped by the QC Manager or the inspectors under the direct observation of the QC Manager.

548-8 Construction Requirements.

548-8.1 General: Due to the unique nature of the structure and concept, procure from the wall supplier fully detailed shop drawings, technical instructions, guidance in preconstruction activities and on-site technical assistance during construction. Closely follow any instructions from the wall supplier, unless otherwise directed by the Engineer. Submit any instructions from the wall supplier to the Engineer. Verify all pertinent retaining wall information (soil parameters, wall alignment, utility locations, conflicting structures) prior to the wall supplier finalizing shop drawings. Bring any conflicts not shown in the Contract to the Engineer's attention.

548-8.2 Wall Excavation: Excavate to the limits shown in the Contract and in conformance with Section 125.

548-8.3 Foundation Preparation: Grade the foundation for the structure level for a width equal to or exceeding the limits of the retaining wall volume or as shown in the Contract. Prepare the foundation in conformance with Section 125.

In addition to the compaction requirements of Section 125, compact the graded area with an appropriate vibratory roller weighing a minimum of ~~8~~ eight tons for at least five passes or as directed by the Department's District Geotechnical Engineer. Remove and replace any soft or loose foundation subsoils incapable of sustaining the required compaction to the Engineer's satisfaction.

For permanent MSE wall systems, provide an unreinforced concrete leveling pad as shown in the Contract Documents. Cure the leveling pad a minimum of 12 hours before placement of precast wall components.

For SBW MSE wall systems, a geogrid reinforced, geotextile wrapped, compacted aggregate leveling pad may be used in lieu of the unreinforced concrete leveling pad. The compacted aggregate leveling pad must be at least 24 inches wide and at least 8 inches thick after compacting, and the geogrid must be at least 6 inches below the top of the leveling pad. Wrap the aggregate leveling pad with a D-2, D-3, or D-5 separation geotextile. The geotextile may run up the front and back of the first block course or between the aggregate leveling pad and the first block course.

548-8.4 Wall Erection: Assemble, connect and support wall components as recommended by the wall supplier. As backfill material is placed behind the wall face of MSE wall systems utilizing reinforced concrete panels, maintain the wall in the vertical position or slightly battered into the backfill to provide a final vertical alignment (by means of bracing, temporary wooden wedges placed in the joint at the junction of the two adjacent precast components on the external side of the wall or other alignment aids). Remove wooden wedges as soon as the precast component above the wedged precast component is completely erected and backfilled. External bracing is required for the initial lift of MSE systems.

For SBW systems, carefully place the first course of concrete block units on the leveling pad. Up to 1/2 inch of sand may be placed between the concrete leveling pad and the buried first course of blocks to provide a level and stable base. A one inch gap between the first course of facing units is allowed, provided a suitable filter fabric is placed behind the foundation units as specified ~~by the Contractor's Engineer of Record~~for each approved wall system. Each unit must be in full contact with the base and checked for level and horizontal alignment. Voids must be kept to a minimum to prevent point loading and cracking, unless otherwise indicated in the shop drawings. Place units side by side for the full length of wall alignment. Fill the hollow cores or cells and the space within blocks with drainage aggregate. Sweep away excess material from top of units and install the next course.

Place soil reinforcement normal to the face of the wall, unless otherwise shown in the Contract or as directed by the Engineer. Do not cut or kink soil reinforcement. Do not connect soil reinforcement to piles or allow soil reinforcement to bear against piles. Field cut soil reinforcement only at locations as shown in the approved shop drawings. Prior to placement of the reinforcement, compact the backfill in accordance with 548-8.5.

For SBW systems, shims made of non-degradable materials may be used as specified ~~by the Specialty Engineer~~for each approved wall system. The shim thickness per course of block must not exceed 1/8 inch and must not be installed on reinforcement elevations when the reinforcement connection relies on any friction.

548-8.4.1 Tolerances for Permanent Walls: Walls that do not meet the following tolerances will not be accepted by the Department and must be removed and reconstructed at no cost to the Department.

548-8.4.1.1 Reinforced Concrete MSE Wall Systems: ~~Ensure that v~~Vertical tolerances (plumbness) and horizontal alignment tolerances ~~do~~must not exceed 3/4 inch when measured with a 10 foot straightedge. The maximum allowable offset in the joint between precast components is 3/4 inch. The final overall vertical tolerance of the completed wall (plumbness from top to bottom) ~~shall~~must not exceed 1/2 inch per 10 feet of wall height. Horizontal and vertical joints between precast components ~~shall~~must not be less than 1/2 inch or more than 1-1/4 inches. ~~Walls which do not meet these tolerances will not be accepted by the Department and must be removed and reconstructed at no cost to the Department.~~

548-8.4.1.2 SBW Systems: Horizontal alignment tolerances must not exceed 3/4 inch per10 feet of wall length. The maximum allowable gap between segmental retaining wall blocks above the first course must not exceed 1/3216 inch. The final overall vertical tolerance of the completed wall (deviation from plumbness from top to bottom or batter shown in the Plans) must not exceed 1/2 inch per 10 feet of wall height.

548-8.4.2 Tolerances for Temporary Walls: Ensure that vVertical tolerances (plumbness) and horizontal alignment tolerances domust not exceed three inches when measured with a 10 foot straightedge. The final overall vertical tolerance of the completed wall (plumbness from top to bottom) shallmust not exceed one inch per three feet of wall height, not to exceed a total of six inches. Walls which do not meet these tolerances will not be accepted by the Department and must be removed and reconstructed at no cost to the Department.

548-8.5 Backfill Placement:

548-8.5.1 Compacted Select and Coarse Aggregate Backfill: A LOT is defined as a single lift of finished embankment not to exceed 500 feet in length or cumulative length of continuous, interconnected walls. Backfill within three feet from the panels and backfill beyond three feet from the panels are separate LOTs. Overlapping retaining wall volumes may be considered one LOT, excluding the three feet width behind the panels. Strips up to eight feet wide between two retaining wall volumes constructed with the same material in one operation may be considered as one LOT with the retaining wall volumes. Isolated compaction operations will be considered as separate LOTs. For multiple phase construction, a LOT will not extend beyond the limits of the phase. When bridge abutments on spread footings are shown in the Plans, the material within three feet behind the wall face and within the limits defined in 548-9.4.2 are considered as separate LOTs.

Remove wrinkles in geotextile reinforcement prior to covering with backfill. Place the backfill closely following the erection of each course of precast components or soil reinforcement layers and spread by moving the machinery parallel to the wall face. Do not allow equipment heavier than eight tons closer than three feet behind the wall face. Place backfill in a manner to avoid any damage or disturbance to the wall materials or misalignment of the facing materials. Remove and replace any wall materials which become damaged or disturbed during backfill placement at no cost to the Department, or correct as directed by the Engineer. Remove and reconstruct any misalignment or distortion of the wall facing due to placement of backfill outside the limits of this specification at no cost to the Department.

Perform allCompact coarse aggregate compaction operations usingbackfill with a minimum of three passes of a vibratory compactor (roller or plate compactor) with an operating weighting of at leastbetween 600 and 1000 pounds and which produces a centrifugal force of not less than 7,500or two passes of vibratory compactor weighing over 1000 pounds. Use the highest vibration level that does not cause excessive fracture of the aggregate in the opinion of the Engineer. Continue compaction until there is no additional movement. Sheepsfoot, grid rollers or other types of equipment employing a foot are not allowed for any backfill type. Achieve compaction of all backfill types within three feet of the back of the wall face using a power operated roller or plate weighing less than 1,000 pounds. At a distance greater than three feet from the back of the wall, a vibratory roller may be used, provided that the frequency and amplitude combined with bulk weight of the roller has performed satisfactorily at a trial section of the same type of wall. For select backfill, a smooth wheel or rubber tire roller is considered adequate. Ensure that the maximum lift thickness after compaction does not exceed six inches. Decrease the lift thickness if necessary, to obtain specified density.

Ensure aAll transitions from coarse aggregate backfill to select backfill must occur at least six inches above and below any layers of backfill reinforcement. Place a separation geotextile in accordance with 548-2.5.4 between the coarse aggregate backfill and select backfill and embankment.

Perform backfill compaction in a way that the compactor moves in a direction parallel to the wall face and proceeds from a distance not less than three feet behind the wall face toward the end of the soil reinforcement element.

When placing select backfill, ensure that the moisture content of the backfill material prior to and during compaction ismust be uniformly distributed throughout each layer of material. Use backfill material having a placement moisture content at the dry side of the optimum moisture content. To achieve the required compaction moisture content, use water that meets the requirements of Section 923. Do not transport excessively moist backfill materials to the site for any reason. Determine the optimum moisture content in accordance with the test method used to determine maximum density in 548-9.

At the end of each day's operation, shape the last level of backfill to permit runoff of rainwater away from the wall face or provide a positive means of controlling run off away from the wall such as temporary pipe, etc.

548-8.5.2 Flowable Fill: Metallic wall components (including metallic soil reinforcements) must not be in partial contact with the flowable fill. If the metallic components contact the flowable fill, the metallic components must be completely encapsulated by the flowable fill.

548-8.6 Compressible Free Draining Seal: Seal all joints between panels of reinforced concrete panel MSE walls with compressible free draining material to prevent plant growth from seeds or spores that may be in the joints or transported to the joints by wind or rain. The installation must be secure and free draining to keep the seal in place until uninstalled and to prevent hydrostatic forces from building up behind the panel.

548-9 Acceptance Program.

548-9.1 General Requirements: Meet the requirements of 120-10 except delete the requirements of 120-10.1.4.1, 120-10.1.4.3, 120-10.1.6, 120-10.2 and 120-10.3.

548-9.2 Maximum Density Determination: For select backfill, determine the maximum QC density in accordance with FM 1-T180, Method D. When compacting A-3 or A-2-4 materials to meet the alternate acceptance criteria in 548-9.4.1, determine the maximum density in accordance with AASHTO T99, Method C.

Perform gradation tests on the sample collected in accordance with AASHTO T27 and FM 1-T011. Classify soils in accordance with AASHTO M145 in order to determine compliance with embankment utilization requirements.

548-9.3 Density Testing Requirements: Ensure compliance with the requirements of nuclear density testing in accordance with FM 1-T238. Determine the in-place moisture content for each density test. Use FM 1-T238, FM 5-507 (Determination of Moisture Content by Means of a Calcium Carbide Gas Pressure Moisture Tester), or FM 5-535 (Laboratory Determination of Moisture Content of Granular Soils by Use of a Microwave Oven) for moisture determination.

Perform these tests at a minimum frequency of one set of tests per LOT.

Determine test locations including stations and offsets, using the random number generator provided by the Engineer. Do not use note pads or work sheets to record data for later transfer to the density log book. Notify the Engineer upon successful completion of QC testing on each LOT.

548-9.4 Acceptance Criteria: For select backfill, obtain a minimum density of 90% of the maximum dry density as determined by FM 1-T180 within three feet behind the wall face and obtain a minimum density of 95% of the maximum dry density as determined by FM 1-T180 from beyond three feet behind the wall face.

For flowable fill, meet the requirements of 121-6. For coarse aggregate backfill, compact with a minimum of three passes of a vibratory compactor weighing between 600 and 1000 pounds or two passes of a vibratory compactor weighing over 1000 pounds. Use the highest vibration level that does not cause excessive fracture of the aggregate in the opinion of the Engineer. Continue compaction until there is no additional movement.

548-9.4.1 Optional Acceptance Criteria for A-3 and A-2-4 Materials: Obtain a minimum density of 95% of the maximum dry density as determined by AASHTO T99 within three feet behind the wall face and obtain a minimum density of 100% of the maximum dry density as determined by AASHTO T99 beyond three feet behind the wall face.

The combined width from both MSE wall backfill (excluding the three feeoot zone from the panels) and embankment material may be considered the same LOT if the same material is used; the material in both wall backfill and embankment is compacted with the same procedure, equipment and compacting effort; and the maximum lift thickness after compaction in both wall backfill and embankment is six inches.

548-9.4.2 Acceptance Criteria for Wall Backfill Supporting Spread Footings: When spread footings at bridge abutments are shown in the Plans, obtain a minimum of 95% of the maximum dry density as determined by FM 1-T180 on the material within three feet behind the wall face, and underneath the footing as defined by the following limits:

1. All lifts below the bottom of the footing for a depth equal to at least the footing width
2. A minimum distance of three feet beyond the edges of the footing width

If the optional criteria specified in 548-9.4.1 is used, compact the backfill material within the limits specified above to obtain a minimum density of 100% of the maximum dry density as determined by AASHTO T99. Compact the remainder of the backfill in accordance with 548-9.4 or 548-9.4.1 as applicable. Do not use compaction equipment larger than permitted in 548-6.5 within three feet behind the wall face; decrease the lift thickness if necessary.

548-9.5 Friction Angle: When the friction angle depicted in the shop drawings exceeds 30 degrees for sand backfill or 34 degrees for limerock backfill, ensure the friction angle of the backfill material tested in accordance with FM 3-D3080 equals or exceeds the backfill friction angle depicted in the shop drawings.

548-9.6 Frequency: Conduct sampling and testing at a minimum frequency listed in the table below. The Engineer will perform verification sampling and tests at a minimum frequency listed in the table below.

Test Name	Quality Control (QC)	Verification
Maximum Density	One per soil type	One per soil type
Density	One per LOT	One per four LOTs for each type of QC test
Gradation	One per Maximum Density	One per Maximum Density
LL&PI	One per Maximum Density	One per Maximum Density

Soil Classification	One per Maximum Density	One per Maximum Density
Organic Content	One per soil type	One per soil type
pH	One per soil type	One per soil type
Direct Shear	Three per soil type when required by 548-9.5	One per soil type
*Verification testing for pH will be performed on samples taken at the point of placement.		

In addition, for permanent walls utilizing metallic soil reinforcement, test for corrosiveness at a minimum frequency of one test per soil type at point of placement according to the electro-chemical table in 548-2.6. The Engineer will collect enough material to split and create two separate samples and retain one for resolution at point of placement until LOTs represented by the samples are accepted. The Engineer will perform verification tests for corrosiveness at a minimum frequency of one test per soil type.

548-9.7 Verification Comparison Criteria and Resolution Procedures:

548-9.7.1 Maximum Density Determination: The Engineer will collect enough material to split and create two separate samples and retain one for resolution until LOTs represented by the samples are accepted.

The Engineer will meet the requirements of 120-10.4.1 except replace AASHTO T99, Method C with FM 1-T180, Method D. If the Contractor selects the Optional Acceptance Criteria, the Engineer will verify the QC results of AASHTO T99, Method C in accordance with 120-10.4.1.

548-9.7.2 Density Testing: Meet the requirements of 120-10.4.2.

548-9.7.3 Soil Classification: The Engineer will meet the requirements of 120-10.4.3 except test the sample retained in 548-9.7.1 instead of taking the additional one.

548-9.7.4 Gradation: The Engineer will verify the QC results if the verification result meets the gradation limits set forth in the gradation table of 548-2.6. Otherwise, the Engineer will test the sample retained in 548-9.7.1. The State Materials Office (SMO) or an AASHTO accredited laboratory designated by the SMO will perform resolution testing. The material will be sampled and tested in accordance with AASHTO T27 and FM 1-T011.

If the resolution test result satisfies the required gradation limits, the LOTS will be verified. If the resolution test results do not meet the required gradation limits, reconstruct the LOTS with acceptable material. The Engineer will perform new verification testing.

548-9.7.5 Liquid Limit and Plasticity Index (LL&PI): The Engineer will verify the QC results if the verification result satisfies the plasticity index and liquid limit criteria set forth in 548-2.6. Otherwise, the Engineer will test the sample retained in 548-9.7.1. The SMO or an AASHTO accredited laboratory designated by the SMO will perform resolution testing. The material will be sampled and tested in accordance with AASHTO T90 and AASHTO T89, respectively.

If the resolution test result satisfies the required criteria, LOTS of that soil type will be verified. If the resolution test results do not meet the required criteria, reconstruct the corresponding LOTS with acceptable material. The Engineer will perform new verification testing.

548-9.7.6 Corrosiveness: The Engineer will verify the QC results if the verification result satisfies the electro-chemical and pH test criteria set forth in 548-2.6. Otherwise, the Engineer will test the sample retained in 548-9.7.1. The SMO or an AASHTO

accredited laboratory designated by the SMO will perform resolution testing. The material will be sampled and tested in accordance with FM 5-550, FM 5-551, FM 5-552 and FM 5-553.

If the resolution test result satisfies the required criteria, material of that soil type will be verified and accepted. If the resolution test results do not meet the required criteria, reject the material and reconstruct with acceptable material.

548-9.7.7 Organic Content: The Engineer will verify the QC results if the verification result satisfies the organic content test criteria set forth in 548-2.6. Otherwise, the Engineer will collect three additional samples. The material will be sampled and tested in accordance with FM 1-T267 and by averaging the test results for three randomly selected samples from at least one lift per soil type. The SMO or an AASHTO accredited laboratory designated by the SMO will perform resolution testing.

If the resolution test result satisfies the required criteria, material of that soil type will be verified and accepted. If the resolution test results do not meet the required criteria, reject the material and reconstruct with acceptable material.

548-9.7.8 Friction Angle: When the friction angle depicted in the shop drawings exceeds 30 degrees for sand backfill or 34 degrees for limerock backfill, the Engineer will take a verification sample at the point of placement to perform a direct shear verification test in accordance with FM 3-D3080. The SMO or a consultant qualified to perform geotechnical specialty lab testing (Type of Work 9.5), per Rule 14-75 of the Florida Administrative Code will perform the verification testing. If the test verifies the material has a friction angle greater than or equal to the friction angle depicted in the shop drawings, the material in the LOTs will be verified. If the verification test does not meet the required friction angle, reconstruct the LOTs with acceptable material.

The Contractor may request to redesign the wall and resubmit the shop drawings with the lower friction angle indicated by the verification test. Employ a Professional Engineer to redesign and submit signed and sealed drawings and computations. Do not begin any reconstruction until the proposed redesign has been reviewed and approved by the Engineer. The Contractor shall bear the costs of the redesign and any work resulting from the design changes.

548-10 Certification.

Submit all test reports to the Engineer ~~which are~~ necessary to document compliance with the Specifications, at least ten days prior to wall construction.

Also submit ~~to the Engineer~~ a certificate of compliance certifying that the retaining wall materials, backfill and construction practices comply with this Section.

For SBW systems, the Engineer will randomly select samples of each type of block used in the segmental block retaining wall system and review a copy of the certified test report corresponding the sample at a frequency of one sample per type of block for each wall.

Acceptance of furnished material will be based on the certificate of compliance, accompanying test reports, and visual inspection by the Engineer.

548-11 Method of Measurement.

The quantity to be paid for will be the plan quantity, in square feet, completed and accepted, of the area bounded by the following:

For permanent retaining wall systems: the top of the coping, the top of the leveling pad or top of structural footings and the begin and end wall limits as shown on the wall control drawings.

For temporary retaining wall systems: the top of wall, the ground line and the begin and end wall limits as shown on the wall control drawings.

548-12 Basis of Payment.

Price and payment will be full compensation for all work specified in this Section, including the design of the wall system, excavation required specifically for wall construction below the normal roadway template, backfill reinforcement, leveling pad, footings, copings, light pole pedestals, fabric material, horizontal joint materials, alignment pins, repairs, labor, equipment, and other materials necessary to complete the wall in an acceptable manner as shown in the Contract. The cost of backfill for the normal roadway template will be included in the cost of embankment or borrow excavation, as applicable.

Payment will be made under:

Item No. 548-12-	Retaining Wall System (Permanent) - per square foot.
Item No. 548-13-	Retaining Wall System (Temporary) - per square foot.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

August 17, 2016

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

Re: State Specifications Office
Section: **611**
Proposed Specification: **6110203 Acceptance Procedures for Traffic Control Signals and Devices.**

Dear Mr. Nguyen:

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

The changes are proposed by Russell Allen of the Traffic Engineering and Operations Office to provide further clarification and detail for As-Built Documentation requirements.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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/ot
Attachment
cc: Florida Transportation Builders' Assoc.
State Construction Engineer

ACCEPTANCE PROCEDURES FOR TRAFFIC CONTROL SIGNALS AND DEVICES. (REV ~~5 316 18~~-*17*-16)

SUBARTICLE 611-2.2 is deleted and the following substituted:

611-2.2 Final Acceptance: The Engineer will make inspection for final acceptance of traffic control signal and device installations as part of all work under the Contract in accordance with 5-11, only after satisfactory completion of all field tests of completed installations and on the basis of a comprehensive ~~final~~ field inspection of all equipment installations. Submit Form 750-010-02, Submittal Data – Traffic Control Equipment for each cabinet location, to the Engineer. The Engineer will make the final inspection with a Contractor's representative and ~~, when applicable,~~ a representative of the agency designated to accept maintenance responsibility. The Engineer will submit the approved form to the District Traffic Operations Engineer and place a hard copy in the cabinet at each location. Transfer warranties and guarantees on equipment to the Department in accordance with Section 608. For traffic signal installations, submit form 700-010-22, Final Acceptance of Traffic Signal Installation(s) and Transfer of Maintenance, to the Engineer.

SUBARTICLE 611-2.3 is deleted and the following substituted:

611-2.3 As-Built ~~Drawings~~*Documentation*: As a condition precedent to acceptance under 611-2.1 or 611-2.2, submit ~~signed and sealed~~ as-built drawings*~~, and other as-built data~~, for all installations, signed and sealed by a Professional Engineer or Professional Surveyor and Mapper registered in the State of Florida, along with supplemental as-built information using Feature Import Templates ~~for~~ used for ~~in~~ the Department's ITS Facility ~~m~~Management (ITSFM) System~~, of for all installations:~~. Feature Import Templates can be found on the Department's web site: http://www.dot.state.fl.us/trafficoperations/ITS/Projects_Telecom/ITSFM/ITSFM.shtm.*

611-2.3.1 Submittal Requirements: Submit as-built plans for review by the Engineer. As-built plans must be PDF files, in the same scale as the Contract Plans, and formatted on 11 inch by 17 inch sheets. Signing and pavement marking plan sheets may be used instead of signalization plan sheets, if a substantial number of changes from the original Plans must be recorded. If, in the opinion of the Engineer, the changes cannot be clearly delineated on the existing drawings, clearly delineate all changes on 11 inch by 17 inch detail sheets, enlarged 200% from the reproductions.

Submit fiber optic splicing diagrams detailing all cable splices, terminations, equipment port assignments, and optical circuit~~s~~ *path names* within the communication network. *Include cable manufacturer, type, strand count, and cable sequential reading at each pull box entrance/exit, each side of the splice enclosure, and at patch panel terminations.*

As-built submittals must include an inventory of all traffic control signals and devices, and support structures. The inventory must include horizontal position geographic coordinate data collected using Differential Global Positioning System (DGPS) equipment. The inventory must include the manufacturer, model, and serial number for each device or completed assembly. Submit coordinate data for pull boxes as well as conduit and cable at 100 foot intervals including changes in direction. *All support structures, equipment cabinets and other*

fixed location features ~~will~~must be assigned a unique ~~S~~site I~~d~~D ~~N~~name to create a common association between the as-built plans, inventory forms, and the ITSFM system.~~ Submit as-built data using Feature Import Templates for use with the Department's ITSFM System.~~ Include data for all components listed in 611-2.3.2, except those listed in 611-2.3.2.2 ~~(Loops and Detection Zones)~~ and 611-2.3.2.5 ~~(Signal Heads). Feature Import Templates can be found on the Department's web site: http://www.dot.state.fl.us/trafficoperations/ITS/Projects_Telecom/ITSFM/ITSFM.shtm.~~

Aerial photographs may be submitted with as-built *plan* submittals to provide supplementary information. The aerials should not include extra features such as the right of way, baseline, or roadway edges. The aerials may be used as a base for the as-built plans with mile post and offset dimensions. Make any corrections resulting from the Engineer's review, and resubmit as-built plans as a condition precedent to acceptance of the installation.

611-2.3.2 Components: As a minimum, identify all traffic control devices, poles, support structures, cabinets, pull and splice boxes, hubs, *conduit duct banks,* access points, and power services*, and utility demarcation points*.

611-2.3.2.1 Conduit and Cable: Identify all conduit and cable with unique line styles for routing (*~~C~~conduit, ~~E~~electrical, and ~~J~~joint-~~U~~use trenched*~~overhead, conduit, saw cut, etc.~~) that are clearly identified in a legend on each *plan* sheet. Identify the type of cable (example - 7 conductor signal cable) and label the number of conductors, fiber strands or other identifying features of the cable. For conduit *duct banks*, clearly note conduit *and*~~/or~~ *innerduct* size*, length,* and number of runs.

611-2.3.2.2 Loops and Detection Zones: Identify the location of all installed loops (including the distance from the stop bar for the advance loops), the path of each loop to the pull box, the loop window and the path of the loop lead-in to the controller cabinet. Identify the device location and the approximate detection area for detection systems that are not embedded in or under pavement.

611-2.3.2.3 Pull Boxes: Label unused and out of service pull boxes clearly. Show distances to each pull box from the nearest edgeline, stop bar, or other permanent feature. If an edgeline is not near a pull box or would not clearly identify its location; a fixed monument may be used (example - FDOT pole or structure).

611-2.3.2.4 Poles: Identify poles from the nearest edgeline of both approaches. If an edgeline is not near a pole or would not clearly identify its location, a fixed monument may be used.

611-2.3.2.5 Signal Heads: As-built plans must show the final location of signal heads. Each signal head shall be identified by its corresponding movement number.

611-2.3.2.6 Cabinet: The type of cabinet and inventory of internal components must be documented. Controller manufacturer along with the controller model number shall be submitted for all traffic signal cabinets. A cabinet corner "blow up" shall be submitted detailing pull box locations with all conduit and cable.

611-2.3.3 Compensation: All costs incurred in submitting as-built ~~drawings~~ *documentation* are incidental to the other items of work associated with traffic control signals and devices.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

August 19, 2016

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

Re: State Specifications Office
Section: **671**
Proposed Specification: **6710000 Traffic Controllers.**

Dear Mr. Nguyen:

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

The changes are proposed by Jeff Morgan of the State Traffic Engineering and Operations Office to clarify the Department's requirements for traffic controllers.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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

TRAFFIC CONTROLLERS.
(REV 5-26-167-8-168-19-16)

SECTION 671 is deleted and the following substituted:

SECTION 671
TRAFFIC CONTROLLERS

671-1 Description.

Furnish and install a NEMA, Model 170, Model 2070, or ATC controller unit as shown in the Plans. Meet the requirements of Section 603.

671-2 Materials.

Use traffic controllers listed on the Department's Approved Product List (APL). Ensure equipment is permanently marked with the manufacturer's name or trademark, part number, and serial number.

Controllers must meet the following applicable industry standards:

NEMA TS1 Controller ..... NEMA TS-1-1989
NEMA TS2 Controller ..... NEMA TS-2-2003
Model 170 Controller .....CALTRANS TEES, 2009
Model 2070 Controller .....CALTRANS TEES, 2009
ATC Controller..... AASHTO/ITE/NEMA ATC 5.2b

All NEMA TS2, Model 2070 and ATC controllers must provide functionality that meets or exceeds operational characteristics, including NTCIP support, as described in NEMA TS-2-2003.

Except for replacing controllers in existing systems, all new installations must include Ccontrollers must implementthat capture all mandatory requirementsevent-based data elements listed in supplemental requirement SR-671-2.1.1-01, Supplemental Traffic Controller High Resolution Data Logging Requirements, as published on the Department's State Traffic Engineering and Operations Office website at the time of Contract letting.

671-3 Method of Measurement.

No separate payment will be made for the controller; payment is included with the Traffic Controller Assembly.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

June 13, 2016

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

Re: State Specifications Office
Section **916**
Proposed Specification: **9160201 Bituminous Materials.**

Dear Mr. Nguyen:

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

The changes are proposed by Greg Sholar of the State Materials Office (SMO) to update the language for current Department practice.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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

BITUMINOUS MATERIALS.
(REV 5-6-16)

ARTICLE 916-2.1 is deleted and the following substituted:

916-2.1 Requirements: Superpave Performance Graded (PG) asphalt binders, identified as PG 52-28, PG 58-22, PG 67-22, polymer modified asphalt (PMA) binders, PG 76-22 (PMA) and PG 82-22 (PMA), and asphalt rubber binders (ARB), PG 76-22 (ARB), shall meet the requirements of 916-2 and AASHTO M 332-14. When the Contract Documents specify either a PG 76-22 (PMA), PG 76-22 (ARB), or PG 76-22 binder, either binder can be used interchangeably at no additional cost to the Department. All PG asphalt binders shall meet the following additional requirements:

1. The intermediate test temperature at 10 rad/sec. for the Dynamic Shear Rheometer (DSR) test (AASHTO T 315-12) shall be 26.5ºC for PG grades PG 67 and higher.

2. An additional high temperature grade of PG 67 is added for which the high test temperature at 10 rad/sec for the DSR test (AASHTO T 315-12) shall be 67ºC.

3. All PG asphalt binders having a high temperature designation of PG 67 or lower shall be prepared without modification.

4. All PMA binders having a high temperature designation higher than PG 67 shall only be produced with a styrene-butadiene-styrene (SBS) or styrene-butadiene (SB) elastomeric polymer modifier and the resultant binder shall meet all requirements of this Section.

5. Polyphosphoric acid may be used as a modifier not exceeding 0.75% by weight of asphalt binder for PG 76-22 (PMA), PG 76-22 (ARB), and PG 82-22 (PMA) binders.

6. PG 76-22 (ARB) shall meet the additional requirements of 916-2.1.1.

7. All PG asphalt binders having a high temperature designation of PG 67 or lower shall not have a high temperature true grade more than 5.9°C higher than the specified PG grade, (for example, if a PG 58-22 is specified, do not supply a PG 64-22 or higher).

8. The use of waste oil is prohibited in the modification of any PG binder grade. Waste oil shall be defined as recycled oil products that have not been processed through a vacuum tower and have an initial boiling point of 385°C (725°F) or lower when tested in accordance with ASTM D6352.

For all PG binder used in all hot mix asphalt, silicone may be added to the PG binder at the rate of 25 cubic centimeters of silicone mixed to each 5,000 gallons of PG binder. If a disbursing fluid is used in conjunction with the silicone, the resultant mixture containing the full 25 cubic centimeters of silicone shall be added in accordance with the manufacturer's recommendation. The blending of the silicone with the PG binder shall be done by the supplier prior to the shipment. When the asphalt binder will be used with a foaming warm mix technology, refer to the technology supplier's guidance on the addition of silicone.

Where an anti-strip additive is required, ~~per the requirements of Sections 334 and 337, the amount shall be from 0.25% to 0.75% by weight of asphalt binder. T~~the anti-strip additive shall meet the requirements of 916-4. The anti-strip additive shall be introduced into the PG binder by the supplier during loading.

916-2.1.1 Additional Requirements for PG 76-22 (ARB): The following additional requirements apply only to PG 76-22 (ARB):

1. The asphalt binder shall contain a minimum of 7.0% ground tire rubber (GTR) by weight of asphalt binder.

2. The GTR shall meet the requirements of Section 919.
3. Polymer modification is optional for PG 76-22 (ARB).
4. Use of excess PG 76-22 (ARB): The Contractor may use excess PG 76-22 (ARB) in other asphalt concrete mixes requiring the use of a PG 67-22 binder by blending with straight PG 67-22 binder so that the total amount of ground tire rubber in the binder is less than 2.0%. The Contractor may use excess PG 76-22 (ARB) in asphalt concrete mixtures requiring the use of a PG 52-28 or PG 58-22 by blending with the designated binder in such proportions that the total amount of ground tire rubber in the binder is less than 1.0%.

916-2.2 Compliance with Materials Manual: Producers of Superpave PG binders shall meet the requirements of Section 3.5, Volume II of the Department's Material Manual, which may be viewed at the following URL:
~~http://www.dot.state.fl.us/programmanagement/Implemented/URLinSpecs/Section35V2.shtm~~
http://www.dot.state.fl.us/programmanagement/Implemented/URLinSpecs/files/Section35-050616.pdf

916-2.3 Reporting: Specification compliance testing results shall be reported for the tests in the table below, unless noted otherwise. Quality control (QC) testing results shall be reported for original binder DSR (G/sin δ and phase angle, as applicable).

SUPERPAVE PG ASPHALT BINDER		
Test and Method	Conditions	Specification Minimum/Maximum Value
Superpave PG Asphalt Binder Grade		Report
APL Number		Report
Modifier (name and type)	Polymer, Ground Tire Rubber with Approved Product List (APL) number, Sulfur, PPA, REOB, and any Rejuvenating Agents	Report
Original Binder		
Solubility, AASHTO T 44-14	in Trichloroethylene	Minimum 99.0% (Not applicable for PG 76-22 (ARB))
Flash Point, AASHTO T 48-06 (2015)	Cleveland Open Cup	Minimum 450ºF
Rotational Viscosity, AASHTO T 316-13	275ºF	Maximum 3 Pa·s[(a)]
Dynamic Shear Rheometer [(b)], AASHTO T 315-12	$G^*/\sin\delta$	Minimum 1.00 kPa
	Phase Angle, δ[(c)] PG 76-22 (PMA) and PG 76-22 (ARB)[(d)] PG 82-22 (PMA)	Maximum 75 degrees Maximum 65 degrees

Separation Test, ASTM D 7173-14 and Softening Point, AASHTO T 53-09 (2013)	163±5°C 48 hours	 Maximum 15°F (PG 76-22 (ARB) only)
Rolling Thin Film Oven Test Residue (AASHTO T 240-09)		
Rolling Thin Film Oven, AASHTO T 240-13	Mass Change %	Maximum 1.00
Multiple Stress Creep Recovery, $J_{nr,\ 3.2}$ AASHTO M 332-14	Grade Temperature (Unmodified binders only)	"S" = 4.50kPa^{-1} max
Multiple Stress Creep Recovery, $J_{nr,\ 3.2}$[(d, e, f)] AASHTO M 332-14	67°C (Modified binders only)	"V" = 1.0 kPa^{-1} max "E" = 0.5 kPa^{-1} max Maximum $J_{nr,diff}$ = 75%
Multiple Stress Creep Recovery, %Recovery[(d, e)] AASHTO M 332-14	67°C (Modified binders only)	$\%R_{3.2} \geq 29.37 (J_{nr,\ 3.2})^{-0.2633}$
Pressure Aging Vessel Residue (AASHTO R 28-12)		
Dynamic Shear Rheometer, AASHTO T 315-12	$G^*\sin\delta$, 10 rad/sec.	Maximum 5000 kPa[(f, g)]
Creep Stiffness, AASHTO T 313-12	S (Stiffness), @ 60 sec. m-value, @ 60 sec.	Maximum 300 MPa Minimum 0.300

(a) Binders with values higher than 3 Pa·s should be used with caution and only after consulting with the supplier as to any special handling procedures, including pumping capabilities.
(b) Dynamic Shear Rheometer (AASHTO T 315) shall be performed on original binders for the purposes of QC testing only.
(c) The original binder phase angle (AASHTO T 315-12) shall be performed at grade temperature.
(d) AASHTO T 315-12 and AASHTO T 350-14 will be performed at a 2 mm gap for PG 76-22 (ARB)
(e) All binders with a high temperature designation >67 will be tested at 67°C. PG 76-22 (PMA) and PG 76-22 (ARB) shall pass a "V" graded and PG 82-22 (PMA) shall pass an "E" grade per AASHTO M 332-14.
(f) A maximum Jnr diff = 75% does not apply for any Jnr value ~~<~~≤ 0.5 kPa-1.
(g) For all PG grades of a PG 67 or higher, perform the PAV residue testing at 26.5°C with a maximum of 5000 kPa.

SUBARTICLE 916-3.1 is deleted and the following substituted:

916-3.1 Compliance with Materials Manual: Producers of asphalt emulsions shall meet the requirements of Section 3.4, Volume II of the Department's Material Manual, which may be viewed at the following URL:
~~http://www.dot.state.fl.us/programmanagement/Implemented/URLinSpecs/files/Section3.4V2.shtm~~
http://www.dot.state.fl.us/programmanagement/Implemented/URLinSpecs/files/Section34-050616.pdf

ARTICLE 916-4 is deleted and the following substituted:

916-4 Liquid Anti-strip Agents.

916-4.1 Requirements: Liquid anti-strip agents shall be tested in accordance with FM 1-T 283. A minimum tensile strength ratio of 0.80 must be obtained when testing the liquid anti-strip with various aggregate sources and two nominal maximum aggregate size mixtures for approval to be placed on the APL. ~~Specific requirements are contained in the APL process.~~

916-4.2 Mix Design Verification: ~~Inclusion of a liquid anti-strip agent on the APL does not guarantee that the anti-strip will be approved for use in an asphalt mixture.~~ Particular aggregate sources may require moisture susceptibility testing per FM 1-T 283 for each mix design. Results from this testing may meet the Department's requirement of minimum tensile strength ratio of 0.80 or may indicate the need for a larger dosage rate of anti-strip agent (up to 0.75% maximum) or may require a different anti-strip agent to meet the specification requirements.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

August 8, 2016

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

Re: State Specifications Office
Section **960**
Proposed Specification: **9600202 Post-Tensioning Components.**

Dear Mr. Nguyen:

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

The changes are proposed by Charles Boyd of the State Structures Design Office to adopt the new fib Bulletin 75 criteria for corrugated post tensioning ducts and make other various changes related to flexible filler injection.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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/ot
Attachment
cc: Florida Transportation Builders' Assoc.
State Construction Engineer

POST-TENSIONING COMPONENTS.
(REV ~~5-276-38-5~~-16)

SUBARTICLE 960-2.1(5) is deleted and the following substituted:

5. Test anchorages in accordance with AASHTO LRFD Bridge Construction Specifications, or the Guideline for European Technical Approval of Post-Tensioning Kits for Prestressing of Structures (ETAG-013, June 2002 edition) with the exception that the design concrete strength used in the testing will be 6,500 psi. For anchorages that will be used for tendons with flexible filler, test anchorages in accordance with ETAG-013 Section 6.1.2-I~~, with the exception that the design concrete strength used in the testing will be 6,500 psi~~.

SUBARTICLE 960-2.2.1.1 is deleted and the following substituted:

960-2.2.1.1 Corrugated Plastic Duct:

1. PT systems with duct injected with grout shall use corrugated polypropylene plastic material except where steel pipe is required.

2. Furnish ducts with minimum wall thickness as follows:

Table 2.2.1.1-1: Corrugated Plastic Duct Minimum Wall Thicknesses

Duct Shape	Duct Diameter	Duct *Wall* Thickness
Flat	Any Size	0.08 inch
Round	0.9 inch	0.08 inch
Round	2.375 inch	0.08 inch
Round	3.0 inch	0.10 inch
Round	3.35 inch	0.10 inch
Round	4.0 inch	0.12 inch
Round	4.5 inch	0.14 inch
Round	5.125 inch	0.16 inch
Round	5.71 inch	0.16 inch

SUBARTICLE 960-2.2.1.3 is deleted and the following substituted:

960-2.2.1.3 Steel Pipe:

~~Where specified in the Contract Documents, s~~Steel pipes shall be *ASTM A53, Type E, Grade B,* Schedule 40 and galvanized in accordance with Section 962.

SUBARTICLE 960-2.2.1.5 is deleted and the following substituted:

960-2.2.1.5 Connections, Fittings, and Tolerance:

1. Devices or methods for all duct connections (e.g., splices, joints, couplers, connection to anchorages), shall produce smooth interior alignment with no lips or kinks.

2. Use of tape is not permitted to join or repair duct, to make connections, or for any other purpose.

3. Use a reducer when adjacent sections of duct are directly connected to each other and the outside diameters vary more than plus or minus 0.08 inch.

4. Provide all connections that are external to the concrete with a minimum pressure rating of ~~100~~ *150* psi.

5. Use heat shrink sleeves and circular sleeve couplers made from polyolefin or polypropylene material, or duct couplers made from polyolefin or polypropylene material with O-rings or seals to make connections between sections of corrugated plastic duct or between corrugated plastic duct and trumpets.

6. Use heat shrink sleeves and circular sleeve couplers made from polyolefin or polypropylene material to make connections between corrugated plastic duct and steel pipe.

7. Use heat shrink sleeves with or without circular sleeve couplers made from polyolefin or polypropylene material to make connections between corrugated plastic duct and anchorages with integral trumpets.

8. Use heat welding techniques, electrofusion duct couplers, or elastomer sleeves and stainless steel band clamps to make connections between sections of smooth plastic duct.

9. Use elastomer sleeves and stainless steel band clamps to make connections between smooth plastic duct and steel pipe.

10. Use welding or elastomer sleeves and stainless steel band clamps to make connections between sections of steel pipe that are external to the concrete.

11. Use welding, elastomer sleeves and stainless steel band clamps or heat shrink sleeves and circular sleeve couplers made from polyolefin or polypropylene material to make connections between steel pipe and trumpets that are internal to the concrete.

12. Use elastomer sleeves with a minimum wall thickness of 3/8 inches and reinforced with a minimum of four ply polyester reinforcement. Use a 3/8 inch wide stainless steel power seated band and clamps on each end of the elastomer sleeves to secure the sleeves to plastic ducts or steel pipes. Seat the bands with a 120 pound force prior to clamping them in place.

SUBARTICLE 2.4.6 is deleted and the following substituted:

960-2.4.6 Elastomer Sleeves:

Conform to all of the following:

1. Meet requirements of ASTM D1171 using Ozone Chamber Exposure Method B (no cracks permitted under 2X magnification).

2. *Manufactured using* ~~Constructed of~~ an elastic polymeric material that is compatible with *concrete,* the ~~in-situ conditions and~~ PT system components *to which the sleeves will be attached, and* ~~including~~ the filler material and filler material installation process. *Identify the applicable ASTM specification~~(~~s~~)~~ that the sleeve material complies with.*

ARTICLE 960-3 is deleted and the following substituted:

960-3 System Pre-Approval Requirements.

960-3.1 Independent Testing:

Use independent laboratories meeting the credentials described in this Section to perform all testing and to submit certified test reports for materials and components. Certification may be performed by a qualified independent laboratory outside of the United States, only if the facility is pre-approved by the State Materials Office.

Conform all testing procedures used for materials or components to applicable American Society of Testing and Materials (ASTM) and International Federation of Structural Concrete (fib) Specifications or as modified in this Section.

960-3.1.1 Material Laboratory:

Test plastic components in a certified independent laboratory accredited through the laboratory accreditation program of the Geosynthetic Accreditation Institute (GAI) or the American Association for Laboratory Accreditation (A2LA).

960-3.1.2 Component and System Laboratory:

Test individual components and the PT system as a whole witnessed by and/or in a certified independent laboratory audited by the AASHTO Materials Reference Laboratory (AMRL).

960-3.2 Testing Requirements:

960-3.2.1 *Component and* System ~~Pressure~~ Test*s*:

~~1. For each Family of PT systems, assemble system as detailed on the system drawings and perform pressure tests defined in this Article. A family of PT systems is a group of PT tendon/bar assemblies of various sizes using common anchorage devices and design.~~

~~2. Perform tests on the largest assembly and the smallest assembly for each family of PT systems.~~

~~3. Include in system test at least one of each component required to install a tendon from anchorage cap to anchorage cap.~~

~~4. Include plastic duct to steel pipe connections and segment duct couplers, if applicable.~~*Corrugated duct, smooth duct and all associated components that are used for both internal and external PT systems, e.g. couplers, anchorages, inlets, outlets, valves, plugs, etc., shall meet the requirements of fib Technical Report Bulletin 75 titled, "Polymer-Duct Systems for Internal Bonded Post-Tensioning", Performance Level 2 (PL2), with modifications as shown in Table 3.2.1-1.*

Table 3.2.1-1 Required Component and System Tests

Reference to fib Bulletin 75			*Required Tests for each PT System Type*[1]		
Procedures	*Appendix*	*Test Description*	*Internal PT System with Grout*	*Internal PT System with Flexible Filler*	*External PT System with Flexible*

					Filler
Component Assessment	A.1	Dimensional requirement	Yes	~~Yes~~No	~~Yes~~No
	A.2	Stiffness of duct	Yes[2]	~~Yes[2]~~No	~~Yes[2]~~No
	A.3	Longitudinal load resistance	Yes	Yes	Yes
	A.4	Lateral load resistance	Yes	~~Yes~~No	No
	A.5	Flexibility of duct system	Yes	Yes	No
	A.6	Leak tightness of duct system	Yes	Yes	No
	A.7	Concrete pressure on duct	Yes[3]	~~Yes[3]~~No	No
	A.8	Wear resistance of duct	Yes	No	No
	A.9	Wear resistance of duct under sustained load	Yes	No	No
	A.10	Bond behavior of duct	Yes	No	No
	A.11	Precast segmental duct coupler system	Yes[4]	Yes[4]	No
	A.12	Fracture resistance of duct	No	No	No
System Assessment	B.1	Leak tightness of anchorage-duct assembly	Yes[5]	Yes[5]	Yes[5]
	B.2	EIT performance of duct system	No	No	No
	B.3	EIT performance of anchorage-duct assembly	No	No	No
	B.4	Full scale duct system assembly	Yes[5][6]	Yes[5][6]	Yes[5][6]
	B.5	Leak tightness of assembled duct system	Yes[5][6]	Yes([5][6]	No

1. Yes = Test is required; No = Test is not required.
2. Do not preload strand into duct prior to testing.
3. Identify duct as meeting Performance Class I or II criteria.
4. Use an epoxy meeting the requirements of Section 926, Type B.
5. Perform tests on the largest assembly and the smallest assembly for each family of PT systems. A family of PT systems is defined a group of PT strand/bar assemblies of various sizes using common anchorage devices and design.
6. For each test, use a PT system assembly consisting of at least one of each component and connection type required to install a tendon from anchorage cap to anchorage cap. For bar tendon systems, use between 15 and 50 feet of duct with a straight profile.

960-3.2.~~1.1~~2 Filler Containment Assembly Pressure Test:

In addition to the other testing specified in this Section, test all filler containment assemblies, i.e., anchorages, anchorage caps, inlets, outlets, valves, plugs, etc., as follows:

1. Assemble *the* anchorage and anchorage cap with all required filler injection attachments. ~~(e.g., grout tube, valves, plugs, etc.).~~

2. Seal *the* opening in *the* anchorage where *the* duct*/trumpet* connects.

3. Condition *the* assembly by maintaining a pressure of 150 psi in *the* system for three hours.

4. After conditioning, *lock off the air supply to the assembly.*

5. After lock off, the assembly must sustain 150 psi internal pressure for five minutes with no more than 15 psi, or 10%, reduction in pressure.

This test may be combined ~~wiith~~with the External Duct Systems Pressure Test for external PT systems.

~~5. Filler Containment Assembly Pressure Test requirement will be considered satisfied for systems using same anchorages, anchorage caps, and filler injection attachments as a previously approved system as long as appropriate documentation from the previous submittal and written certification is submitted by system Supplier stating that identical components are used in both assemblies.~~

960-3.2.~~1.2~~*3* External *PT* ~~Duct~~ Systems *Pressure Test*:

In addition to the other testing specified in this Section, test all external PT systems as follows:

1. Prepare a system assembly consisting of at least one of each component and connection type required to install a tendon from anchorage cap to anchorage cap using between 15 and 50 feet of duct with a straight profile.

~~System testing for external duct assemblies requires two additional tests beyond the Filler Containment Assembly Pressure Test requirements:~~

~~1. Anchorage and its connection to duct/pipe assembly must be tested in accordance with and satisfy requirements for the Internal Duct Systems, where duct/pipe assembly consists of all components internal to concrete. Test assembly at 1.5 psi.~~

~~2. Duct/pipe assembly consisting of all external duct connections (e.g., welded duct splices, duct-to-pipe connections, etc.) and vent must meet the following:~~

~~a. Use 15 feet of pipe length for test pipe assembly.~~

~~b~~*2*. Condition *the* assembly by maintaining a pressure of ~~150~~ *100* psi in *the* system for three hours.

~~c~~*3*. After conditioning, *lock off the air supply to the assembly.*

4. After lock off, the assembly must sustain ~~150~~ *100* psi internal pressure for five minutes with no more than ~~15~~ *10* psi~~, or 10%,~~ reduction in pressure.

~~**960-3.2.1.3 Internal Duct Systems:**~~

~~1. Perform system test of assembly for compliance with requirements of Chapter 4, Article 4.2, Stage 1 and Stage 2 Testing contained in fib Technical Report, Bulletin 7 titled, "Corrugated Plastic Duct for Internal Bonded Post-Tensioning".~~

~~2. For bar systems, modify system test length to 15 feet.~~

~~3. For systems being tested for use in precast segmental construction, modify this test to include one duct coupler or "O"-ring assembly intended for use at segment joint:~~

~~a. Test duct coupler for proper function by casting it into a two part concrete test block using match cast techniques. Use blocks that are at least 12 inches x 12 inches x 12 inches.~~

~~b. After concrete has hardened, pull blocks apart and clean surface of any bond breaker materials.~~

~~c. Using an external apparatus, clamp blocks together and maintain 40 psi pressure on block cross-section during pressure test. Do not apply epoxy compound between blocks.~~

~~d. Pressurize duct within test block to 5 psi and lock off outside air source.~~

~~e. Assembly must sustain a 5 psi internal pressure for five minutes with no more than a 0.5 psi, or 10%, reduction in pressure.~~

~~4. Remove clamping device, separate duct coupler blocks from duct system, and place a 1/16 inch layer of epoxy compound (Type B per Section 926) on face of both blocks, clamp blocks together, and maintain a pressure of 40 psi on block cross-section for 24 hours. Upon removal of clamping force, demolish blocks. Duct coupler and attached ducts should be intact and free of epoxy compound and properly attached without crushing, tearing, or other signs of failure.~~

960-3.2.~~1.~~4 *Vacuum Test for Internal and External PT* Systems ~~for use~~ with ~~Vacuum-Assisted~~ Flexible Filler ~~Injection~~: In addition to the *other* testing specified in this Section, *test internal PT systems with flexible filler and* all *external* PT ~~systems that will be used in conjunction with vacuum-assisted flexible filler injection must meet the following requirements~~*as follows*:

1. Prepare a system assembly consisting of at least one of ~~the~~ each component *and connection type* required to install a tendon from anchorage cap to anchorage cap using *between* 15 *and 50* feet of duct.

2. Condition the assembly by maintaining a 90% vacuum in it for 1 hour.

3. After conditioning, *lock off the air supply to the assembly.*

4. After lock off, the assembly must sustain a 90% vacuum for 5 minutes with no more than a 10% loss of vacuum.

~~**960-3.2.2 Minimum Bending Radius:**~~

~~Establish bending radius for duct through testing. Test consists of a modified duct wear test as described in Chapter 4, Article 4.1.7 of fib Technical Report, Bulletin 7 titled, "Corrugated Plastic Duct for Internal Bonded Post-Tensioning". Use identical test apparatus as that used for wear test with same clamping force as a function of number of strands in a duct.~~

~~1. Modify procedure as follows: After the specimen has reached its final position, remove the specimen and confirm that the residual thickness is adequate. With confirmation that the residual thickness is acceptable, immediately (within 30 minutes) reapply the original clamping force for 14 days.~~

~~2. Upon completion of test, remove duct and measure wall thickness along strand path. Wall thickness must not be less than 0.03 inches for duct up to 3.35 inches diameter and not less than 0.04 inches for duct greater than 3.35 inches diameter.~~

~~**960-3.2.3 Additional Material Tests:**~~

~~Ensure internal duct system components and accessories meet requirements of Chapter 4, Articles 4.1.1 through 4.1.8 of International Federation of Structural Concrete (fib) Technical Report, Bulletin 7 titled, "Corrugated Plastic Duct for Internal Bonded Post-Tensioning" as modified below:~~

~~1. Conduct lateral load resistance test (fib 4.1.4) without use of a duct stiffener plate using a 150 pound load for all sizes.~~

~~2. Wear resistance of duct (fib 4.1.7) as modified in this Section.~~

~~3. Bond length test (fib 4.1.8) must achieve 40% of GUTS in a maximum length of 16 duct diameters.~~

~~4. For smooth duct injected with flexible filler, fib 4.1.1 through 4.1.8 does not apply.~~

960-3.3 *Standard Tendon*~~Required~~ Sizes:

Develop and test PT systems for both internal and external applications *that can accommodate*~~for~~ the following *Department standard tendon sizes that are used for designing and detailing*:

1. ~~Department s~~*S*tandard *strand* tendon sizes*:* ~~for designing and detailing consist of 0.6 inch diameter strand in anchorages containing~~ 4, 7, 12, 15, 19, 27, and 31 strand *tendon*s, *each using 0.6 inch diameter strand*. *Systems using alternate anchorage sizes* ~~*and/*~~*or 1/2 inch diameter strand that provide equivalent force to these standard sizes may be submitted for approval.*

2. Standard bar *tendon diameters:* ~~sizes range from 5/8 inches to 2-1/2 inches~~ *5/8, 3/4, 1, 1-1/4, 1-3/8, 1-3/4, 2-1/2 and 3 inch* diameter *bars*.

~~3. Systems using alternate anchorage sizes and/or strands utilizing 1/2 inch strand and providing equivalent force to these standard sizes may be submitted for approval.~~

960-3.4 System Modifications:

Contact the SDO for direction before attempting to change pre-approved PT system materials or components. Repeat all appropriate material, component, and entire system tests if any component of a pre-approved PT system is modified or replaced, excluding local zone reinforcement. Submit an updated application to the SDO containing test reports and revised system drawings for proposed modified systems.

960-3.5 Component Samples:

Furnish all required material samples to laboratories for testing and to the Department as requested, at no cost to the Department.

960-3.6 Calculations, Drawings, and Certification:

Show fully detailed drawings of all component configurations, connections, anchorages, inlets, outlets, drains, high point outlet inspection details, anchorage inspection details, permanent anchorage caps, ~~and~~ application limits of the PT system*, and installation procedures of components* for approval and posting on the SDO's website for Approved Post-Tensioning Systems. Submit details of typical local zone reinforcement in system drawings signed and sealed by a Specialty Engineer. Indicate that all PT system components are stamped with the following:

1. Manufacturer's name
2. Trademark model number
3. Size corresponding to catalog description on PT system drawings.

Submit an application package cover letter signed by an officer of the PT system vendor certifying that the submitted PT system, as a whole and all of its individual components, meet or exceed all material and component/system requirements of this Section, as demonstrated by the submittal. Indicate in this certification that all testing required by this Section was performed by a certified independent laboratory (or laboratories), as defined in 960-3.1, and that all tests were performed to applicable ASTM and fib Specifications. Submit proof of current laboratory accreditation specifically indicating applicable accreditation categories related to PT systems. Submit all material and component certifications required throughout this Section.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

July 22, 2016

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

Re: State Specifications Office
Section **975**
Proposed Specification: **9750602 Structural Coating Materials.**

Dear Mr. Nguyen:

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

The changes are proposed by Mark Conley of the State Materials Office (SMO) to clarify the testing requirements for Class 5 applied finish coatings.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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

STRUCTURAL COATING MATERIALS.
(REV 5-25-166-20-167-22-16)

SUBARTICLE 975-6.2 is deleted and the following substituted:

975-6.2 Coating Requirements: UsePrepare four, 4 inch by 8 inch (except as required below) fiber cement test panels with a mass of 7 to 9 pounds per square foot of surface area to perform the laboratory tests. Apply the finish coating to each test panel at a rate of 50 square feet per gallon, plus or minus, 10 square feet per gallon. Seal the corners of all test panels with a high build epoxy or equivalent to prevent moisture ingress at corners and cut edges. Submit the samples to an independent laboratory for testing. Coating performance shall meet the following requirements:

Laboratory Testing		
Property	Test Method	Requirement
Resistance to Wind Driven Rain	ASTM D6904	No visible water leaks, and if the rear face of the block is damp, the average gain in weight of the three 8"x16"x2" blocks must be less than 0.2 lb.
Freeze thaw resistance	AASHTO R31	No disbondment
Water Vapor Transmission	ASTM D1653; Method B, Condition C	WVT≥10 perms
Abrasion Resistance	ASTM D968, 3,000 liters of sand	No loss of coating thickness ASTM D6132
Salt Spray (fog) resistance	ASTM B117, 2,000 hours	No disbondment
Fluorescent UV-Condensation Exposure	ASTM D4587, 2000 hours, 4 hours UV, 4 hours condensation	No blistering (ASTM D714), cracking (visual), or delamination (visual). chalking (ASTM D4214Method D) rating no less than 8.
Fungal Resistance	ASTM D3273	Rating of 10, ASTM D3274

SubmitInclude four fiber cement test panels and a 1 one quart wet sample of each component of each coating incorporated in the total system being evaluated to the SMOwith the submitted APL application. Prepare test panels by applying the finished coating at a rate of 50 plus or minus 10 square feet per gallon. In addition, completely seal the corners of all test panels with a high build epoxy or equivalent to prevent moisture ingress at corners and cut edges.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

May 11, 2016

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

Re: State Specifications Office
Section **350**
Proposed Specification: **SP3500200 Cement Concrete Pavement – Colored Concrete.**

Dear Mr. Nguyen:

We are submitting, for your approval, two copies of the above referenced Special Provision.

The changes are proposed by David Amato of the State Roadway Design Office to create a special provision for colored and/or patterned concrete pavement. It is intended for projects that include roundabout truck aprons that require contrasting color from the roadway pavement.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to 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/ot
Attachment
cc: Florida Transportation Builders' Assoc.
State Construction Engineer

CEMENT CONCRETE PAVEMENT – COLORED CONCRETE.
(REV ~~3-14~~ *~~8~~5-11*-16)

ARTICLE 350-1 is expanded by the following:

Construct colored portland cement concrete pavement as shown in Plans.

ARTICLE 350-2 is deleted and the following substituted:

350-2 Materials.

350-2.1 General: Meet the following requirements:

Concrete, Class I or Class I (Pavement) .....Section 346
Grinding Concrete Pavement.....Section 352
Curing Materials .....Section 925
Embedded Items.....Section 931
Joint Seal.....Section 932

For concrete pavement placed using the slip-form method of construction, utilize Concrete Class I (Pavement). For concrete pavement placed by hand in constructed forms, utilize Concrete Class I or Concrete Class I (Pavement). LOT size for the use of either material shall be as stated in Section 346 for Concrete Class I (Pavement).

350-2.2 Colored Concrete Pavement: *Add coloring agents to the concrete mix in accordance with the manufacturer's recommendations.*

~~-~~Use~~Concrete shall be colored utilizing~~ a ~~water-reducing,~~ mineral oxide containing no calcium chloride. ~~with~~Use only non-fading, finely ground synthetic coloring agents that are lime proof and UV resistant~~ to color concrete pavement~~. The mineral oxide ~~shall~~must closely match the Federal Standard 595C Color number s~~pecified~~hown in the ~~p~~Plans and conform to the requirements of ACI~~-~~ 303.1, ASTM~~-~~ C979, and ASTM~~-~~ C494. Submit to the Engineer a certificate from the manufacturer attesting that the color agents meet the requirements of this Subarticle.

ARTICLE 350-10 is deleted and the following substituted:

350-10 Final Finish.

350-10.1 Finishing: As the water sheen disappears from the surface of the pavement and just before the concrete achieves its initial set, drag a seamless length of damp burlap that extends the full width of the strip of the constructed pavement, longitudinally along the surface to produce a uniform gritty texture.

Use a burlap drag that consists of two layers of medium weight burlap with the trailing edge of the lower layer extending approximately 2 inches behind the upper layer. Support the burlap drag in a manner so that a length of at least 3 feet of burlap is in contact with the pavement.

Except in areas where using hand methods to construct the pavement, support the lead end of the burlap drag by a traveling bridge. Maintain the drag clean and free from encrusted mortar. Replace the burlap with new material as necessary.

350-10.2 Edging: After applying the final finish, but before the concrete has become nonplastic, carefully round the edges to a 1/4 inch radius on each side of transverse expansion joints and construction joints and along any structure extending into the pavement. Produce a well-defined and continuous radius, and obtain a smooth, dense mortar finish. Completely remove all concrete from the top of the joint filler.

Check all joints with a straightedge before the concrete has become nonplastic, and, if one side of the joint is higher than the other or the entire joint is higher or lower than the adjacent slabs, make corrections as necessary.

350-10.3 Colored Concrete Pavement: *Imprint concrete as ~~detailed~~shown in the ~~p~~Plans. If no imprint finish is shown in the Plans,~~, otherwise~~ finish in accordance with ~~350-10~~this Article.*