



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

August 12, 2021

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

Re: State Specifications Office  
Section: **001**  
Proposed Specification: **0010300 Definitions and Terms.**

Dear Mr. Nguyen:

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

The changes are proposed by Tim Lattner from the State Office of Design to add the definition of Estimated Quantities Report (EQR) and provide clarification to refer to the EQR when the Plans don't include quantity related information. Changes were also proposed by Scott Arnold from the State Construction Office to add definitions for Request for Information, Request for Modification, and Request for Correction to reduce delays in responding to these types of requests.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**DEFINITIONS AND TERMS**  
**(REV 5-28-21)**

ARTICLE 1-3 is deleted and the following substituted:

**1-3 Definitions.**

The following terms, when used in the Contract Documents, have the meaning described

**Advertisement.**

The public announcement, as required by law, inviting bids for work to be performed or materials to be furnished, usually issued as “Notice to Contractors,” or “Notice to Bidders.”

**Article.**

The numbered prime subdivision of a Section of these Specifications.

**Bidder.**

An individual, firm, or corporation submitting a proposal for the proposed work.

**Bridge.**

A structure, including supports, erected over a depression or over an obstruction such as water, highway or railway, or for elevated roadway, for carrying traffic or other moving loads, and having a length, measured along the center of the roadway, of more than 20 feet between the inside faces of end supports. A multiple-span box culvert is considered a bridge, where the length between the extreme ends of the openings exceeds 20 feet.

**Calendar day.**

Every day shown on the calendar, ending and beginning at midnight.

**Contract.**

The term “Contract” means the entire and integrated agreement between the parties thereunder and supersedes all prior negotiations, representations, or agreements, either written or oral. The Contract Documents form the Contract between the Department and the Contractor setting forth the obligations of the parties thereunder, including, but not limited to, the performance of the Work and the basis of payment.

**Contract Bond.**

The security furnished by the Contractor and the surety as a guaranty that the Contractor shall fulfill the terms of the Contract and pay all legal debts pertaining to the construction of the project.

**Contract Claim (Claim).**

A written demand submitted to the Department by the Contractor in compliance with 5-12.3 seeking additional monetary compensation, time, or other adjustments to the Contract, the entitlement or impact of which is disputed by the Department.

**Contract Documents.**

The term “Contract Documents” includes: Advertisement for Proposal, Proposal, Certification as to Publication and Notice of Advertisement for Proposal, Appointment of Agent by Nonresident Contractors, Noncollusion Affidavit, Warranty Concerning Solicitation of the Contract by Others, Resolution of Award of Contract, Executed Form of Contract, Performance Bond and Payment Bond, Specifications, Plans (including revisions thereto issued during construction), Estimated Quantities Report, Standard Plans, Addenda, or other information mailed or otherwise transmitted to the prospective bidders prior to the receipt of bids, work orders and supplemental agreements, all of which are to be treated as one instrument whether or not set forth at length in the form of contract.

Note: As used in Sections 2 and 3 only, Contract Documents do not include work orders, and supplementary agreements. As used in Section 2 only, Contract Documents also do not include Resolution of Award of Contract, Executed Form of Contract, and Performance and Payment Bond.

**Contract Letting.**

The date that the Department opened the bid proposals.

**Contract Time.**

The number of calendar days allowed for completion of the Contract work, including authorized time extensions.

**Contractor.**

The individual, firm, joint venture, or company contracting with the Department to perform the work.

**Contractor’s Engineer of Record.**

A Professional Engineer registered in the State of Florida, other than the Engineer of Record or his subcontracted consultant, who undertakes the design and drawing of components of the permanent structure as part of a redesign or Cost Savings Initiative Proposal, or for repair designs and details of the permanent work. The Contractor’s Engineer of Record may also serve as the Specialty Engineer.

The Contractor’s Engineer of Record must be an employee of a pre-qualified firm. The firm shall be pre-qualified in accordance with the Rules of the Department of Transportation, Chapter 14-75. Any Corporation or Partnership offering engineering services must hold a Certificate of Authorization from the Florida Department of Business and Professional Regulation.

As an alternate to being an employee of a pre-qualified firm, the Contractor’s Engineer of Record may be a Department-approved Specialty Engineer. For items of the permanent work declared by the State Construction Office to be “major” or “structural”, the work performed by a Department-approved Specialty Engineer must be checked by another Department-approved Specialty Engineer. An individual Engineer may become a Department-approved Specialty Engineer if the individual meets the Professional Engineer experience requirements set forth within the individual work groups in Chapter 14-75, Rules of the Department of Transportation, Florida Administrative Code. Department-approved Specialty Engineers are listed on the State Construction Website. Department-approved Specialty Engineers will not be authorized to perform redesigns or Cost Savings Initiative Proposal designs of items fully detailed in the Plans.

**Controlling Work Items.**

The activity or work item on the critical path having the least amount of total float. The controlling item of work will also be referred to as a Critical Activity.

**Culverts.**

Any structure not classified as a bridge that provides an opening under the roadway.

**Delay.**

Any unanticipated event, action, force or factor which extends the Contractor's time of performance of any controlling work item under the Contract. The term "delay" is intended to cover all such events, actions, forces or factors, whether styled "delay", "disruption", "interference", "impedance", "hindrance", or otherwise, which are beyond the control of and not caused by the Contractor, or the Contractor's subcontractors, materialmen, suppliers or other agents. This term does not include "extra work".

**Department.**

State of Florida Department of Transportation.

**Developmental Specification.**

See definition for Specifications.

**Engineer.**

The Director, Office of Construction, acting directly or through duly authorized representatives; such representatives acting within the scope of the duties and authority assigned to them.

Note: In order to avoid cumbersome and confusing repetition of expressions in these Specifications, it is provided that whenever anything is, or is to be done, if, as, or, when, or where "acceptable, accepted, approval, approved, authorized, condemned, considered necessary, contemplated, deemed necessary, designated, determined, directed, disapproved, established, given, indicated, insufficient, ordered, permitted, rejected, required, reserved, satisfactory, specified, sufficient, suitable, suspended, unacceptable, or unsatisfactory," it shall be understood as if the expression were followed by the words "by the Engineer," "to the Engineer," or "of the Engineer."

**Engineer of Record.**

The Professional Engineer or Engineering Firm registered in the State of Florida that develops the criteria and concept for the project, performs the analysis, and is responsible for the preparation of the Plans and Specifications. The Engineer of Record may be Departmental in-house staff or a consultant retained by the Department.

The Contractor shall not employ the Engineer of Record as the Contractor's Engineer of Record or as a Specialty Engineer.

**Equipment.**

The machinery and equipment, together with the necessary supplies for upkeep and maintenance thereof, and all other tools and apparatus necessary for the construction and acceptable completion of the work.

**Estimated Quantities Report.**

The Estimated Quantities Report contains pay item and quantity information for the project. When the Plans do not adequately describe quantity related information, refer to the Estimated Quantities Report.

**Extra Work.**

Any “work” which is required by the Engineer to be performed and which is not otherwise covered or included in the project by the existing Contract Documents, whether it be in the nature of additional work, altered work, deleted work, work due to differing site conditions, or otherwise. This term does not include a “delay”.

**Federal, State, and Local Rules and Regulations.**

The term “Federal, State and Local Rules and Regulations” includes: any and all Federal, State, and Local laws, bylaws, ordinances, rules, regulations, orders, permits, or decrees including environmental laws, rules, regulations, and permits.

**Highway, Street, or Road.**

A general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

**Holidays.**

Days designated by the State Legislature or Cabinet as holidays, which include, but are not limited to, New Year’s Day, Martin Luther King’s Birthday, Memorial Day, Independence Day, Labor Day, Veterans’ Day, Thanksgiving Day and the following Friday, and Christmas Day.

**Inspector.**

An authorized representative of the Engineer, assigned to make official inspections of the materials furnished and of the work performed by the Contractor.

**Laboratory.**

The official testing laboratory used by the Department.

**Major Item of Work.**

Any item of work having an original Contract value in excess of 5% of the original Contract amount.

**Materials.**

Any substances to be incorporated in the work under the Contract.

**Median.**

The portion of a divided highway or street separating the traveled ways for traffic moving in opposite directions.

**Plans.**

The approved Plans, including reproductions thereof, showing the location, character, dimensions, and details of the work.

**Proposal (Bid, Bid Proposal).**

The offer of a bidder, on the prescribed form, to perform the work and to furnish the labor and materials at the prices quoted.

**Proposal Form.**

The official form or the electronically generated bid item sheets on which the Department requires formal bids to be prepared and submitted for the work.

**Proposal Guaranty.**

The security furnished by the bidder as guaranty that the bidder will enter into the Contract for the work if the Department accepts the proposal.

**Request for Correction.**

A document initiated by the Contractor proposing a method for correction of work that is not in compliance with the Contract Documents. The Request for Correction is submitted to the Engineer for review and disposition.

**Request for Information.**

A document initiated by the Contractor that is submitted to the Engineer for interpretation of a Contract Document provision, the meaning of which is not clear to the Contractor; errors, omissions, or conflicts in the Contract Documents that are identified by the Contractor; or a pay adjustment or entitlement.

**Request for Modification.**

A document initiated by the Contractor requesting to modify the Contract Documents, that is submitted to the Engineer for review and disposition.

**Right-of-Way.**

The land that the Department has title to, or right of use, for the road and its structures and appurtenances, and for material pits furnished by the Department.

**Roadbed.**

The portion of the roadway occupied by the subgrade and shoulders.

**Roadway.**

The portion of a highway within the limits of construction.

**Secretary.**

Secretary of Transportation, State of Florida Department of Transportation, acting directly or through an assistant or other representative authorized by him; the chief officer of the Department of Transportation.

**Section.**

A numbered prime division of these Specifications.

**Special Event.**

Any event, including but not limited to, a festival, fair, run or race, motorcade, parade, civic activity, cultural activity, charity or fund drive, sporting event, or similar activity designated in the Contract Documents.

**Special Provisions.**

See definition for Specifications.

**Specialty Engineer.**

A Professional Engineer registered in the State of Florida, other than the Engineer of Record or his subcontracted consultant, who undertakes the design and drawing preparation of components, systems, or installation methods and equipment for specific temporary portions of the project work or for special items of the permanent works not fully detailed in the Plans and required to be furnished by the Contractor. The Specialty Engineer may also provide designs and details, repair designs and details, or perform Engineering Analyses for items of the permanent work declared by the State Construction Office to be “minor” or “non-structural”.

For items of work not specifically covered by the Rules of the Department of Transportation, a Specialty Engineer is qualified if he has the following qualifications:

1. Registration as a Professional Engineer in the State of Florida.
2. The education and experience necessary to perform the submitted design as required by the Florida Department of Business and Professional Regulation.

**Specifications.**

The directions, provisions, and requirements contained herein, together with all stipulations contained in the Contract Documents, setting out or relating to the method and manner of performing the work, or to the quantities and qualities of materials and labor to be furnished under the Contract.

Standard Specifications: “Standard Specifications for Road and Bridge Construction” an electronic book, applicable to all Department Contracts containing adopted requirements, setting out or relating to the method or manner of performing work, or to the quantities and qualities of materials and labor.

Supplemental Specifications: Approved additions and revisions to the Standard Specifications, applicable to all Department Contracts.

Special Provisions: Specific clauses adopted by the Department that add to or revise the Standard Specifications or supplemental specifications, setting forth conditions varying from or additional to the Standard Specifications applicable to a specific project.

Technical Special Provisions: Specifications, of a technical nature, prepared, signed, and sealed by an Engineer registered in the State of Florida other than the State Specifications Engineer or his designee, that are made part of the Contract as an attachment to the Contract Documents.

Developmental Specification: A specification developed around a new process, procedure, or material.

**Standard Plans.**

“Standard Plans for Road and Bridge Construction”, an electronic book describing and detailing aspects of the Work. Where the term Design Standards appears in the Contract Documents, it will be synonymous with Standard Plans.

**Standard Specifications.**

See definition for Specifications.

**State.**

State of Florida.

**Subarticle.**

A headed and numbered subdivision of an Article of a Section of these Specifications.

**Subgrade.**

The portion of the roadbed immediately below the base course or pavement, including below the curb and gutter, valley gutter, shoulder and driveway pavement. The subgrade limits ordinarily include those portions of the roadbed shown in the Plans to be constructed to a design bearing value or to be otherwise specially treated. Where no limits are shown in the Plans, the subgrade section extends to a depth of 12 inches below the bottom of the base or pavement and outward to 6 inches beyond the base, pavement, or curb and gutter.

**Substructure.**

All of that part of a bridge structure below the bridge seats, including the parapets, backwalls, and wingwalls of abutments.

**Superintendent.**

The Contractor's authorized representative in responsible charge of the work.

**Superstructure.**

The entire bridge structure above the substructure, including anchorage and anchor bolts, but excluding the parapets, backwalls, and wingwalls of abutments.

**Supplemental Agreement.**

A written agreement between the Contractor and the Department, and signed by the surety, modifying the Contract within the limitations set forth in these Specifications.

**Supplemental Specifications.**

See definition for Specifications.

**Surety.**

The corporate body that is bound by the Contract Bond with and for the Contractor and responsible for the performance of the Contract and for payment of all legal debts pertaining thereto.

**Technical Special Provisions.**

See definition for Specifications.

**Traveled Way.**

The portion of the roadway for the movement of vehicles, exclusive of shoulders and bicycle lanes.



**Unilateral Payment.**

A payment of money made to the Contractor by the Department pursuant to Section 337.11(12), Florida Statutes (2009), for sums the Department determines to be due to the Contractor for work performed on the project, and whereby the Contractor by acceptance of such payment does not waive any rights the Contractor may otherwise have against the Department for payment of any additional sums the Contractor claims are due for the work.

**Work.**

All labor, materials and incidentals required to execute and complete the requirements of the Contract including superintendence, use of equipment and tools, and all services and responsibilities prescribed or implied.

**Work Order.**

A written agreement between the Contractor and the Department modifying the Contract within the limitations set forth in these Specifications. Funds for this agreement are drawn against the Initial Contingency Pay Item or a Contingency Supplemental Agreement.

**Working Day.**

Any calendar day on which the Contractor works or is expected to work in accordance with the approved work progress schedule.



*Florida Department of Transportation*

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KEVIN J. THIBAUT, P.E.  
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August 20, 2021

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Director, Office of Technical Services  
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3500 Financial Plaza, Suite 400  
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**Controlling Work Items.**

The activity or work item on the critical path having the least amount of total float. The controlling item of work will also be referred to as a Critical Activity.

**Culverts.**

Any structure not classified as a bridge that provides an opening under the roadway.

**Delay.**

Any unanticipated event, action, force or factor which extends the Contractor's time of performance of any controlling work item under the Contract. The term "delay" is intended to cover all such events, actions, forces or factors, whether styled "delay", "disruption", "interference", "impedance", "hindrance", or otherwise, which are beyond the control of and not caused by the Contractor, or the Contractor's subcontractors, materialmen, suppliers or other agents. This term does not include "extra work".

**Department.**

State of Florida Department of Transportation.

**Developmental Specification.**

See definition for Specifications.

**Engineer.**

The Director, Office of Construction, acting directly or through duly authorized representatives; such representatives acting within the scope of the duties and authority assigned to them.

Note: In order to avoid cumbersome and confusing repetition of expressions in these Specifications, it is provided that whenever anything is, or is to be done, if, as, or, when, or where "acceptable, accepted, approval, approved, authorized, condemned, considered necessary, contemplated, deemed necessary, designated, determined, directed, disapproved, established, given, indicated, insufficient, ordered, permitted, rejected, required, reserved, satisfactory, specified, sufficient, suitable, suspended, unacceptable, or unsatisfactory," it shall be understood as if the expression were followed by the words "by the Engineer," "to the Engineer," or "of the Engineer."

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The Contractor shall not employ the Engineer of Record as the Contractor's Engineer of Record or as a Specialty Engineer.

**Equipment.**

The machinery and equipment, together with the necessary supplies for upkeep and maintenance thereof, and all other tools and apparatus necessary for the construction and acceptable completion of the work.

**Estimated Quantities Report.**

The Estimated Quantities Report contains pay item and quantity information for the project. When the Plans do not adequately describe quantity related information, refer to the Estimated Quantities Report.

**Extra Work.**

Any “work” which is required by the Engineer to be performed and which is not otherwise covered or included in the project by the existing Contract Documents, whether it be in the nature of additional work, altered work, deleted work, work due to differing site conditions, or otherwise. This term does not include a “delay”.

**Federal, State, and Local Rules and Regulations.**

The term “Federal, State and Local Rules and Regulations” includes: any and all Federal, State, and Local laws, bylaws, ordinances, rules, regulations, orders, permits, or decrees including environmental laws, rules, regulations, and permits.

**Highway, Street, or Road.**

A general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

**Holidays.**

Days designated by the State Legislature or Cabinet as holidays, which include, but are not limited to, New Year’s Day, Martin Luther King’s Birthday, Memorial Day, Independence Day, Labor Day, Veterans’ Day, Thanksgiving Day and the following Friday, and Christmas Day.

**Inspector.**

An authorized representative of the Engineer, assigned to make official inspections of the materials furnished and of the work performed by the Contractor.

**Laboratory.**

The official testing laboratory used by the Department.

**Major Item of Work.**

Any item of work having an original Contract value in excess of 5% of the original Contract amount.

**Materials.**

Any substances to be incorporated in the work under the Contract.

**Median.**

The portion of a divided highway or street separating the traveled ways for traffic moving in opposite directions.

**Plans.**

The approved Plans, including reproductions thereof, showing the location, character, dimensions, and details of the work.

**Proposal (Bid, Bid Proposal).**

The offer of a bidder, on the prescribed form, to perform the work and to furnish the labor and materials at the prices quoted.

**Proposal Form.**

The official form or the electronically generated bid item sheets on which the Department requires formal bids to be prepared and submitted for the work.

**Proposal Guaranty.**

The security furnished by the bidder as guaranty that the bidder will enter into the Contract for the work if the Department accepts the proposal.

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A document initiated by the Contractor proposing a method for correction of work that is not in compliance with the Contract Documents. The Request for Correction is submitted to the Engineer for review and disposition.

**Request for Information.**

A document initiated by the Contractor that is submitted to the Engineer for interpretation of a Contract Document provision, the meaning of which is not clear to the Contractor. The Request for Information is submitted to the Engineer for review and disposition.

**Request for Modification.**

A document initiated by the Contractor requesting to modify the Contract Documents, that is submitted to the Engineer for review and disposition.

**Right-of-Way.**

The land that the Department has title to, or right of use, for the road and its structures and appurtenances, and for material pits furnished by the Department.

**Roadbed.**

The portion of the roadway occupied by the subgrade and shoulders.

**Roadway.**

The portion of a highway within the limits of construction.

**Secretary.**

Secretary of Transportation, State of Florida Department of Transportation, acting directly or through an assistant or other representative authorized by him; the chief officer of the Department of Transportation.

**Section.**

A numbered prime division of these Specifications.

**Special Event.**

Any event, including but not limited to, a festival, fair, run or race, motorcade, parade, civic activity, cultural activity, charity or fund drive, sporting event, or similar activity designated in the Contract Documents.

**Special Provisions.**

See definition for Specifications.

**Specialty Engineer.**

A Professional Engineer registered in the State of Florida, other than the Engineer of Record or his subcontracted consultant, who undertakes the design and drawing preparation of components, systems, or installation methods and equipment for specific temporary portions of the project work or for special items of the permanent works not fully detailed in the Plans and required to be furnished by the Contractor. The Specialty Engineer may also provide designs and details, repair designs and details, or perform Engineering Analyses for items of the permanent work declared by the State Construction Office to be “minor” or “non-structural”.

For items of work not specifically covered by the Rules of the Department of Transportation, a Specialty Engineer is qualified if he has the following qualifications:

1. Registration as a Professional Engineer in the State of Florida.
2. The education and experience necessary to perform the submitted design as required by the Florida Department of Business and Professional Regulation.

**Specifications.**

The directions, provisions, and requirements contained herein, together with all stipulations contained in the Contract Documents, setting out or relating to the method and manner of performing the work, or to the quantities and qualities of materials and labor to be furnished under the Contract.

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Supplemental Specifications: Approved additions and revisions to the Standard Specifications, applicable to all Department Contracts.

Special Provisions: Specific clauses adopted by the Department that add to or revise the Standard Specifications or supplemental specifications, setting forth conditions varying from or additional to the Standard Specifications applicable to a specific project.

Technical Special Provisions: Specifications, of a technical nature, prepared, signed, and sealed by an Engineer registered in the State of Florida other than the State Specifications Engineer or his designee, that are made part of the Contract as an attachment to the Contract Documents.

Developmental Specification: A specification developed around a new process, procedure, or material.

**Standard Plans.**

“Standard Plans for Road and Bridge Construction”, an electronic book describing and detailing aspects of the Work. Where the term Design Standards appears in the Contract Documents, it will be synonymous with Standard Plans.

**Standard Specifications.**

See definition for Specifications.



**State.**

State of Florida.

**Subarticle.**

A headed and numbered subdivision of an Article of a Section of these Specifications.

**Subgrade.**

The portion of the roadbed immediately below the base course or pavement, including below the curb and gutter, valley gutter, shoulder and driveway pavement. The subgrade limits ordinarily include those portions of the roadbed shown in the Plans to be constructed to a design bearing value or to be otherwise specially treated. Where no limits are shown in the Plans, the subgrade section extends to a depth of 12 inches below the bottom of the base or pavement and outward to 6 inches beyond the base, pavement, or curb and gutter.

**Substructure.**

All of that part of a bridge structure below the bridge seats, including the parapets, backwalls, and wingwalls of abutments.

**Superintendent.**

The Contractor's authorized representative in responsible charge of the work.

**Superstructure.**

The entire bridge structure above the substructure, including anchorage and anchor bolts, but excluding the parapets, backwalls, and wingwalls of abutments.

**Supplemental Agreement.**

A written agreement between the Contractor and the Department, and signed by the surety, modifying the Contract within the limitations set forth in these Specifications.

**Supplemental Specifications.**

See definition for Specifications.

**Surety.**

The corporate body that is bound by the Contract Bond with and for the Contractor and responsible for the performance of the Contract and for payment of all legal debts pertaining thereto.

**Technical Special Provisions.**

See definition for Specifications.

**Traveled Way.**

The portion of the roadway for the movement of vehicles, exclusive of shoulders and bicycle lanes.

**Unilateral Payment.**

A payment of money made to the Contractor by the Department pursuant to Section 337.11(12), Florida Statutes (2009), for sums the Department determines to be due to the Contractor for work performed on the project, and whereby the Contractor by acceptance of such

payment does not waive any rights the Contractor may otherwise have against the Department for payment of any additional sums the Contractor claims are due for the work.

**Work.**

All labor, materials and incidentals required to execute and complete the requirements of the Contract including superintendence, use of equipment and tools, and all services and responsibilities prescribed or implied.

**Work Order.**

A written agreement between the Contractor and the Department modifying the Contract within the limitations set forth in these Specifications. Funds for this agreement are drawn against the Initial Contingency Pay Item or a Contingency Supplemental Agreement.

**Working Day.**

Any calendar day on which the Contractor works or is expected to work in accordance with the approved work progress schedule.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 22, 2021

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 Proposal Requirements and Conditions.**

Dear Mr. Nguyen:

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

The changes are proposed by Scott Arnold from the State Construction Office to clarify the Contractor's responsibility to examine and interpret any pavement coring data provided by the Department.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**PROPOSAL REQUIREMENTS AND CONDITIONS****(REV 6-16-21)****2-4 Examination of Plans, Specifications, Special Provisions, 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.

The Department does not guarantee the details pertaining to borings and pavement cores, as shown in the Plans Contract Documents, 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 and pavement core data, where available, and make their own interpretation of the subsoil investigations and other preliminary data, and 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*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

August 12, 2021

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

Re: State Specifications Office  
Section: **005**  
Proposed Specification: **0050104 Control of the Work.**

Dear Mr. Nguyen:

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

The changes are proposed by Scott Arnold from the State Construction Office to include and clarify Request for Information, Request for Modification, and Request for Correction as part of an effort to reduce delays in responding to these types of requests.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## **CONTROL OF THE WORK (REV 8-12-21)**

SUBARTICLE 5-1.4 is deleted and the following is substituted:

### **5-1.4 Shop Drawings:**

**5-1.4.1. Definitions:** In addition to the definitions below, also refer to Section 1, Definitions and Terms.

1. Bracing: Temporary structural member(s) placed between beams, girders, piles, precast columns, etc. to provide stability during construction activities.

2. Construction Affecting Public Safety: Construction that may jeopardize public safety such as structures and construction operations spanning over or adjacent to functioning vehicular roadways, pedestrian walkways, railroads, navigable waterways and walls supporting fill sections or excavations immediately adjacent to functioning roadways. Construction Affecting Public Safety may also apply to the construction or demolition of a bridge with continuous beams or girders if traffic is being placed under one of the spans within the unit. It does not apply to those areas of the site outside the limits of normal public access. Adjacent as used above applies to any project or property where normal construction operations could impact functioning vehicular roadways, pedestrian walkways, railroads, and navigable waterways.

3. Contractor Originated Designs: Items which the Contract Documents require the Contractor to design, detail and incorporate into the permanent works.

4. Detailer: The steel detailer that prepares the steel shop drawings for the fabrication, geometry and fit-up for all steel members in accordance with the Plans.

5. Falsework: Any temporary construction work used to support the permanent structure until it becomes self-supporting. Falsework includes steel or timber beams, girders, columns, bracing, piles and foundations, and any proprietary equipment including modular shoring frames, post shores, and adjustable horizontal shoring.

6. Formwork: Any structure or mold used to retain plastic or fluid concrete in its designated shape until it hardens. Formwork may be comprised of common materials such as wood or metal sheets, battens, soldiers and walers, ties, proprietary forming systems such as stay-in-place metal forms, and proprietary supporting bolts, hangers and brackets. Formwork may be either permanent formwork requiring a shop drawing submittal such as stay-in-place metal or concrete forms or may be temporary formwork which requires certification by the Specialty Engineer for Construction Affecting Public Safety and for Major and Unusual Structures.

7. Major and Unusual Structures: Bridges of complex design. Generally, this includes the following types of structures:

- a. Bridges with an individual span longer than 300 feet.
- b. Structurally continuous superstructures with spans over 150 feet.
- c. Steel box and plate girder bridges.
- d. Concrete or steel straddle piers and straddle pier caps.
- e. Steel truss bridges including pedestrian steel truss spans that utilize proprietary designs.
- f. Concrete segmental, post-tensioned girder bridges and post-tensioned substructures.

g. Cable stayed, extradosed or suspension bridges.  
h. Arch bridges.  
i. Tunnels.  
j. All movable bridges (including specifically structural, electrical and mechanical components).  
k. Rehabilitation, widening, lengthening or jacking of any of the above structures.

8. Permanent Works: All the permanent structures and parts thereof required of the completed Contract.

9. QA/QC Shop Drawing Check Prints: The Engineer of Record is responsible for conducting a review of all shop drawings regardless of whether the shop drawing is originated by the Engineer of Record or by others. QA/QC Shop Drawing Check Prints shall consist of highlighting items that the EOR is able to verify based on the EOR's plans and design information on each sheet reviewed. Each sheet shall be initialed by the reviewer. QA/QC Shop Drawing Check Prints shall be submitted to the Department along with the stamped Shop Drawing.

10. Scaffolding: An elevated work platform used to support workers, materials and equipment, but not intended to support the structure.

11. Shop Drawings: A shop drawing is a drawing or set of drawings produced by the contractor, supplier, manufacturer, subcontractor, or fabricator for prefabricated components. Shop drawings also include all working drawings, erection plans, associated trade literature, material cut-sheets, calculations, schedules, erection manuals, geometry control manuals and other manuals and similar documents submitted by the Contractor to define some portion of the project work. The type of work includes both permanent and temporary works as appropriate to the project.

12. Shoring: A component of falsework such as horizontal, vertical or inclined support members. In this Section, this term is interchangeable with falsework.

13. Special Erection Equipment: Includes launching gantries, beam and winch equipment, form travelers, segment lifters, beam shifters, erection trusses, launching noses or similar items made purposely for construction of the structure. It does not apply to commonly available proprietary construction equipment such as cranes.

14. Temporary Works: Any temporary construction work necessary for the construction of the permanent works. This includes but is not limited to bracing, falsework, formwork, scaffolding, shoring, stability towers, strong-backs, counterweights, temporary earthworks, sheeting, cofferdams, and special erection equipment.

**5-1.4.2 Shop Drawing Submittal and Review Requirements:** See table below for shop drawing submittal and review requirements.

Table 005-1 Submittal and Review Requirements					
Shop Drawing for:	Originated by Specialty Engineer Not Signed and Sealed	Originated by Detailer Not Signed and Sealed	Originated by Specialty Engineer Signed and Sealed	Originated by Contractor's EOR Signed and Sealed	Requires Review, QA/QC Shop Drawing Check prints and disposition stamp by Design EOR
Steel Fabrication Drawings		Originator			Reviewer
Steel Erection Plan			Originator		Reviewer
Geometry Control Manual				Originator	Reviewer
Segmental Erection Manual				Originator	Reviewer
Segmental Shop Drawings					Reviewer
Post-tensioning Mock-up Plan			Originator		Reviewer
Post-tensioning Systems <sub>1</sub>			Originator		Reviewer
Pretensioned Prestressed Concrete Products Containing FRP Bars or Strands Excluding Standard Piles and Sheet Piles			Originator		Reviewer
Temporary Works Affecting Public Safety <sub>2</sub>			Originator		Reviewer



Table 005-1 Submittal and Review Requirements					
Shop Drawing for:	Originated by Specialty Engineer Not Signed and Sealed	Originated by Detailer Not Signed and Sealed	Originated by Specialty Engineer Signed and Sealed	Originated by Contractor's EOR Signed and Sealed	Requires Review, QA/QC Shop Drawing Check prints and disposition stamp by Design EOR
Demolition Plans of Bridges with Continuous Beams or Girders Where One Span Within the Unit is Over Traffic			Originator		Reviewer
Prefabricated Bridge Elements and System Connection Mock-Up Plans			Originator		Reviewer
Bridge Formwork Including SIP Forms			Originator		Reviewer
Construction Equipment Placed on Existing Bridges				Originator	Reviewer
Bridge components not fully detailed in the Plans, i.e. post-tensioning details, handrails, temporary operating systems for movable bridges etc.				Originator	Reviewer
Retaining Wall Systems			Originator		Reviewer

Table 005-1 Submittal and Review Requirements					
Shop Drawing for:	Originated by Specialty Engineer Not Signed and Sealed	Originated by Detailer Not Signed and Sealed	Originated by Specialty Engineer Signed and Sealed	Originated by Contractor's EOR Signed and Sealed	Requires Review, QA/QC Shop Drawing Check prints and disposition stamp by Design EOR
Precast Box Culverts			Originator		Reviewer
Non-standard structures and components for drainage, lighting, signalization and signing			Originator		Reviewer
Building structures			Originator <sup>3</sup>		Reviewer <sup>4</sup>
Non-standard crash cushions and other nonstructural items			Originator		Reviewer
Design and structural details furnished by the Contractor in compliance with the Contract				Originator	Reviewer
Material or Product Cut-Sheets	Originator				Reviewer

Table 005-1 Submittal and Review Requirements					
Shop Drawing for:	Originated by Specialty Engineer Not Signed and Sealed	Originated by Detailer Not Signed and Sealed	Originated by Specialty Engineer Signed and Sealed	Originated by Contractor's EOR Signed and Sealed	Requires Review, QA/QC Shop Drawing Check prints and disposition stamp by Design EOR
<p>1 Includes approved post-tensioning systems and project specific integration details of the approved system.</p> <p>2 Does not include formwork complying with Standard Plans, Index 102-600 (concrete placement is not permitted directly over traffic). Also, does not include critical temporary walls that are fully detailed in the plans unless redesigned by the Contractor. Does not include specialized equipment if traffic is removed from under equipment while equipment is being loaded, launched, and while loads are being transported by equipment.</p> <p>3 In lieu of a Specialty Engineer, originator may be a licensed Architect.</p> <p>4 In lieu of the Design Engineer of Record, the reviewer may be the Design Architect of Record.</p>					

**5-1.4.3 Schedule of Submittals:** Prepare and submit a schedule of submittals that identifies the work for which shop drawings apply. For each planned submittal, define the type, and approximate number of drawings or other documents that are included and the planned submittal date, considering the processing requirements herein. Submit the schedule of submittals to the Department's Shop Drawing Review Office and the Engineer of Record within 60 days of the start of the Contract, and prior to the submission of any shop drawings.

Coordinate subsequent submittals with construction schedules to allow sufficient time for review, resubmittal and approval prior to beginning fabrication, as necessary.

**5-1.4.4 Style, Numbering, and Material of Submittals:**

**5-1.4.4.1 Drawings:** Submit all shop drawings that are necessary to complete the structure in compliance with the design shown in the Plans. Prepare all shop drawings using the same units of measure as those used in the Contract Plans. Consecutively number each sheet in the submittal series and indicate the total number in the series (i.e., 1 of 12, 2 of 12 . . . 12 of 12). Include on each sheet the following items as a minimum requirement: the complete Financial Project Identification Number, Bridge Number(s), drawing title and number, a title block showing the names of the fabricator or producer and the Contractor for which the work is being done, the initials of the person(s) responsible for the drawing, the date on which the drawing was prepared, the location of the item(s) within the project, the Contractor's approval stamp with date and initials, and, when applicable, the documents shall be signed and sealed by the Specialty Engineer or Contractor's Engineer of Record. A re-submittal will be requested when any of the required information is not included.

Shop drawings shall be submitted in Portable Document Format (PDF) files, formatted on sheets 11 by 17 inches.

**5-1.4.4.2 Other Documents:** Submit PDF files of other documents such as trade literature, catalogue information, calculations, and manuals formatted on sheets no larger than 11 by 17 inches. Clearly label and number each sheet in the submittal to indicate the total number of sheets in the series (i.e., 1 of 12, 2 of 12 . . . 12 of 12).

Prepare all documents using the same units of measure as the Contract Plans and include a Table of Contents cover sheet. List on the cover sheet the total number of pages and appendices, and include the complete Financial Project Identification Number, a title referencing the submittal item(s), the name of the firm and person(s) responsible for the preparation of the document, the Contractor's approval stamp with date and initials, and, when applicable, the documents shall be signed and sealed by the Specialty Engineer or Contractor's Engineer of Record.

Submit appropriately prepared and checked calculations and manuals that clearly outline the design criteria. Include on the internal sheets the complete Financial Project Identification Number and the initials of the person(s) responsible for preparing and checking the document.

Clearly label trade literature and catalogue information on the front cover with the title, Financial Project Identification Number, date and name of the firm and person(s) responsible for that document.

#### **5-1.4.5 Submittal Paths:**

**5-1.4.5.1 General:** Shop drawings are not required for items on the Approved Products List used as intended in the relevant Standard Plans and Standard Specifications. For non-qualified items, determine the submittal path to be followed based upon the identity of the Engineer of Record as shown adjacent to the title block on the structural plan sheets, and on the key sheets of roadway plans, signing, and pavement marking plans, and/or lighting plans. At the preconstruction conference, the Department will notify the Contractor in writing of any changes in the submittal path and whether the Department's or the Consultant's review stamp will signify an officially reviewed shop drawing.

1. When the Florida Department of Transportation is the Engineer of Record, submit shop drawings to the Resident Engineer and to the appropriate Department Review Office. Include in the submittal other information such as catalog data, procedure manuals, fabrication/welding procedures, and maintenance and operating procedures when required by the work. Submit material certifications and material tests to the Resident Engineer.

2. When the Engineer of Record is a consultant hired by the Department, submit shop drawings to the consultant, the Resident Engineer and, when requested, to the appropriate Department Review Office. Include in the submittal other documentation such as catalog data, procedure manuals, fabrication/welding procedures, and maintenance and operating manuals when required by the work. Submit material certifications and material tests to the Resident Engineer.

**5-1.4.5.2 Building Structures:** Submit shop drawings and all correspondence related to building structures, such as Rest Area Pavilions, Office Buildings, and Maintenance Warehouses, to the Architect of Record and the Resident Engineer for review and approval.

**5-1.4.5.3 Contractor-Originated Design:** Submit shop drawings and applicable calculations to the Engineer of Record for review. The shop drawings and applicable

calculations must be signed and sealed by the Specialty Engineer or the Contractor's Engineer of Record. Submit in accordance with the requirements of 5-1.4.1 through 5-1.4.3, as appropriate.

**5-1.4.5.4 Temporary Works:** For Construction Affecting Public Safety, submit to the Engineer of Record shop drawings and the applicable calculations for the design of special erection equipment, bracing, falsework, scaffolding, etc. The shop drawings and applicable calculations must be signed and sealed by the Specialty Engineer. Submit in accordance with the requirements of 5-1.4.1 through 5-1.4.3, as appropriate.

**5-1.4.5.5 Demolition Plans of Bridges with Continuous Beams or Girders when Traffic is Under Any of the Spans of the Unit During Demolition Activities:** For demolition plans of bridges with continuous beams or girders when traffic is placed under any of the spans of the unit during demolition activities, the Specialty Engineer shall prepare signed and sealed demolition plans and applicable calculations including a step-by-step sequence of demolition, etc. Clearly denote any traffic restrictions for all demolition steps. Submit in accordance with the requirements of 5-1.4. 1 through 5-1.4. 3, as appropriate.

**5-1.4.5.6 Falsework Founded on Shallow Foundations:** When vertical displacement limits are provided in the Plans for falsework founded on shallow foundations such as spread footings and mats, submit to the Engineer of Record shop drawings and applicable calculations of the falsework system including subsurface conditions and settlement estimates. The shop drawings and applicable calculations must be signed and sealed by the Specialty Engineer. Submit in accordance with the requirements of 5-1.4.1 through 5-1.4.3, as appropriate.

**5-1.4.5.7 Formwork and Scaffolding:** The Contractor is solely responsible for the safe installation and use of all formwork and scaffolding. The Department does not require any formwork or scaffolding submittals unless such work would be classified as Construction Affecting Public Safety. For formwork, scaffolding, or other temporary works affecting public safety; develop the required designs in accordance with the AASHTO Guide Design Specifications for Bridge Temporary Works, the AASHTO Construction Handbook for Bridge Temporary Works, and Chapter 11 of the Structures Design Guidelines (SDG) using wind loads specified in the SDG.

**5-1.4.5.8 Beam, Girder and Column Temporary Bracing:** The Contractor is solely responsible for ensuring stability of beams, girders and columns during all handling, storage, shipping and erection. Adequately brace beams, girders and columns to resist wind, weight of forms and other temporary loads, especially those eccentric to the vertical axis of the products, considering actual beam geometry and support conditions during all stages of erection and deck construction. At a minimum, provide temporary bracing at each end of each beam or girder. Develop the required bracing designs in accordance with the AASHTO LRFD Bridge Design Specifications (LRFD) and Chapter 11 of the SDG using wind loads specified in the SDG. For information not included in the SDG or LRFD, refer to the AASHTO Guide Design Specifications for Bridge Temporary Works and the AASHTO Construction Handbook for Bridge Temporary Works.

For Construction Affecting Public Safety, when temporary bracing requirements are shown in the Plans, submit plans and calculations signed and sealed by a Specialty Engineer for the design of temporary bracing members and connections based on the forces shown in the Plans. In addition, submit a written certification that construction loads do not exceed the assumed loads shown in the Plans.

For Construction Affecting Public Safety, when temporary bracing requirements are not shown in the Plans or an alternate temporary bracing system is proposed,

submit plans and calculations signed and sealed by a Specialty Engineer including the stability analysis and design of temporary bracing members and connections.

#### **5-1.4.5.9 Erection Plan, Geometry Control Manual and Erection**

**Manual:** Submit, for the Engineer's review, an Erection Plan that meets the specific requirements of Sections 450, 452 and 460 and this section. Submit in writing for the Engineer's review, an Erection Manual and Geometry Control Manual that meets the specific requirements of Section 462 and this Section. For all Erection Plans and Erection Manuals refer to Standard Plans, Index 102-600 for construction activities not permitted over traffic. For construction activities not covered in Index 102-600, clearly denote what additional construction steps are not allowed over traffic.

#### **5-1.4.5.10 Other Miscellaneous Design and Structural Details**

**Furnished by the Contractor in Compliance with the Contract:** The Engineer of Record shall review all shop drawings and the applicable calculations for miscellaneous design and structural details as required by the Contract. The shop drawings and applicable calculations will be signed and sealed by the Specialty Engineer. Submit in accordance with the requirements of 5-1.4.1 through 5-1.4.3, as appropriate.

#### **5-1.4.6 Processing of Shop Drawings:**

##### **5-1.4.6.1 Contractor Responsibility for Accuracy and Coordination of**

**Shop Drawings:** Coordinate, schedule, and control all submittals, with a regard for the required priority, including those of the various subcontractors, suppliers, and engineers, to provide for an orderly and balanced distribution of the work.

Coordinate, review, date, stamp, approve and sign all shop drawings prepared by the Contractor or agents (subcontractor, fabricator, supplier, etc.) prior to submitting them to the Engineer for review. Submittal of the drawings confirms verification of the work requirements, units of measurement, field measurements, construction criteria, sequence of assembly and erection, access and clearances, catalog numbers, and other similar data. Indicate on each series of drawings the Specification section and sheet or drawing number of the Contract Plans to which the submission applies. Indicate on the shop drawings all deviations from the Contract drawings and itemize all deviations in the letter of transmittal. Likewise, whenever a submittal does not deviate from the Contract Plans, clearly state so in the submittal.

Schedule the submission of shop drawings to allow for a 45 calendar day review period for all submittals associated with a category 2 bridge; tolling components identified in the current FDOT General Tolling Requirements (GTR) Part 3; and the tolling-related signing, DMS and ITS infrastructure. Schedule the submission of shop drawings to allow for a 25 calendar day review period for all other items. The review period commences upon the Engineer's receipt of the valid submittal or valid re-submittal and terminates upon the transmittal of the submittal back to the Contractor. A valid submittal includes all the minimum requirements outlined in 5-1.4.4.

Submit shop drawings to facilitate expeditious review. The Contractor is discouraged from transmitting voluminous submittals of shop drawings at one time. For submittals transmitted in this manner, allow for the additional review time that may result.

Only shop drawings distributed with the approval stamps are valid and all work that the Contractor performs in advance of approval will be at the Contractor's risk. Work affecting Public Safety may not be performed prior to approval of appropriate submittals and work may not proceed at the Contractor's risk.

**5-1.4.6.2 Scope of Review by Engineer of Record:** The Engineer of Record's review of the shop drawings is for conformity to the requirements of the Contract Documents and to the intent of the design. The Engineer of Record's review of shop drawings which include means, methods, techniques, sequences, and construction procedures are limited to the effects on the permanent works. The Engineer of Record's review of submittals which include means, methods, techniques, sequences, and construction procedures does not include an in-depth check for the ability to perform the work in a safe or efficient manner.

**5-1.4.6.3 Special Review by Engineer of Shop Drawings for Construction Affecting Public Safety:** The Engineer may request copies of shop drawings related to Construction Affecting Public Safety for review and comment. When shop drawings are requested, do not proceed with construction of the permanent works until receiving the Engineer's written approval.

**5-1.4.7 Other Requirements for Shop Drawings for Bridges:**

**5-1.4.7.1 Shop Drawings for Structural Steel and Miscellaneous Metals:** Submit shop drawings for structural steel and miscellaneous metals. Shop drawings shall consist of shop and erection drawings, welding procedures, and other working plans, showing details, dimensions, sizes of material, and other information necessary for the complete fabrication and erection of the metal work.

**5-1.4.7.2 Shop Drawings for Concrete Structures:** Submit shop drawings for concrete components that are not cast-in-place and are not otherwise exempted from submittal requirements. Also, submit shop drawings for all details that are required for the effective execution of the concrete work and are not included in the Contract Documents such as: special erection equipment, masonry layout diagrams, and diagrams for bending reinforcing steel, in addition to any details required for concrete components for the permanent work.

**5-1.4.7.3 Shop Drawings for Major and Unusual Structures:** In addition to any other requirements, within 60 days from the Notice to Proceed, submit information to the Engineer outlining the integration of the Major and Unusual Structure into the overall approach to the project. Where applicable to the project, include, but do not limit this information to:

1. The overall construction program for the duration of the Contract. Clearly show the Milestone dates. (For example, the need to open a structure by a certain time for traffic operations.)
2. The overall construction sequence. The order in which individual structures are to be built, the sequence in which individual spans of girders or cantilevers are erected, and the sequence in which spans are to be made continuous, and the order that components are to be installed (such as mechanical and electrical devices in moveable bridges).
3. The general location of any physical obstacles to construction that might impose restraints or otherwise affect the construction, and an outline of how to deal with such obstacles while building the structure(s). (For example, obstacles might include road, rail and waterway clearances, temporary diversions, transmission lines, utilities, property, and the Contractor's own temporary works, such as haul roads, cofferdams, plant clearances and the like.)
4. The approximate location of any special lifting equipment in relation to the structure, including clearances required for the operation of the equipment. (For example, crane positions, operating radii and the like.)

5. The approximate location of any temporary falsework, and the conceptual outline of any special erection equipment. Provide the precise locations and details of attachments, fixing devices, loads, etc. in later detailed submittals.

6. An outline of the handling, transportation, and storage of fabricated components, such as girders or concrete segments. Provide the precise details in later detailed submittals.

7. Any other information pertinent to the proposed scheme or intended approach.

Clearly and concisely present the above information on as few drawings as possible in order to provide an overall, integrated summary of the intended approach to the project. The Department will use these drawings for information, review planning, and to assess the Contractor's approach in relation to the intent of the original design. Submittal to and receipt by the Engineer does not constitute any Department acceptance or approval of the proposals shown thereon. Include the details of such proposals on subsequent detailed shop drawing submittals. Submit timely revisions and re-submittals for all variations from these overall scheme proposals.

~~**5-1.4.8 Modifications for Construction:** Where the Engineer allows the Contractor to make modifications to the permanent works for the purposes of expediting the Contractor's chosen construction methods, the Contractor shall submit proposals to the Engineer of Record for review and approval prior to modifying the works. Submit proposals for minor modifications under the shop drawing process. Indicate on all drawings the deviations from the Contract Documents and itemize all deviations in the letter of transmittal. The Department will require additional submittals and/or submittal under a Cost Savings Initiative Proposal for major modifications. 41 July 2021 Minor modifications are those items that, in the opinion of the Engineer, do not significantly affect the quantity of measured work, or the integrity or maintainability of the structure or its components. (For example, adjusting concrete dimensions; substituting steel plate sizes, changing reinforcing bar size and spacing, etc., all within the acceptable limits of the design.) Major modifications are any modifications that, in the opinion of the Engineer, significantly affect the quantity of measured work, or the integrity or maintainability of the structure or its' components. (For example, substituting alternative beam sizes and spacings, changing material strength or type, and the like.) Submit signed and sealed revised sheets to the Engineer for any such revisions to the Contract Plans prior to submitting shop drawings. The Engineer's decision on the delineation between a minor and a major modification and the disposition of a proposal is final.~~

**5-1.4.9 8 Cost of Shop Drawings:** Include the cost of shop drawings submittal in the Contract prices for the work requiring the shop drawings. The Department will not pay the Contractor additional compensation for such drawings.

SUBARTICLE 5-1.6 is deleted and the following is substituted:

**5-1.6 ~~Corrections for Construction Errors~~ Request for Correction:** For work that the Contractor constructs incorrectly or does not meet the requirements of the Contract Documents, the Contractor has the prerogative to submit an acceptance proposal to the Engineer for review and disposition. The acceptance proposal shall describe the error or defect and either describe remedial action for its correction or propose a method for its acceptance. In either case, the



acceptance proposal shall address structural integrity, aesthetics, maintainability, and the effect on Contract Time. The Department will judge any such proposal for its effect on these criteria ~~and also~~and for its effect on Contract Administration.

When the Engineer judges that a proposal infringes on the structural integrity or maintainability of the structure, the Contractor's Engineer of Record will perform a technical assessment and submit it to the Engineer for approval. Do not take any corrective action without the Engineer's written approval.

Carry out all approved corrective construction measures at no expense to the Department.

Notwithstanding any disposition of the compensation aspects of the defective work, the Engineer's decision on the technical merits of a proposal is final.

ARTICLE 5-1 is expanded by the following

**5-1.7 Request for Information:** Submit Requests for Information in writing to the Engineer to request clarification where a provision, detail or drawing in the Contract Documents seems to have more than one meaning, have an unclear meaning, or have conflicts between Plans and Specifications. A Request for Information is not considered a Notice of Claim. Notices of Claim must be submitted in accordance with 5-12.2.

**5-1.8 Request for Modification:** Where the Engineer allows the Contractor to make modifications to the permanent works for the purposes of expediting the Contractor's chosen construction methods, the Contractor shall submit proposals to the Engineer for review and approval prior to modifying the works. Submit proposals for minor modifications under the shop drawing process. Indicate on all drawings the deviations from the Contract Documents and itemize all deviations in the letter of transmittal. Major modifications must be submitted as a Cost Savings Initiative Proposal.

Minor modifications are those items that, in the opinion of the Engineer, do not significantly affect the quantity of measured work, or the integrity or maintainability of the structure or its components.

The Engineer's decision on the delineation between a minor and a major modification and the disposition of a proposal is final.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

August 4, 2021

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

Re: State Specifications Office  
Section: **006**  
Proposed Specification: **0060401 Control of Materials.**

Dear Mr. Nguyen:

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

The changes are proposed by Larry Ritchie from the State Construction Office to include Clarification of existing language to provide Department review times for Engineering Analysis Reports (EAR).

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## CONTROL OF MATERIALS

(REV 3-19-21)

SUBARTICLE 6-4.1 is deleted and the following substituted:

**6-4.1 Engineering Analysis:** As an exception to the above, within 30 calendar days of the termination of the LOT or rejection of the material, the Contractor may submit to the Engineer a proposed Engineering Analysis Scope to determine the disposition of the material. The Engineering Analysis Scope must contain at a minimum:

1. Description of the defective materials.
2. Supporting information, testing or inspection reports with nonconformities, pictures, drawings, and accurately dimensioned deficiency maps as necessary. For cracked elements, provide drawings showing the location, average width, depth, length, and termination points of each crack along the surfaces. Provide the distance from each termination point to a fixed reference point on the component, such as beam end or edge of flange.
3. Proposed approach of investigation and analysis.
4. Name and credentials of the proposed Specialty Engineer or Contractor's Engineer of Record who will perform the engineering analysis.
5. Proposed testing laboratories, qualified in accordance with

Section 105-7.

Upon approval of the Engineering Analysis Scope by the Engineer, the Specialty Engineer or Contractor's Engineer of Record may perform the engineering analysis as defined in the approved scope and submit a signed and sealed Engineering Analysis Report (EAR) to the Engineer. The EAR must contain at a minimum:

1. The approved Engineering Analysis Scope.
2. Any investigations performed and the associated results obtained.
3. Analysis and conclusion.
4. Proposed disposition of the material, addressing the performance and durability of the proposed action.

Provide as appropriate:

1. Written evidence of a previously approved comparable deficiency and its repair.
2. Documented research demonstrating the effectiveness of the proposed repair.
3. Engineering calculations.

A Specialty Engineer, who is an independent consultant, or the Contractor's Engineer of Record as stated within each individual Section shall perform any such analysis within 45 calendar days of the Engineer's approval of the Engineering Analysis Scope, complete and submit the EAR. The EAR must be signed and sealed by the Specialty Engineer or the Contractor's Engineer of Record that performed the engineering analysis. Allow for a 45 -calendar day review period for all EARs associated with a category 2 bridge; tolling components identified in the current FDOT General Tolling Requirements (GTR) Part 3; and the tolling-related signing, DMS and ITS infrastructure. Allow for a 25 -calendar day review period for all other items. The Engineer will determine the final disposition of the material

after review of the EAR. No additional monetary compensation or time extension will be granted for the impact of any such analysis or review.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

June 29, 2021

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: **0070140 LEGAL REQUIREMENTS AND  
RESPONSIBILITY TO THE PUBLIC.**

Dear Mr. Nguyen:

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

The changes are proposed by Olivia Townsend to clarify that the contractor must contact law enforcement within 14 days of damage by a known 3rd party and to add guardrail, guardrail transitions and end treatments as items to be paid as invoice plus 20% when damaged by unknown 3rd parties.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/jj

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**LEGAL REQUIREMENTS AND RESPONSIBILITY TO THE PUBLIC.  
(REV. 5-12-21)**

ARTICLE 7-14 is deleted and the following substituted:

**7-14 Contractor's Responsibility for Work.**

The Contractor will take charge and custody of the Work and take every necessary precaution against damage to the Work, by the action of the elements or from any other cause whatsoever, until the Department's final acceptance of the Work. The Contractor will rebuild, repair, restore, and make good, all damage to any portion of the Work occasioned by any of the above causes before final acceptance of the Contract.

The Department will have no obligation to pay any reimbursement for damage caused by the execution or nonexecution of the Work by the Contractor or its sub-contractors, or damage the Contractor was negligent in preventing.

For damage to installed material caused by third parties, the Contractor may pursue recovery from the third party or seek reimbursement from the Department, but not both. The Department will not reimburse the Contractor for repair costs due to damage to installed material caused by known third parties unless the Contractor has contacted law enforcement within 14 days of the damage, filed a report, and provided the report to the Department within 14 calendar days of receiving the report from law enforcement. Upon submission of the report to the Department, the Department solely retains the right to pursue recovery from the known third party. If damage to installed material is caused by a known third party, the Department will reimburse the Contractor for costs associated with the repair after reducing the amount of the repair cost by a \$2000.00 deductible for each occurrence, borne solely by the Contractor. If the Department is successful in recovery, the Contractor may be reimbursed proportionally, up to the amount of the deductible.

If damage to installed material other than guardrail, guardrail transitions and end treatments, and temporary crash cushions is caused by an unknown third party, the Department will reimburse the contractor for 50% of the cost of the repair after reducing the amount of the repair cost by a \$2000.00 deductible for each occurrence, borne solely by the Contractor. Repair costs for damage to guardrail, guardrail transitions and end treatments, and temporary crash cushions installed as part of the work caused by unknown third parties will be reimbursed at the manufacturer's/distributor's invoice price for the new materials/parts plus 20% markup. The 20% markup is compensation for all necessary work, including but not limited to labor, equipment, supplies and profit, as authorized by the Engineer. Payment for any additional MOT required for the repair of guardrail, guardrail transitions and end treatments, and temporary crash cushions installed as part of the work will be paid for under the appropriate MOT pay item.

Repair cost will be determined in accordance with 4-4. Theft and vandalism are considered damage caused by an unknown third party.

The Department may, at its discretion, reimburse the Contractor for the repair of damage to the Work not caused by a third party and due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to Acts of God, of the public enemy, or of governmental authorities.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 27, 2021

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

Re: State Specifications Office  
Section: **009**  
Proposed Specification: **0090201 Measurement and Payment.**

Dear Mr. Nguyen:

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

The changes are proposed by Taylor Carlquist to revise the specification language to only reference diesel as a fuel adjustment.

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

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

Sincerely,

Signature on File

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**MEASUREMENT AND PAYMENT**  
**(REV 7-1-21)**

SUBARTICLE 9-2.1.1 is deleted and the following is substituted:

**9-2.1.1 Fuels:** The Department will, in the Contract Documents, provide an estimated quantity for fuel requirements for ~~gasoline and~~ diesel to cover the ~~work~~ **Work** specified in the Contract. Price adjustments will be made only for the amount of ~~gasoline and~~ diesel fuel estimated by the Department as required to complete the Contract. The requirement of ~~each type of~~ fuel for each pay item is estimated by multiplying the Department's standard fuel factor for that pay item by the quantity of that pay item. On Contracts with an original Contract Time in excess of 120 calendar days, the Department will make price adjustments on each applicable progress estimate to reflect increases or decreases in the price of ~~gasoline and~~ diesel from those in effect during the month in which bids were received. The Contractor will not be given the option of accepting or rejecting these adjustments. Price adjustments for ~~these fuels~~ will be made only when the current fuel price (CFP) varies by more than 5% from the price prevailing in the month when bids were received (BFP), and then only on the portion that exceeds 5%.

Price adjustments will be based on the monthly bulk average price for ~~gas and~~ diesel as derived by the Department. These average indexes shall be determined by averaging bulk fuel prices on the first day of each month as quoted by major oil companies that are reasonably expected to furnish fuel for projects in the State of Florida. Average price indices for ~~gasoline and~~ diesel will be available on the Construction Office website before the 15th of each month, at the following URL:

<https://www.fdot.gov/construction/fuel-bit/fuel-bit.shtm>.

Payment will be based on the quantities shown on the progress estimate on all items for which established standard fuel factors are on a file maintained by the Department.

Payment on progress estimates will be adjusted to reflect adjustments in the prices for ~~gasoline and~~ diesel in accordance with the following:

When fuel prices have decreased between month of bid and month of this progress estimate:

$A_i = F_i (P_i - 0.95 P_b)$  during a period of decreasing prices.

$A_i$  = Total dollar amount - positive or negative - of the cost adjustment for ~~each kind of~~ fuel used by the Contractor during the month "i."

$F_i$  = Total gallons calculated as being used during the month.

$P_i$  = Average price for fuel prevailing during month "i."

$P_b$  = Average price for fuel prevailing during the month "b" when bids were received on this Contract.

When fuel prices have increased between month of bid and month of this progress estimate:

$A_i = F_i (P_i - 1.05 P_b)$  during a period of increasing prices.

$A_i$  = Total dollar amount - positive or negative - of the cost adjustment for ~~each kind of~~ fuel used by the Contractor during the month "i."

$F_i$  = Total gallons calculated as being used during the month.

$P_i$  = Average price for fuel prevailing during month "i."

$P_b$  = Average price for fuel prevailing during the month "b" when bids were received on this Contract.



Payment will be made on the current progress estimate to reflect the index difference at the time ~~work~~Work was performed.

Adjustments will be paid or charged to the Prime Contractor only. Any Contractor receiving an adjustment under this provision shall distribute the proper proportional part of such adjustment to subcontractors who perform applicable ~~work~~Work.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 27, 2021

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

Re: State Specifications Office  
Section: **009DB**  
Proposed Specification: **0090201DB Measurement and Payment.**

Dear Mr. Nguyen:

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

The changes are proposed by Taylor Carlquist to revise the specification language to only reference diesel as a fuel adjustment for Design Build Projects.

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

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

Sincerely,

Signature on File

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**MEASUREMENT AND PAYMENT**  
**(REV 7-1-21)**

SUBARTICLE 9-2.1.1 is deleted and the following substituted:

**9-2.1.1 Fuels:** On Contracts with an original Contract Time in excess of 120 calendar days, the Department will make price adjustments on each applicable progress estimate to reflect increases or decreases in the price of ~~gasoline and~~ diesel from those in effect during the month in which bids were received. The Contractor will not be given the option of accepting or rejecting these adjustments. Price adjustments for ~~these fuels~~ will be made only when the current fuel price (CFP) varies by more than 5% from the price prevailing in the month when bids were received (BFP), and then only on the portion that exceeds 5%.

The Contractor will certify the number of gallons of fuel (~~gasoline and/or~~ diesel) used on this Contract during the period represented by each Contractor's Certified Monthly Estimate.

Price adjustments will be based on the monthly bulk average price for ~~gas and~~ diesel as derived by the Department. These average indexes shall be determined by averaging bulk fuel prices on the first day of each month as quoted by major oil companies that are reasonably expected to furnish fuel for projects in the State of Florida. Average price indices for ~~gasoline and~~ diesel will be available on the State Construction Office website before the 15th of each month at the following URL:  
<https://www.fdot.gov/construction/fuel-bit/fuel-bit.shtm>.

Payment on progress estimates will be adjusted to reflect adjustments in the prices for fuel in accordance with the following:

When fuel prices have decreased between month of bid and month of this progress estimate:

$A_i = F_i (P_i - 0.95 P_b)$  during a period of decreasing prices.

$A_i$  = Total dollar amount - positive or negative - of the cost adjustment for ~~each kind of~~ fuel used by the Contractor during the month "i."

$F_i$  = Total gallons calculated as being used during the month.

$P_i$  = Average price for fuel prevailing during month "i."

$P_b$  = Average price for fuel prevailing during the month "b" when bids were received on this Contract.

When fuel prices have increased between month of bid and month of this progress estimate:

$A_i = F_i (P_i - 1.05 P_b)$  during a period of increasing prices.

$A_i$  = Total dollar amount - positive or negative - of the cost adjustment for ~~each kind of~~ fuel used by the Contractor during the month "i."

$F_i$  = Total gallons calculated as being used during the month.

$P_i$  = Average price for fuel prevailing during month "i."

$P_b$  = Average price for fuel prevailing during the month "b" when bids were received on this Contract.

Gallons will be derived only from the established Standard Fuel Factor list posted on the State Construction Office website at the following URL:  
<https://www.fdot.gov/construction/fuel-bit/fuel-bit.shtm>.

The Department will provide a computer application that will calculate and print the gallons of ~~gasoline and/or~~ diesel for the items that these factors represent. The Contractor will attach this worksheet and record these gallons on the Contractor's Certified Monthly Estimate as required in 9-11.

Payment will be based on the quantities shown on the Contractor's Certified Monthly Estimate on all items for which established standard fuel factors are posted on the State Construction Office website at the following URL:  
<https://www.fdot.gov/construction/fuel-bit/fuel-bit.shtm>.

Payment will be made on the current progress estimate to reflect the index difference at the time ~~work~~Work was performed. The total price adjustment for the Contract is limited to the pay quantity as specified in 9-2.3.2.

Adjustments will be paid or charged to the Prime Contractor only. Any Contractor receiving an adjustment under this provision shall distribute the proper proportional part of such adjustment to subcontractors who perform applicable ~~work~~Work.

SUBARTICLE 9-11.2 is deleted and the following substituted:

**9-11.2 Contractor's Certified Monthly Estimate:** The Contractor must make a request for payment by submitting a monthly estimate, no later than Twelve O'clock noon, Monday, after the estimate cut-off date or as directed by the Engineer, based on the amount of ~~work~~Work completed. The Contractor's certified monthly estimate must consist of the following:

1. Contract Number, Financial Project Identification Number, Estimate Number, Monthly Estimate Date and the period that the monthly estimate represents.
2. The basis for arriving at the amount of the monthly estimate including approximate quantities of ~~work~~Work completed, less payment previously made and less the amount previously retained or withheld.
3. Contract Summary showing the percentage of dollar value of completed ~~work~~Work based on the present Contract amount and the percentage of days used based on the present Contract days.
4. Certify the number of gallons of ~~gasoline,~~ diesel and bituminous material during the monthly estimate period.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

June 30, 2021

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

Re: State Specifications Office  
Section: **102**  
Proposed Specification: **1020200 MAINTENANCE OF TRAFFIC.**

Dear Mr. Nguyen:

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

The changes are proposed by Olivia Townsend to support additional requirements being added to specification Section 970 for epoxy adhesives by the State Materials Office. This specification is also associated with the revised Section 706.

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

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

Sincerely,

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**MAINTENANCE OF TRAFFIC  
(REV 5-5-21)**

ARTICLE 102-2 is deleted and the following substituted:

**102-2 Materials.**

Meet the following requirements:

- ~~Bituminous~~**Raised Pavement Marker** Adhesive .Section 970
- Temporary Raised Pavement Markers.....Section 990
- Paint .....Section 971
- Removable Tape .....Section 990
- Glass Spheres .....Section 971
- Temporary Traffic Control Device Materials .....Section 990
- Retroreflective and Nonreflective Sheeting  
for Temporary Traffic Control Devices .....Section 994

**102-2.1 Temporary Traffic Control Devices:** Use only the materials meeting the requirements of Section 990, Section 994, Standard Plans and the Manual on Uniform Traffic Control Devices (MUTCD).

**102-2.2 Detour:** Provide all materials for the construction and maintenance of all detours.

**102-2.3 Commercial Materials for Driveway Maintenance:** Provide materials of the type typically used for base, including reclaimed asphalt pavement (RAP) material, and having stability and drainage properties that will provide a firm surface under wet conditions.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 8, 2021

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: **1050403 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 Elizabeth Weber from the State Materials Office (SMO) to include shifting plant qualification and review processes from the Districts to the State Materials Office for both timber and flexible pipe, allowing SMO to provide immediate consistency to industry as well as cost savings to the Department.

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

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

Sincerely,

Signature on File

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**CONTRACTOR QUALITY CONTROL GENERAL REQUIREMENTS  
(REV 4-20-21)**

SUBARTICLE 105-4.3.1 is deleted and the following substituted:

**105-4.3.1 State Materials Office (SMO):** Producers of cementitious materials, steel and miscellaneous metals, galvanized metal products, aggregates, timber, flexible pipe, and fiber reinforced polymer (FRP) products must submit their proposed Producer Quality Control Program to the SMO for review and acceptance.

**105-4.3.2 District Materials Office:** Producers of hot mix asphalt, portland cement concrete (structural), earthwork, timber, and precast/prestressed ~~and/or precast~~ concrete products ~~and drainage products~~ must submit their proposed Producer Quality Control Program to the local District Materials Office for acceptance. Producers located outside the State must contact the SMO for address information of the District Materials Office responsible for the review of the proposed Quality Control Program.





*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

August 10, 2021

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

Re: State Specifications Office  
Section: **110**  
Proposed Specification: **1100201 Clearing and Grubbing.**

Dear Mr. Nguyen:

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

The changes are proposed by Jason Russell from the State Construction Office to add payment to Subarticle 110-2.1 for clarity, correct the term used for concrete pavement and to add base and edgdrains to the list of ancillary items.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## **CLEARING AND GRUBBING** **(REV 5-5-21)**

SUBARTICLE 110-2.1 is deleted and the following substituted:

**110-2.1 Work Included:** Completely remove and dispose of all buildings, timber, brush, trees, stumps, roots, rubbish, debris, existing flexible pavement and base, drainage structures, culverts, and pipes. Remove all other obstructions resting on or protruding through the surface of the existing ground and the surface of excavated areas.

Perform standard clearing and grubbing within the following areas:

1. All areas where excavation is to be done, including borrow pits, lateral ditches, right-of-way ditches, etc.
2. All areas where roadway embankments will be constructed, unless constructing over an existing road. If constructing over an existing road, remove asphalt pavement and base in accordance with 120-4.2 and the Plans.
3. All areas where structures will be constructed, including pipe culverts and other pipe lines.

ARTICLE 110-7 is deleted and the following substituted:

### **110-7 Removal of Existing Concrete.**

Remove and dispose of existing ~~rigid-p~~Portland cement concrete pavement, sidewalk, slope pavement, ditch pavement, curb, and curb and gutter, etc., where shown in the Plans.

Remove all gravity walls, noise/sound walls, retaining walls, MSE walls, perimeter walls, and roadway concrete barriers, where shown in the Plans. All ancillary elements of these concrete features being removed including, but not limited to, base, leveling pads, copings, reinforcing steel or straps, footings, edgedrains, etc., are incidental and included in the cost of the removal.

SUBARTICLE 110-12.4 is deleted and the following substituted:

**110-12.4 Removal of Existing Concrete:** Price and payment will be full compensation for performing and completing all the work of removal and satisfactory disposal.

When no separate item for this work ~~is provided and no applicable item of excavation or embankment covering such work (as provided in 120-13.1)~~ is included, the Contractor shall include the costs of this work in the Contract price for the item of clearing and grubbing or for the pipe or other structure for which the concrete removal is required.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 29, 2021

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

Re: State Specifications Office  
Section: **120**  
Proposed Specification: **1200101 Excavation and Embankment.**

Dear Mr. Nguyen:

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

The changes are proposed by Jason Russell from the State Construction Office to clarify removal of pavement and embankment quantities when constructing over an existing roadway.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## **EXCAVATION AND EMBANKMENT** **(REV 4-8-21)**

SUBARTICLE 120-1.1 is deleted and the following is substituted:

**120-1.1 General:** Excavate and construct embankments as required for the roadway, ditches, channel changes and borrow material. Use suitable excavated material or authorized borrow to prepare subgrades and foundations. Construct embankments in accordance with Standard Plans, Index 120-001. Compact and dress excavated areas and embankments.

Meet the requirements of Section 110 for excavation of material for clearing and grubbing and Section 125 for excavation and backfilling of structures and pipe. Material displaced by the storm sewer or drainage structure system is not included in the earthwork quantities shown in the Plans. The original ground line is defined as the contour of existing natural topography. The finished grading template is defined as the contour of the finished side slopes, unpaved shoulders, and the bottom of the roadway base ~~or subbase, as applicable~~ and shoulder base for flexible or rigid pavement.

SUBARTICLE 120-4.2 is deleted and the following is substituted:

**120-4.2 Construction over Existing Old Road:** Where a new roadway is to be constructed over an old one, completely remove the existing flexible and Portland cement concrete pavement for the entire limits of the width and depth. Compact disturbed material in accordance with Section 120 or 160, whichever material applies. If indicated in the Plans, remove the existing base in accordance with Section 110-~~2~~.

SUBARTICLE 120-5.3 is deleted and the following is substituted:

**120-5.3 Disposal of Paving Materials:** Unless otherwise noted, take ownership of paving materials, such as paving brick, asphalt block, concrete slab, sidewalk, curb and gutter, etc., excavated in the removal of existing pavements, and dispose of them outside the right-of-way. If the materials are to remain the property of the Department, place them in neat piles as directed. Existing ~~lime~~rock-base materials that ~~is~~are removed may be incorporated in the stabilized portion of the subgrade in accordance with Section 160. If the construction sequence will allow, incorporate all existing ~~lime~~rock-base material into the project as allowed by the Contract Documents.

SUBARTICLE 120-6.3 is deleted and the following is substituted:

**120-6.3 Borrow Material for Shoulder Build-up:** When ~~so~~ indicated in the Plans, furnish borrow material with a specific minimum bearing value, for building up of existing shoulders. Blend materials as necessary to achieve this specified minimum bearing value prior to placing the materials on the shoulders. Take samples of this borrow material at the pit or blended

stockpile. Include all costs of providing a material with the required bearing value in the Contract unit price for borrow material.

SUBARTICLE 120-7.2 is deleted and the following is substituted:

**120-7.2 General Requirements for Embankment Materials:** Construct embankments of acceptable material including reclaimed asphalt pavement (RAP), recycled concrete aggregate (RCA) and ~~P~~portland cement concrete rubble, but containing no muck, stumps, roots, brush, vegetable matter, rubbish, reinforcement bar or other material that does not compact into a suitable and enduring roadbed. Do not use RAP or RCA in the top 3 feet of slopes and shoulders that are to be grassed or have other type of vegetation established. Do not use RAP or RCA in stormwater management facility fill slopes or permitted wetland impact areas.

Remove all waste material designated as undesirable. Use material in embankment construction in accordance with ~~plan details~~Plans -or as the Engineer directs.

Complete the embankment using maximum particle sizes (in any dimension) as follows:

1. In top 12 inches: 3-1/2 inches (in any dimension).
2. 12 to 24 inches: 6 inches (in any dimension).
3. In the depth below 24 inches: not to exceed 12 inches (in any dimension) or the compacted thickness of the layer being placed, whichever is less.

Spread all material so that the larger particles are separated from each other to minimize voids between them during compaction. Compact around these rocks in accordance with 120-9.2.

When and where approved by the Engineer, the Contractor may place larger rocks (not to exceed 18 inches in any dimension) outside the one to two slope and at least 4 feet or more below the bottom of the base. Compact around these rocks to a firmness equal to that of the supporting soil. Construct grassed embankment areas in accordance with 120-9.2.5. Where constructing embankments adjacent to bridge end bents or abutments, do not place rock larger than 3-1/2 inches in diameter within 3 feet of the location of any end-bent piling.

SUBARTICLE 120-13.7 is deleted and the following is substituted:

**120-13.7 Embankment:** The quantity will be at the plan quantity. Where payment for embankment is not to be included in the payment for the excavation, and is to be paid for on a cubic yard basis for the item of embankment, the measurement will include material actually placed above the original ground line or the finished grading template of an existing roadbed, as applicable, within the lines and grades indicated in the Plans or directed by the Engineer. Where embankment is constructed over an existing road, the embankment measurement will include only the material actually placed above the existing base, unless the Plans require the complete removal of the base. ~~If both the asphalt pavement (flexible or rigid) and base is are removed,~~ the embankment measurement will include only the material actually placed above the finish grading template of the existing roadbed. ~~\_\_\_\_\_~~ If there are authorized changes in plan dimensions or if errors in plan quantities are detected, plan quantity will be adjusted as provided in 9-3.2.

Any overrun or underrun of plan quantity for subsoil excavation which results in a corresponding increase or decrease in embankment will be considered as an authorized plan change for adjustment purposes as defined in 9-3.2.2.

No payment will be made for embankment material used to replace unsuitable material excavated beyond the lines and grades shown in the Plans or ordered by the Engineer.

In no case will payment be made for material allowed to run out of the embankment on a flatter slope than indicated on the cross-section. The Contractor shall make his own estimate on the volume of material actually required to obtain the pay section.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 8, 2021

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

Re: State Specifications Office  
Section: **234**  
Proposed Specification: **2340100 Superpave Asphalt Base.**

Dear Mr. Nguyen:

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

The changes are proposed by Wayne Rilko from the State Materials Office to update the Flexible Pavement Design Manual and remove references to traffic level D. The proposed specification change is associated with changes to Section 334 and 525.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**SUPERPAVE ASPHALT BASE****(REV ~~75-813~~-21)**

ARTICLE 234-1 is deleted and the following substituted:

**234-1 Description.**

Construct a Superpave asphalt concrete base course as defined in these Specifications. Base course mixes are designated as Type B-12.5. The Contractor may use a Type SP-12.5 mixture (Traffic Level B, C, ~~D~~, or E) or a Type SP-19.0 mixture (Traffic Level B, C, ~~D~~, or E), in lieu of a Type B-12.5 at no additional cost to the Department.

Obtain Superpave asphalt base 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.





*Florida Department of Transportation*

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GOVERNOR

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KEVIN J. THIBAUT, P.E.  
SECRETARY

July 13, 2021

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

Re: State Specifications Office  
Section: **300**  
Proposed Specification: **3000100 PRIME AND TACK COATS.**

Dear Mr. Nguyen:

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

The changes are proposed by Richard Hewitt to simplify tack rates in the Standard Specification.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**PRIME AND TACK COATS.**  
**(REV 5-25-21)**

ARTICLE 300-1 is deleted and the following substituted:

**300-1 Description.**

Apply bituminous prime coats on previously prepared bases, and apply bituminous tack coats on previously prepared bases and on existing pavement surfaces.

SUBARTICLE 300-8.4 is deleted and the following substituted:

**300-8.4 Application Rate:** Use an application rate defined in Table 300-2. Control the application rate within plus or minus 0.01 gallon per square yard of the target application rate. The target application rate may be adjusted by the Engineer to meet specific field conditions. Determine and record the application rate a minimum of twice per day, once at the beginning of each day’s production and again, as needed, to control the operation. When using PG 52-28, multiply the target application rate by 0.6.

<u>Table 300-2</u> <u>Tack Coat Application Rates</u>		
<u>Asphalt Mixture Type</u>	<u>Underlying Pavement Surface</u>	<u>Target Tack Rate</u> <u>(gal/yd<sup>2</sup>)</u>
<u>Base Course, Structural Course, Dense Graded Friction Course</u>	<u>Newly Constructed Asphalt Layers</u>	<u>0.05 minimum</u>
	<u>Milled Surface or Oxidized and Cracked Pavement</u>	<u>0.07</u>
	<u>Concrete Pavement</u>	<u>0.09</u>
<u>Open Graded Friction Course</u>	<u>Newly Constructed Asphalt Layers</u>	<u>0.06</u>
	<u>Milled Surface</u>	<u>0.08</u>

<u>Table 300-2</u> <u>Tack Coat Application Rates</u>		
<u>Asphalt Mixture Type</u>	<u>Underlying Pavement Surface</u>	<u>Target Tack Rate</u> <u>(gal/yd<sup>2</sup>)<sup>1</sup></u>
<u>Base Course, Structural Course, Dense-Graded Friction Course, Open-Graded Friction Course</u>	<u>Newly Constructed Asphalt Layers</u>	<u>0.06</u>
	<u>Milled Asphalt Pavement Surface, Oxidized and Cracked Asphalt Pavement, Concrete Pavement</u>	<u>0.09</u>

Note 1: Target tack application rates greater than those specified may be used upon approval of the Engineer.

When using a meter to control the tack or prime application rate, manually measure the volume in the tank at the beginning and end of the application area for a specific target application rate. Perform this operation at a minimum frequency of once per production shift. Resolve any differences between the manually measured method and the meter to ensure

| the target application rate is met in accordance with this Section. Adjust the application rate if the manually measured application rate is greater than plus 0.02 or minus 0.01 gallons per square yard when compared to the target application rate.



*Florida Department of Transportation*

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KEVIN J. THIBAUT, P.E.  
SECRETARY

July 13, 2021

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

Re: State Specifications Office  
Section: **300**  
Proposed Specification: **3000201 PRIME AND TACK COATS.**

Dear Mr. Nguyen:

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

The changes are proposed by Wayne Rilko to add Bill of Lading requirements for prime and tack and allow trailer-mounted distributor tanks to be used for non-mainline paving areas to the Standard Specification.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## **PRIME AND TACK COATS (REV 5-3-21)**

SUBARTICLE 300-2.1 is deleted and the following substituted:

### **300-2 Materials.**

**300-2.1 Prime Coat:** For prime coat, use a product listed on the Department's Approved Product List (APL), meeting the requirements of 916-3, or other types and grades of bituminous material if specified in the Contract Documents. A copy of the Bill of Lading representing the material in the distributor tank must be in the truck and be always available.

Where prime coats are to be diluted, certify the dilution was done in accordance with the specific dilution requirements for each product and for each load of material used.

The Contractor may select any approved prime coat unless the Contract Documents indicate the use of a specific material. The Engineer may allow types and grades of bituminous material other than those specified above if the Contractor can show the alternate material will properly perform the function of prime coat material.

SUBARTICLE 300-2.3 is deleted and the following substituted:

**300-2.3 Tack Coat:** Unless the Contract Documents call for a specific type or grade of tack coat, use PG 52-28 meeting the requirements of 916-2, heated to a temperature from 250 to 300°F or use an undiluted emulsion listed on the APL, meeting the requirements of 916-3. Heat the emulsion to the temperature recommended by the tack coat manufacturer. A copy of the Bill of Lading representing the material in the distributor tank must be in the truck and be always available.

For night paving, use PG 52-28 tack coat. The Engineer may approve an emulsified tack coat for night paving if the Contractor demonstrates, at the time of use, the emulsion will break and not affect the progress of the paving operation.

SUBARTICLE 300-3.1 is delete and the following substituted:

### **300-3 Equipment.**

**300-3.1 Pressure Distributor:** Provide a pressure distributor equipped with pneumatic tires having a sufficient width of rubber in contact with the road surface to avoid breaking the bond or forming a rut in the surface. Ensure the distance between the centers of openings of the outside nozzles of the spray bar is equal to the width of the application required, plus or minus two inches. Ensure the outside nozzle at each end of the spray bar has an area of opening not less than 25% or more than 75% in excess of the other nozzles. Ensure all other nozzles have uniform openings. When the application covers less than the full width, the Contractor may allow the normal opening of the end nozzle at the junction line to remain the same as the interior nozzles. A trailer-mounted pressure distributor can be used for non-mainline applications, if approved by the Engineer. It shall have a self-contained heat system, clean out system, calibration chart, manhole, and shall meet the requirements herein.

Clean the distributor tank at a minimum of every twelve months and whenever the product type in the tank is changed. Remove all emulsion and asphalt material during cleaning. Additionally, clean the distributor tank if the quality of the tack or prime shot diminishes or buildup causes the calibration of the tank to be affected.

**300-3.2 Sampling Device:** Equip all pressure distributors and transport tanks with an approved spigot-type sampling device.

**300-3.3 Temperature Sensing Device:** Equip all pressure distributors and transport tanks with an approved dial type thermometer.

Use a thermometer with a temperature range from 50 to 500°F, no greater than 25°F increments, and a minimum dial diameter of two inches.

Locate the thermometer near the midpoint of the tank's length and within the middle third of the tank's height, or as specified by the manufacturer (if in a safe and easily accessible location). Enclose the thermometer in a well with a protective window or by other means as necessary to keep the instrument clean and in the proper working condition.



*Florida Department of Transportation*

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SECRETARY

July 13, 2021

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

Re: State Specifications Office  
Section: **330**  
Proposed Specification: **3300701 HOT MIX ASPHALT GENERAL  
CONSTRUCTION REQUIREMENTS.**

Dear Mr. Nguyen:

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

The changes are proposed by Wayne Rilko to remove language regarding passes and clarify coverage in the Standard Specification.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**HOT MIX ASPHALT GENERAL CONSTRUCTION REQUIREMENTS  
(REV 5-3-21)**

SUBARTICLE 330-7.1 is deleted and the following substituted:

**330-7 Compacting Mixture.**

**330-7.1 General Requirements:** When density testing for acceptance is required, select equipment, sequence, and coverages ~~s (number of times the roller passes over a given area of pavement)~~ of rolling to meet the specified density requirement. Regardless of the rolling procedure used, complete the final rolling before the surface temperature of the pavement drops to the extent effective compaction may not be achieved or the rollers begin to damage the pavement.

No vibratory compaction in the vertical direction will be allowed for layers one inch or less in thickness or, if the Engineer or Contract Documents limit compaction to the static mode only. Compact these layers in the static mode only. Other non-vertical vibratory modes of compaction will be allowed, if approved by the Engineer; however, no additional compensation, cost or time, will be made.





*Florida Department of Transportation*

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SECRETARY

July 8, 2021

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

Re: State Specifications Office  
Section: **334**  
Proposed Specification: **3340104 Superpave Asphalt Concrete.**

Dear Mr. Nguyen:

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

The changes are proposed by Wayne Rilko from the State Materials Office to update the Flexible Pavement Design Manual. Based on design mixes there was elimination of TL A and TL D. The proposed specification change is associated with changes to Section 234 and 525.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## SUPERPAVE ASPHALT CONCRETE

(REV ~~75-813~~-21)

SUBARTICLE 334-1.4.1 is deleted and the following substituted:

**334-1.4.1 Layer Thicknesses:** The allowable layer thicknesses for Type SP Asphalt Concrete mixtures are as follows:

Type SP-9.5..... 1 to 1-1/2 inches

Type SP-12.5..... 1-1/2 to 3 inches

Type SP-19.0..... 2 to 4 inches

In addition to the minimum and maximum thickness requirements, the following restrictions are placed on mixes when used as a structural course:

Type SP-9.5 - Limited to the top two structural layers, two layers maximum.

Type SP-9.5 - Do not use ~~on~~for Traffic Level ~~D~~ and E applications.

Type SP-19.0 - Do not use ~~in~~for the final (top) structural layer below FC-5 mixtures. Type SP-19.0 mixtures are permissible ~~in~~for the layer directly below FC-9.5 and FC-12.5 mixtures. Do not use ~~in~~for the final (top) layer of shoulders.

SUBARTICLE 334-3.2.1 is deleted and the following substituted:

### 334-3.2 Mix Design:

**334-3.2.1 General:** Design the asphalt mixture in accordance with AASHTO R 35-17, except as noted herein. Prior to the production of any asphalt mixture, submit the proposed mix design with supporting test data indicating compliance with all mix design criteria to the Engineer. For all mix designs, include representative samples of all component materials, including asphalt binder. Allow the Director of the Office of Materials a maximum of four weeks to either conditionally verify or reject the mix as designed.

~~For a Traffic Level A mixture, meet the mix design criteria for a Traffic Level B mixture and for a Traffic Level D mixture meet the mix design criteria for a Traffic Level E mixture.~~

At no additional cost to the Department, for a Type SP mix the following Traffic Level substitutions are allowed:

~~Traffic Level E can be substituted for Traffic Level D.~~

Traffic Level ~~D~~ or E can be substituted for Traffic Level C.

Traffic Level C can be substituted for Traffic Level B.

~~Traffic Level B or C can be substituted for Traffic Level A.~~

The same traffic level and binder type that is used for the mainline traffic lanes may be placed in the shoulder at no additional cost to the Department, even if the conditions stated above are not met for the shoulder.

Do not use more than four mix designs per nominal maximum aggregate size per traffic level per binder grade per year, where the year starts at the Notice to Proceed. Exceeding this limitation will result in a maximum Composite Pay Factor (CPF) of 1.00 as defined in 334-8.2 for all designs used beyond this limit.

Warm mix technologies (additives, foaming techniques, etc.) listed on the Department's website may be used in the production of the mix. The URL for obtaining this information, if available, is: <https://www.fdot.gov/materials/mac/production/warmmixasphalt/>.

When warm mix technologies are used, for mixtures containing a PG 52-28, PG 58-22, or PG 67-22 binder, a mixture will be considered a warm mix asphalt design if the mixing temperature is 285°F or less. For mixtures containing a PG 76-22 or High Polymer binder, a mixture will be considered a warm mix asphalt design if the mixing temperature is 305°F or less.

The Engineer will consider any marked variations from original test data for a mix design or any evidence of inadequate field performance of a mix design as sufficient evidence that the properties of the mix design have changed, and the Engineer will no longer allow the use of the mix design.

SUBARTICLE 334-3.2.3 is deleted and the following substituted:

**334-3.2.3 Aggregate Consensus Properties:** For Traffic Level C ~~and through~~ E mixtures, meet the following consensus properties at design for the aggregate blend. Aggregate consensus properties do not apply to Traffic Level ~~A and~~ B mixtures.

SUBARTICLE 334-3.2.3.2 is deleted and the following substituted:

**334-3.2.3.2 Fine Aggregate Angularity:** When tested in accordance with AASHTO T 304-17 (2020), Method A, meet the uncompacted void content of fine aggregate specified in AASHTO M 323-17, Table 6.

SUBARTICLE 334-3.2.4 is deleted and the following substituted:

**334-3.2.4 Gyratory Compaction:** Compact the design mixture in accordance with AASHTO T 312-19, with the following exception: use the number of gyrations at  $N_{\text{design}}$  as defined in Table 334-4. Measure the inside diameter of gyratory molds in accordance with AASHTO T 312-19.

Traffic Level	$N_{\text{design}}$ Number of Gyrations
<del>A</del>	<del>50</del>
B	65
C	75
<del>D</del>	<del>100</del>
E	100

SUBARTICLE 334-3.3 is deleted and the following substituted:

**334-3.3 Mix Design Revisions:** During production, the Contractor may request a target value revision to a mix design, subject to meeting the following requirements: the target change falls within the limits defined in Table 334-5, appropriate data exists demonstrating that the mix complies with production air voids specification criteria, and the mixture gradation meets the basic gradation requirements defined in 334-3.2.2.

Table 334-5 Limits for Potential Adjustments to Mix Design Target Values	
Characteristic	Limit from Original Mix Design
<u>Asphalt Binder Content</u> <sup>(1)</sup>	<u>±0.3%</u>
<u>Gradation and Aggregate Component</u> <sup>(2)</sup>	
No. 8 sieve and Coarser	± 5.0%
No. 16 sieve	± 4.0%
No. 30 sieve	± 4.0%
No. 50 sieve	± 3.0%
No. 100 sieve	± 3.0%
No. 200 sieve	± 1.0%
<del>Asphalt Binder Content</del> <sup>(3)</sup>	<del>± 0.3%</del>
Each Component of Aggregate Blend <sup>(3)</sup>	± 5.0 %

<sup>(1)</sup> Reductions to the asphalt binder content will not be permitted if the VMA during production is lower than 1.0% below the design criteria.

<sup>(2)</sup> The Engineer may waive the limits for the individual sieves and component of the aggregate blend contingent upon the quality of the production data for the mixture.

<sup>(3)</sup> Revisions to FC-5 mixtures to be determined by the Engineer.

Submit all requests for revisions to mix designs, along with supporting documentation, to the Engineer. In order to expedite the revision process, the request for revision or discussions on the possibility of a revision may be made verbally, but must be followed up by a written request. The verified mix design will remain in effect until the Engineer authorizes a change. In no case will the effective date of the revision be established earlier than the date of the first communication between the Contractor and the Engineer regarding the revision.

A new design mix will be required if aggregate sources change, or for any substitution of an aggregate product with a different aggregate code, unless approved by the Engineer.

SUBARTICLE 334-3.2.6 is deleted and the following substituted:

**334-3.2.6 Moisture Susceptibility:**

1. For all traffic levels, use a liquid anti-strip agent listed on the APL at the specified dosage rate. Hydrated lime may be used instead of the liquid anti-strip agent.
2. Provide a mixture having a retained tensile strength ratio of at least 0.80 and a minimum tensile strength (unconditioned) of 100 psi in accordance with FM1-T 283.

~~Provide a mixture having a retained tensile strength ratio of at least 0.80 and a minimum tensile strength (unconditioned) of 100 psi.~~

SUBARTICLE 334-5.1.1 is deleted and the following substituted:

**334-5.1.1 Sampling and Testing Requirements:** Obtain the samples in accordance with FM 1-T 168. Obtain samples at the plant of a sufficient quantity to be split into three smaller samples; one for QC, one for Verification testing and one for Resolution testing. Obtain each split sample of a sufficient quantity, approximately 40 pounds, for all required testing. The split samples for Verification testing and Resolution testing shall be reduced in size and stored in three boxes each. The approximate size of each box must be 12 inches x 8 inches x 4 inches. Provide, label, and safely store sample boxes in a manner agreed upon by the Engineer for future testing.

The asphalt content of the mixture will be determined in accordance with FM 5-563. The gradation of the recovered aggregate will be determined in accordance with FM 1-T 030. Volumetric testing will be in accordance with AASHTO T 312-19 and FM 1-T 209. Prior to testing volumetric samples, condition the test-sized sample for one hour, plus or minus five minutes, at the target roadway compaction temperature in a shallow, flat pan, such that the mixture temperature at the end of the one hour conditioning period is within plus or minus 20°F of the roadway compaction temperature.

If one of the QC gyratory specimens is damaged, make an additional gyratory specimen.

For situations where two properly prepared gyratory specimens do not meet single-operator precision requirements for  $G_{mb}$  as provided in FM 1-T 166:

1. Retest both gyratory specimens in accordance FM 1-T 166.
2. Following the retest, if the newly measured  $G_{mb}$  values do not meet single-operator precision requirements, QC shall prepare a third gyratory specimen in accordance with AASHTO T 312-19 and test in accordance with FM 1-T 166. All three test results shall be input into MAC. The average  $G_{mb}$  will be determined by MAC after performing an outlier check in accordance with ASTM E178-16a.

Test for roadway density in accordance with FM 1-T 166.

SUBSRTICLE 334-8.2.3 is deleted and the following substituted:

**334-8.2.3 Three or More Sublot Test Results:** When three or more sublot test results are available for a LOT, the variability-unknown, standard deviation method will be used to determine the estimated percentage of the LOT that is within the specification limits. The number of significant figures used in the calculations will be in accordance with requirements of AASHTO R11-06/[ASTM E29-13 \(2019\)](#), Absolute Method.

**SUPERPAVE ASPHALT CONCRETE****(REV 7-8-21)**

SUBARTICLE 334-1.4.1 is deleted and the following substituted:

**334-1.4.1 Layer Thicknesses:** The allowable layer thicknesses for Type SP Asphalt Concrete mixtures are as follows:

Type SP-9.5..... 1 to 1-1/2 inches

Type SP-12.5..... 1-1/2 to 3 inches

Type SP-19.0..... 2 to 4 inches

In addition to the minimum and maximum thickness requirements, the following restrictions are placed on mixes when used as a structural course:

Type SP-9.5 - Limited to the top two structural layers, two layers maximum.

Type SP-9.5 - Do not use for Traffic Level E applications.

Type SP-19.0 - Do not use for the final (top) structural layer below FC-5 mixtures. Type SP-19.0 mixtures are permissible for the layer directly below FC-9.5 and FC-12.5 mixtures. Do not use for the final (top) layer of shoulders.

SUBARTICLE 334-3.2.1 is deleted and the following substituted:

**334-3.2 Mix Design:**

**334-3.2.1 General:** Design the asphalt mixture in accordance with AASHTO R 35-17, except as noted herein. Prior to the production of any asphalt mixture, submit the proposed mix design with supporting test data indicating compliance with all mix design criteria to the Engineer. For all mix designs, include representative samples of all component materials, including asphalt binder. Allow the Director of the Office of Materials a maximum of four weeks to either conditionally verify or reject the mix as designed.

At no additional cost to the Department, for a Type SP mix the following Traffic Level substitutions are allowed:

Traffic Level E can be substituted for Traffic Level C.

Traffic Level C can be substituted for Traffic Level B.

The same traffic level and binder type that is used for the mainline traffic lanes may be placed in the shoulder at no additional cost to the Department, even if the conditions stated above are not met for the shoulder.

Do not use more than four mix designs per nominal maximum aggregate size per traffic level per binder grade per year, where the year starts at the Notice to Proceed. Exceeding this limitation will result in a maximum Composite Pay Factor (CPF) of 1.00 as defined in 334-8.2 for all designs used beyond this limit.

Warm mix technologies (additives, foaming techniques, etc.) listed on the Department's website may be used in the production of the mix. The URL for obtaining this information, if available, is: <https://www.fdot.gov/materials/mac/production/warmmixasphalt/>.

When warm mix technologies are used, for mixtures containing a PG 52-28, PG 58-22, or PG 67-22 binder, a mixture will be considered a warm mix asphalt design if the mixing temperature is 285°F or less. For mixtures containing a PG 76-22 or High Polymer



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
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KEVIN J. THIBAUT, P.E.  
SECRETARY

July 21, 2021

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

Re: State Specifications Office  
Section: **346**  
Proposed Specification: **3460100 STRUCTURAL PORTLAND CEMENT  
CONCRETE.**

Dear Mr. Nguyen:

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

This change was proposed by Jose Armenteros to expand classification, move existing language to the Materials Manual, and clarify existing language in the Standard Specification.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**STRUCTURAL PORTLAND CEMENT CONCRETE.****(REV ~~6-37-14~~-21)**

ARTICLE 346-1 is deleted and the following substituted:

**346-1 Description.**

Use a Department-approved concrete mix design composed of a mixture of portland cement, aggregate, water, ~~and, where specified,~~ admixtures, and supplementary cementitious materials. Deliver the portland cement concrete to the site of placement in a freshly mixed, unhardened state.

Obtain concrete 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. If the concrete production facility's Quality Control (QC) Plan is suspended, the Contractor is solely responsible to obtain the services of another concrete production facility with an accepted QC Plan or await the reacceptance of the concrete production facility's QC Plan prior to the placement of any further concrete on the project. There will be no changes in the Contract Time because of the suspension, as described. Bear all delay costs and other costs associated with the concrete production facility's QC Plan acceptance or reacceptance.

ARTICLE 346-2 is deleted and the following substituted:

**346-2 Materials.**

**346-2.1 General:** Meet the following requirements:

Coarse Aggregate.....	Section 901
Fine Aggregate*.....	Section 902
Portland Cement and Blended Cement.....	Section 921
Water.....	Section 923
Admixtures**.....	Section 924
Supplementary Cementitious Materials.....	Section 929

\*Use only silica sand except as provided in 902-5.2.3.

\*\*Use products listed on the Department's Approved Product List (APL).

Do not use materials containing hard lumps, crusts, or frozen matter, or that is contaminated with materials exceeding the specified limits in the above listed Sections.

**346-2.2 Types of Cement:** Unless a specific type of cement is designated in the Contract Documents, use Type I, Type IL, Type IP, Type IS, Type II, Type II (MH) or Type III cement in all classes of concrete. Use Type IL or Type II (MH) for all mass concrete elements.

Use only the types of cements designated for each environmental classification in structural concrete as shown in Table 346-1. A mix design for a more aggressive environment may be used in a less aggressive environmental condition.



Table 346-1 Cement Use by Environmental Classification			
Component	Slightly Aggressive Environment	Moderately Aggressive Environment	Extremely Aggressive Environment <sup>(1)</sup>
Bridge Superstructures			
Precast Superstructure and Prestressed Elements	Type I or Type III	Type I, Type IL, Type II, Type III, Type IP, or Type IS	Type II (MH), Type IL, Type III <sup>(2)</sup> or Ternary Blend
Cast <u>I</u> n Place	Type I	Type I, Type IL, Type II, Type IP, or Type IS	Type II (MH), Type IL, or Ternary Blend
Bridge Substructures, Drainage Structures, and other Structures			
All Elements	Type I or Type III	Type I, Type IL, Type II, Type IP, or Type IS	Type II (MH), Type IL, or Ternary Blend
Notes:			
(1) Cements used in a more aggressive environment may also be used in a less aggressive environment.			
(2) Type III cement may be used in an Extremely Aggressive Environment for precast superstructure and prestressed elements when the ambient temperature at the time of concrete placement is 60°F and below.			

**346-2.3 Supplementary Cementitious Materials:** Supplementary cementitious materials are required to produce binary or ternary concrete mixes in all classes of concrete specified in Table 346-3, except for the following when used in slightly aggressive environments: Class I ~~3,000 psi~~, Class I ~~3,000 psi~~ (Pavement), and Class II ~~3,400 psi~~.

The quantity of portland cement replaced with supplementary cementitious materials must be on an equal weight replacement basis of the total cementitious materials in accordance with the limitations, shown in Table 346-2.

**346-2.3.1 Highly Reactive Pozzolans:** Materials that have a very high degree of pozzolanic reactivity due to their very fine particle sizes, including silica fume, metakaolin and ultrafine fly ash.

**346-2.3.2 Binary Concrete Mixes:** Concrete mixes containing portland cement and one supplementary cementitious material.

**346-2.3.3 Ternary Concrete Mixes:** Concrete mixes containing portland cement and any two of supplementary cementitious materials, either fly ash, slag, or highly reactive pozzolans.

Table 346-2 Cementitious Materials Concrete Mix Proportions (%) (Environmental classification is extremely aggressive, unless otherwise noted)						
Application	Portland Cement	Fly Ash Type F	Slag	Highly Reactive Pozzolans <sup>(4)</sup>		
				Silica Fume	Metakaolin	Ultra-Fine Fly Ash
General Use	70-82	18-30				
	66-78	15-25		7-9		
	66-78	15-25			8-12	
	66-78	15-25				8-12
	30-40	10-20	50-60			
	<del>30-75</del> <sup>(4)</sup>		<del>25-70</del> <sup>(4)</sup>			
	30-50		50-70			
	36-43		50-55	7-9		
	33-42		50-55		8-12	
	33-42		50-55			8-12
Precast / Prestressed	70-85 <sup>(1)</sup>	15-30 <sup>(1)</sup>				
	70-82	18-30				
	66-78	15-25		7-9		
	66-78	15-25			8-12	
	66-78	15-25				8-12
	30-40	10-20	50-60			
	30-50		50-70			
	36-43		50-55	7-9		
	33-42		50-55		8-12	
	33-42		50-55			8-12
Drilled Shaft	63-67	33-37				
	38-42		58-62			
	30-40	10-20	50-60			
Mass Concrete	50-82 <sup>(2)</sup>	18-50 <sup>(2)</sup>				
	50-65 <sup>(3)</sup>	35-50 <sup>(3)</sup>				
	66-78	15-25		7-9		
	66-78	15-25			8-12	
	66-78	15-25				8-12
	30-40	10-20	50-60			
	30-50		50-70			
	36-43		50-55	7-9		
	33-42		50-55		8-12	
	33-42		50-55			8-12

Notes:  
(1) Slightly Aggressive and Moderately Aggressive environments.  
(2) For Concrete with Core Temperature T ≤ 165°F.  
(3) For Concrete with Core Temperature T ≥ 165°F.  
(4) Highly reactive pozzolans may be used below the specified ranges to enhance strength and workability.

**346-2.4 Coarse Aggregate Gradation:** Produce all concrete using Size No. 57, 67 or 78 coarse aggregate ~~specified in Section 901.~~

~~- Use With the Engineer's approval and input from the District Materials Office with Producer QC Plan acceptance authority, Size No. 8, and Size No. 89 alone, only when approved by the Engineer with input from the District Materials Office (DMO).~~

~~Use Size No. 4 or larger or other gradations may be used either alone or blended with Size No. 57, 67 or 78 coarse aggregate. Submit sufficient statistical data to establish production quality and uniformity of the subject aggregates, and establish the quality and uniformity of the resultant concrete. Aggregate gradations sized larger than nominal maximum size of 1.5 inch may be used blended with smaller size coarse aggregate as two components.~~

**346-2.4.1 Optimized Aggregate Gradation:** Improve the aggregate packing density at the Contractor's option, by adding an intermediate-size coarse aggregate. Meet the requirements of Section 9.2, **Volume II** of the Materials Manual, on the methods used to produce combined aggregate gradation of fine, intermediate, and coarse aggregate sizes for the concrete mixes.

**346-2.5 Admixtures:** ~~Use admixtures in accordance with the requirements of this subarticle. Ensure admixtures are used in accordance with the manufacturer's recommended dosage rates and meeting the requirements of Section 9.2 Volume II of the Materials Manual. Dosage rates outside of this range may be used with written recommendation from the admixture producer's technical representative. Do not use admixtures or additives containing calcium chloride in reinforced concrete, either in the raw materials or introduced during the manufacturing process.~~

~~**346-2.5.1 Air Entrainment Admixtures:** Use an air entraining admixture in all concrete mixes except counterweight and dry cast concrete. For precast concrete products, the use of air entraining admixture is optional for Class I and Class II concrete.~~

~~**346-2.5.2 High Range Water-Reducing, Retarding and Plasticizing Admixtures:** When a highly reactive pozzolan is incorporated into a concrete mix design, use a high range water reducing admixture Type I, II, F or G.~~

~~**346-2.5.2.1 Flowing Concrete Admixtures for Precast/Prestressed Concrete:** Use a Type I, II, F or G admixture for producing flowing concrete. If Type F or G admixture is used, verify the distribution of aggregates in accordance with ASTM C1610 except allow for minimal vibration for consolidating the concrete. The maximum allowable difference between the static segregation is less than or equal to 15 %. Add the flowing concrete admixtures at the concrete production facility.~~

~~**346-2.5.3 Corrosion Inhibitor Admixtures:** Use a water reducing and retarding admixture, Type D, or a high range water reducing and retarding admixture, Type G, to normalize the setting time of concrete.~~

~~**346-2.5.4 Accelerating Admixture for Precast Drainage and Incidental Concrete Products:** Use non-chloride accelerating admixtures, Type C or accelerating and water reducing, Type E, only in the manufacturing of precast drainage and incidental concrete products.~~

ARTICLE 346-3 is deleted and the following substituted:

### 346-3 Classification of Concrete.

**346-3.1 General:** The classifications of concrete ~~covered by this Section~~ are designated as Class I, Class I (Pavement), Class II, Class II (Bridge Deck), Class III, Class III (Seal), Class IV, Class IV (Drilled Shaft), Class V, Class V (Special), Class VI, and Class VII. The 28-day specified minimum compressive strength, maximum water to cementitious materials ratio and target slump of each class are ~~specifi~~detailed in Table 346-3. The required air content for all classes of concrete is less than or equal to 6.0%.

For purposes of this Specification the concrete is further classified as follows:

1. Conventional Concrete: The target slump is described in Table 346-3 with a tolerance of  $\pm 1.5$  inches.

2. Increased Slump Concrete: The maximum target slump is 7 inches with a tolerance of  $\pm 1.5$  inches when a Type F, G, I or II admixture is used.

3. Slip-form Concrete: The target slump is 1.5 inches with a tolerance of  $\pm 1.5$  inches.

4. Flowing Concrete: Use flowing concrete only in the manufacturing of precast and prestressed products. Request Engineer's authorization to use flowing concrete for cast-in-place applications. The target slump is 9 inches with a tolerance of  $\pm 1.5$  inches. Meet the requirements of Section 8.6 Volume II of the Materials Manual.

5. Self-Consolidating Concrete (SCC): Use SCC only in the manufacturing of precast and prestressed products. The minimum target slump flow is 22.5 inches with a tolerance of  $\pm 2.5$  inches. Meet the requirements of Section 8.4 Volume II of the Materials Manual.

**346-3.2 Concrete Class Substitutions:** The Engineer may allow the substitution of a higher class concrete in lieu of the specified class concrete when the substituted concrete mixes are included as part of the QC Plan, or for precast concrete, the Precast Concrete Producer QC Plan. The substituted higher class concrete must meet or exceed the requirements of the specified class concrete.

When the average 28-day compressive strength ~~acceptance data~~ is less than the 28-day specified minimum compressive strength of the higher class mix design ~~mix~~, notify the Engineer. Acceptance is based on the requirements in Table 346-3 for the specified class concrete. ~~Do not place concrete with a slump more than plus or minus 1.5 inches from the target slump value specified in Table 346-3.~~

**346-3.3 Master Proportion Table:** Proportion the materials ~~used~~ to produce the ~~various~~ classes of concrete in accordance with Table ~~346-3~~.

The calculation of the water to cementitious materials ratio (w/cm) is based on the total cementitious materials including portland cement and any supplementary cementitious materials used in the mix.

Class of Concrete	28-day Specified Minimum Compressive Strength ( $f_c'$ ) (psi)	Maximum Water to Cementitious Materials Ratio (pounds per pounds)	Target Slump Value (inches) <sup>(3)</sup>
I <sup>(1)</sup>	3,000	0.53	3 <sup>(2)</sup>
I (Pavement)	3,000	0.50	1.5 or 3 <sup>(53)</sup>
II <sup>(1)</sup>	3,400	0.53	3 <sup>(2)</sup>
II (Bridge Deck)	4,500	0.44	3 <sup>(2)</sup>
III <sup>(4)</sup>	5,000	0.44	3 <sup>(2)</sup>
III (Seal)	3,000	0.53	8
IV	5,500	0.41 <sup>(64)</sup>	3 <sup>(2)</sup>
IV (Drilled Shaft)	4,000	0.41	8.5
V (Special)	6,000	0.37 <sup>(64)</sup>	3 <sup>(2)</sup>
V	6,500	0.37 <sup>(64)</sup>	3 <sup>(2)</sup>
VI	8,500	0.37 <sup>(64)</sup>	3 <sup>(2)</sup>
VII	10,000	0.37 <sup>(64)</sup>	3 <sup>(2)</sup>

## Notes:

(1) For precast three-sided culverts, box culverts, endwalls, inlets, manholes and junction boxes, the target slump value and air content will not apply. The maximum allowable slump is 6 inches, except as noted in (2). The Contractor is permitted to use concrete meeting the requirements of ASTM C478 (4,000 psi) in lieu of the specified Class I or Class II concrete for precast endwalls, inlets, manholes and junction boxes.

(2) Increased slump and slip form concrete as defined in 346-3.1 The Engineer may allow a maximum target slump of 7 inches when a Type F, G, I or II admixture is used. When flowing concrete is used, meet the requirements of Section 8.6 of the Materials Manual.

(3) For a reduction in the target slump for slip form operations, submit a revision to the mix design to the Engineer. The target slump for slip form mix is 1.50 inches.

(4) When precast three-sided culverts, box culverts, endwalls, inlets, manholes or junction boxes require a Class III concrete, the minimum cementitious materials content is 470 pounds per cubic yard. Do not apply the air content range and the maximum target slump shall be 6 inches, except as allowed in (2).

(53) Meet the requirements of Section 350.

(64) When silica fume or metakaolin is required, the maximum water to cementitious material ratio will be 0.35. When ultrafine fly ash is used, the maximum water to cementitious material ratio will be 0.30.

### 346-3.4 Durability for Concrete Construction:

**346-3.4.1 Minimum Cementitious Materials Content:** Ensure that the produced concrete meets the minimum amount of cementitious materials content in Table 346-4.

Concrete Class	Environmental Classification		
	Extremely Aggressive	Moderately Aggressive	Slightly Aggressive
I, I (Pavement), II, and III (Seal)	470		
II (Bridge Deck), III <sup>(1)</sup> , IV, IV (Drilled Shaft), V, V (Special), VI and VII	600	550	510

## Notes:

(1) When precast three-sided culverts, box culverts, endwalls, inlets, manholes or junction boxes require a Class III concrete, the minimum cementitious materials content may be reduced to 470 pounds per cubic yard.

**346-3.4.2 Chloride Content Limits:** Use the following maximum allowable chloride content limits for the concrete application and/or exposure environment shown:

Table 346-5 Chloride Content Limits for Concrete Construction		Maximum Allowable Chloride Content, (pounds per cubic yard of concrete)
Application/Exposure Environment		
Non-Reinforced Concrete		No Test Needed
Reinforced Concrete	Slightly Aggressive Environment	0.70
	Moderately or Extremely Aggressive Environment	0.40
Prestressed Concrete		0.40

~~If chloride test results exceed the limits of Table 346-5, s~~Suspend concrete placement immediately for every mix design ~~if chloride test results exceed the limits of Table 346-5 represented by the failing test results,~~ until corrective measures are made. Submit an Engineering Analysis Scope in accordance with 6-4 by a Specialty Engineer knowledgeable in the areas of corrosion and corrosion control, to determine if the material meets the intended service life of the structure on all concrete produced from the mix design failing chloride test results to the previous passing test results.

**346-3.4.3 Surface Resistivity Test:** Ensure that the Class II (Bridge Deck), Class IV, Class V, Class V (Special), Class VI, or Class VII concrete in extremely aggressive environments meets or exceeds a resistivity of 29 kOhm-cm at 28 days, when a highly reactive pozzolan is used.

SUBARTICLE 346-4.1 is deleted and the following substituted:

#### **346-4 Special Types of Concrete.**

**346-4.1 Drilled Shaft Concrete:** Notify the Engineer at least 48 hours before placing drilled shaft concrete. Obtain slump loss test results demonstrating that the drilled shaft concrete maintains a slump of at least 5 inches throughout the concrete elapsed time before drilled shaft concrete operations begin.

Perform the slump loss test at the anticipated ambient temperature for drilled shaft placements greater than 30 cubic yards and an elapsed time of greater than five hours.

Obtain slump loss test results from an approved laboratory or from a field demonstration. Slump loss test results for drilled shafts requiring 30 cubic yards of concrete or less and a maximum elapsed time of five hours or less may be done in a laboratory. Obtain all other slump loss test results in the field.

The concrete elapsed time is defined in Section 455. Obtain the Engineer's approval for use of slump loss test results including elapsed time before concrete placement begins.

Test each load of concrete for slump to ensure ~~that it~~the slump is within the limits of this Section. Initially cure acceptance cylinders for 48 hours before transporting them to the laboratory.

If the elapsed time during placement exceeds the slump loss test data, submit an Engineering Analysis Scope in accordance with 6-4 by a Specialty Engineer knowledgeable in

the area of concrete foundations, to determine if the shaft is structurally sound and free from voids. At the direction of the Engineer, excavate the drilled shaft for inspection. Obtain approval from the Engineer before placing any additional shafts.

ARTICLE 346-5 is deleted and the following substituted:

### **346-5 Sampling and Testing Methods.**

Perform concrete sampling and testing in accordance with the following methods:

Table 346-7 Concrete Sampling and Testing Methods	
Description	Method
Slump of Hydraulic Cement Concrete	ASTM C143
Air Content of Freshly Mixed Concrete by the Pressure Method <sup>(1)</sup>	ASTM C231
Air Content of Freshly Mixed Concrete by the Volumetric Method <sup>(1)</sup>	ASTM C173
Making and Curing Test Specimens in the Field <sup>(2)</sup>	ASTM C31
Compressive Strength of Cylindrical Concrete Specimens	ASTM C39
Obtaining and Testing Drilled Core and Sawed Beams of Concrete	ASTM C42
Initial Sampling of Concrete from Revolving Drum Truck Mixers or Agitators	FM 5-501
Low Levels of Chloride in Concrete and Raw Materials	FM 5-516
Density (Unit Weight), Yield and Air Content (Gravimetric) of Concrete	ASTM C138
Temperature of Freshly Mixed Portland Cement Concrete	ASTM C1064
Sampling Freshly Mixed Concrete <sup>(3)</sup>	ASTM C172
Static Segregation of Self-Consolidating Concrete using Column Techniques	ASTM C1610
Slump Flow of Self-Consolidating Concrete	ASTM C1611
Relative Viscosity of Self-Consolidating Concrete	ASTM C1611
Visual Stability Index of Self-Consolidating Concrete	ASTM C1611
Passing Ability of Self-Consolidating Concrete by J-Ring	ASTM C1621
Rapid Assessment of Static Segregation Resistance of Self-Consolidating Concrete Using Penetration Test	ASTM C1712
Aggregate Distribution of Hardened Self-Consolidating Concrete	FM 5-617
Hardened Visual Stability Index of Self-Consolidating Concrete	AASHTO R_81
Fabricating Test Specimens with Self-Consolidating Concrete	ASTM C1758
Concrete Resistivity as an Electrical Indicator of its Permeability	AASHTO T_358
<p>(1) The Department will use the same type of meter for Verification testing as used for QC testing. When using pressure type meters, use an aggregate correction factor determined by the concrete producer for each mix design to be tested. Record and certify test results for correction factors for each type of aggregate at the concrete production facility.</p> <p>(2) Provide curing facilities that have the capacity to store all QC, Verification, and Resolution cylinders simultaneously for the initial curing. Cylinders will be delivered to the testing laboratory in their molds. The laboratory will remove the specimens from the molds and begin final curing.</p> <p>(3) Take the test sample from the middle portion of the batch in lieu of collecting and compositing samples from two or more portions, as described in ASTM C172.</p>	



SUBARTICLE 346-6.2 is deleted and the following substituted:

**346-6.2 Concrete Mix Design:** Provide concrete that has been produced in accordance with a Department approved mix design, in a uniform mass free from balls and lumps.

For slump target values in excess of 6 inches, including flowing ~~and self consolidating~~ concrete and SCC, utilize a grate over the conveyance equipment to capture any lumps or balls that may be present in the mix. The grate must cover the entire opening of the conveyance equipment and have an opening that is a maximum of 2-1/2 inches in any one direction. Remove the lumps and balls from the grate and discard them. Discharge the concrete in a manner satisfactory to the Engineer. Perform demonstration batches to ensure complete and thorough placements in complex elements, when requested by the Engineer.

Do not place concretes of different compositions such that the plastic concretes may combine, except where the Plans require concrete with a surface resistivity value of 29 kOhm-cm or below and one with higher than 29 kOhm-cm values in a continuous placement. Produce these concretes using separate mix designs. For example, designate the mix with calcium nitrite as the original mix and the mix without calcium nitrite as the redesigned mix. Ensure that both mixes contain the same cement, fly ash or slag, coarse and fine aggregates and admixtures. Submit both mixes for approval as separate mix designs, both meeting all requirements of this Section. Ensure that the redesigned mix exhibits plastic and hardened qualities which are additionally approved by the Engineer as suitable for placement with the original mix. The Engineer will approve the redesigned mix for commingling with the original mix and for a specific project application only. Alternately, place a construction joint at the location of the change in concretes as approved by the Engineer.

ARTICLE 346-9 is deleted and the following substituted:

### **346-9 Acceptance Sampling and Testing.**

**346-9.1 General:** Perform plastic properties tests in accordance with 346-8 and cast a set of three QC cylinders, for all structural concrete incorporated into the project. Take these acceptance samples randomly as determined by a random number generator acceptable to the Department. The Department will independently perform VT plastic properties tests and cast a set of VT cylinders. The VT cylinders will be the same size cylinder selected by the Contractor, from a separate sample from the same load of concrete as the Contractor's QC sample.

For each set of QC cylinders verified by the Department, cast two additional cylinders from the same sample, and identify them as the quality control resolution (QR) test cylinders. The Department will also cast two additional verification resolution (VR) test cylinders from each VT sample. All cylinders will be clearly identified as outlined in the Sample/Lot Numbering System instructions located on the State Materials Office website. Deliver the QC samples, including the QR cylinders to the final curing facility in accordance with ASTM C31. Concurrently, the Department will deliver the VT samples, including the VR cylinders, to their final curing facility.

Test the QC laboratory cured samples for compressive strength at the age of 28 days, in a laboratory meeting and maintaining at all times the qualification requirements listed in Section 105.



Ensure the QC testing laboratory input the compressive strength test results into the Department's Materials Acceptance and Certification (MAC) system on daily basis within 24 hours after testing. Notify the Engineer when results cannot be inputted into MAC.

~~The QC testing laboratory will input the compressive strength test results into the Department's Materials Acceptance and Certification (MAC) system within 24 hours. When the QC testing laboratory cannot input the compressive strength test results into MAC within 24 hours, the QC testing laboratory will notify the VT testing laboratory within 24 hours of testing the cylinder and provide the VT testing laboratory the compressive strength test results. Ensure the compressive strength results are input into MAC within 72 hours of determining the compressive strength of the cylinders.~~

The Department will compare the VT sample compressive strength test results with the corresponding QC sample test results.

**346-9.2 Sampling Frequency:** As a minimum, sample and test concrete of each mix design for water to cementitious materials ratio, air content, temperature, slump and compressive strength once per LOT as defined by Table 346-9. The Engineer will randomly verify one of every four consecutive LOTs of each mix design based on a random number generator. The Department may perform Independent Verification (IV) testing to verify compliance with specification requirements. All QC activities, calculations, and inspections will be randomly confirmed by the Department.

Class Concrete <sup>(1)</sup>	LOT Size
I	one day's production
I (Pavement)	2,000 square yards, or one day's production, whichever is less
II, II (Bridge Deck), III, IV, V (Special), V, VI, VII	50 cubic yards, or one day's production, whichever is less
IV (Drilled Shaft)	50 cubic yards, or one day's production, whichever is less <sup>(2)</sup>
III (Seal)	Each Seal placement

(1) For any class of concrete used for roadway concrete barrier, the lot size is defined as 100 cubic yards, or one day's production, whichever is less.  
(2) Start a new LOT when there is a gap of more than two hours between the end of one drilled shaft placement and the beginning of the next drilled shaft placement.

**346-9.2.1 Reduced Frequency for Acceptance Tests:** The LOT size may represent 100 cubic yards when produced with the same mix design at the same concrete production facility for the same prime Contractor and subcontractor on a given Contract. As an exception, the requirements for the precast/prestressed production facility will only include the same mix design at the same concrete production facility.

Submit strength test results indicating that the two following criteria are met:

1. The average of the acceptance compressive strengths is equal to or greater than the specified minimum compressive strength ( $f'_{cfe}$ ) plus 2.33 standard deviations minus:

a. 500 psi, if  $f'_{cfe}$  is 5,000 psi or less.

b.  $0.10 f_{cfe}'$ , if  $f_{cfe}'$  is greater than 5,000 psi.

2. Every average of three consecutive strength test equals or exceeds the  $f_{cfe}'$  plus 1.34 standard deviations.

Base calculations on a minimum of ten consecutive strength test results for a Class IV or higher; or a minimum of five consecutive strength results for a Class III or lower.

The average of the consecutive compressive strength test results, based on the class of concrete, can be established using historical data from a previous Department project. The tests from the previous Department project must be within the last calendar year or may also be established by a succession of samples on the current project. Only one sample can be taken from each LOT. Test data must be from a laboratory meeting the requirements of Section 105. Obtain Department approval before beginning reduced frequency LOTs.

If at any time a strength test is not verified or the average strength of the previous ten or five consecutive samples based on the class of concrete from the same mix design and the same production facility does not conform to the above conditions, return to the frequency represented by the LOT as defined in Table 346-9. Notify the Engineer that the initial frequency is reinstated. In order to reinstate reduced frequency, submit a new set of strength test results.

**346-9.3 Strength Test Definition:** The strength test of a LOT is defined as the average ~~of the~~ compressive strengths tests of three cylinders cast from the same sample of concrete ~~from the LOT~~.

**346-9.4 Acceptance of Concrete:** The Engineer will accept the concrete of a given LOT when the compressive strength test results are verified and ~~it~~ meets the minimum specified compressive strength ~~in requirement of~~ Table 346-3. Ensure that the hardened concrete strength test results are obtained in accordance with 346-9.3.

The process of concrete compressive strength verification and acceptance consists of the following steps:

1. Verification of QC and VT data.
2. Resolution of ~~QC~~ and ~~VT~~ data if needed.
3. Structural Adequacy determination.

Do not discard a cylinder strength test result based on low strength (strength below the specified minimum strength as per the provisions of this Section).

When one of the three QC cylinders from a LOT is lost, missing, damaged or destroyed, determination of compressive strength will be made by averaging the remaining two cylinders. If more than one QC cylinder from a LOT is lost, missing, damaged or destroyed, the Contractor will core the structure at no additional expense to the Department to determine the compressive strength. Prior to coring, obtain Engineer's approval for coring the structure and its proposed coring location. Acceptance of LOT may be based on VT data at the discretion of the Engineer. ~~Obtain the approval of the Engineer to core, and of the core location prior to coring.~~

For each QC and each QR cylinder that is lost, missing, damaged or destroyed, payment for that LOT will be reduced by \$750.00 per 1,000 psi of the specified design strength [Example: loss of two Class IV (Drill Shaft) QC cylinders that has no VT data will require the element to be cored and a pay reduction will be assessed (4,000 psi / 1,000 psi) x \$750 x 2 = \$6,000]. This reduction will be in addition to any pay adjustment for low strength.

**346-9.4.1 Small Quantities of Concrete:** When a project has a total plan quantity of less than 50 cubic yards, that concrete will be accepted based on the satisfactory compressive strength of the QC cylinders. Submit certification to the Engineer that the concrete was batched

and placed in accordance with the Contract Documents. Submit a QC Plan for the concrete placement operation in accordance with Section 105. The Engineer may perform IV testing as identified in 346-9 and evaluate the concrete in accordance with 346-9.7.

**346-9.5 Verification:** The results of properly conducted test by QC and VT laboratories on specimens prepared from the same sample of concrete are not to differ by more than 14%.

$$\text{Difference (\%)} = \text{ABS} \left( \frac{\text{QC} - \text{VT}}{\text{QC}} \right) 100$$

Where:

Difference (%) is the absolute percentage difference between QC and ~~Verification-Test~~ average compressive strength.

The procedure consists of verifying if the QC and ~~Verification-Test~~ compressive strengths data meet the established comparison criteria:

1. When the difference between the average compressive strength of QC and the average compressive strength of ~~Verification-Test~~ is less than or equal to 14%, the QC test results are upheld and verified, ~~the Engineer will accept the concrete based on QC test results~~. The Engineer will accept at full pay only LOTs of concrete represented by plastic property results which meet the requirements of the approved mix design and strength test results which equal or exceed the respective specified minimum strength.

2. When the difference between the average compressive strength of QC and the average compressive strength of ~~Verification-Test~~ data exceeds 14%, the compressive strength results are ~~QC data is~~ not verified and the Engineer will initiate the resolution procedure. ~~The resolution procedure will be used to accept or reject the concrete.~~

~~\_\_\_\_\_ Maintain the QR and VR cylinders for a minimum of 30 days following until the verification of the compressive strength test results testing date of, and may be discarded after about no more than one month after the age of the specified strength test age.~~

**346-9.6 Resolution Procedure:** ~~The resolution procedure may consist of, but need not be limited to, a review of sampling and testing of fresh concrete, calculation of water to cementitious materials ratio, handling of cylinders, curing procedures and compressive strength testing.~~ The Engineer will perform the resolution process to identify the reliability of the compressive strength results when the difference between the average compressive strength of QC and the average compressive strength of VT data exceeds 14% as described in 346-9.5(2).

The Engineer will correlate the 28-day strength (VR<sub>28</sub> and QR<sub>28</sub>) for the VR and QR cylinders and will compare:

1. The VT sample results with the VR<sub>28</sub> cylinders results.

2. The QC sample results with the QR<sub>28</sub> cylinders results.

~~\_\_\_\_\_ Compare the VT sample results with the VR cylinders results. Compare the QC sample results with the QR cylinders results. Comparison results must not be greater than 17.5%. Core samples of the hardened concrete may be required. The Engineer will correlate the 28 day strength (VR<sub>28</sub> and QR<sub>28</sub>) for the VR and QR cylinders.~~

$$V_D (\%) = \text{ABS} \left( \frac{\text{VT} - \text{VR}_{28}}{\text{VT}} \right) 100$$

$$Q_D (\%) = \text{ABS} \left( \frac{\text{QC} - \text{QR}_{28}}{\text{QC}} \right) 100$$

Where:

$V_D$  (%) is the absolute percentage difference between VT and VR<sub>28</sub>.

$Q_D$  (%) is the absolute percentage difference between QC and QR<sub>28</sub>.

The resolution procedure will use the above equations. The Engineer will determine through the resolution procedure whether the QC strength test results or the VT strength test are deemed to be the most accurate, LOTS<sub>s</sub> will then be considered to be verified.

~~When the Engineer cannot determine which strength test results are the most accurate, the concrete represented by the four consecutive LOTS will be evaluated based on the QC data.~~

The Engineer will inform the QC and VT laboratories within three calendar days of the acceptance compressive strength test to transport their QR and VR cylinders to the resolution laboratory. The QC and VT laboratories will transport their own hold cylinders to the resolution testing laboratory within three calendar days after the Engineer notifies the Contractor that a resolution procedure is required. In addition, the Engineer will ensure that the QR and VR cylinders are tested within 14 calendar days of the acceptance strength tests.

The Engineer will determine the most accurate strength test result to represent the four or fewer consecutive LOTS as follows:

1. When both results meet the established comparison criteria, both are deemed accurate and the QC strength will represent the LOTS. The Department will pay for cost of the resolution testing.

2. When only the QC result is within the established comparison criteria, the QC strength is deemed as most accurate and will represent the LOTS. The Department will pay for the cost of the resolution testing.

3. When only the VT result is within the established comparison criteria, the VT strength is deemed as most accurate and will represent the LOTS. The Department will assess a \$1,000 pay reduction for the cost of the Resolution Investigation.

4. When both results are outside the established comparison criteria, the Engineer, with input from the ~~District Materials Office~~, will determine if any Department IA evaluations are required and which test results are most accurate. The Department will pay for the cost of the resolution testing.

~~When the Engineer cannot determine which strength test results are the most accurate, the concrete represented by the four consecutive LOTS will be evaluated based on the QC data.~~

The results of the resolution procedure will be forwarded to the Contractor within five working days after completion of the investigation.

~~**346-9.7 Small Quantities of Concrete**~~~~**346-10 Investigation of Low Strength Concrete and Structural Adequacy:**~~ ~~When a project has a total plan quantity of less than 50 cubic yards, that concrete will be accepted based on the satisfactory compressive strength of the QC cylinders. Submit certification to the Engineer that the concrete was batched and placed in accordance with the Contract Documents. Submit a QC Plan for the concrete placement operation in accordance with Section 105. In addition, the Engineer may conduct IV testing as identified in 346-9. Evaluate the concrete in accordance with 346-10 at the discretion of the Engineer. The Engineer will evaluate the structural adequacy — ~~**346-10.1 General:**~~ ~~The following applies for verified concrete that does not meet the minimum specified compressive strength of Table 346-3.~~~~

For standard molded and cured strength cylinders, the compressive strength of concrete is satisfactory provided that the two following criteria are met:

\_\_\_\_\_ 1. The average compressive strength does not fall below the specified minimum compressive strength by more than:

\_\_\_\_\_ a. 500 psi if the specified minimum compressive strength is equal to or less than 5,000 psi.

\_\_\_\_\_ b. 10% of the specified minimum compressive strength if the specified minimum compressive strength is greater than 5,000 psi.

\_\_\_\_\_ 2. The average compressive strength with the previous two LOTs is equal to or exceeds the specified minimum compressive strength. This condition only applies if there are two or more previous LOTs to calculate the average.

The Engineer will consider the concrete for a given LOT as structurally adequate and coring will not be allowed when a concrete compressive strength test result falls below the specified minimum strength but has met the above conditions.

ARTICLE 346-10 is deleted and the following substituted:

**346-10 Investigation of Low Compressive Strength Concrete ~~and Structural Adequacy.~~**

~~\_\_\_\_\_ **346-10.1 General:** The following applies for concrete that does not meet the minimum specified compressive strength of Table 346-3.~~

~~\_\_\_\_\_ For standard molded and cured strength cylinders, the compressive strength of concrete is satisfactory provided that the two following criteria are met:~~

~~\_\_\_\_\_ 1. The average compressive strength does not fall below the specified minimum compressive strength by more than:~~

~~\_\_\_\_\_ a. 500 psi if the specified minimum compressive strength is equal to or less than 5,000 psi.~~

~~\_\_\_\_\_ b. 10% of the specified minimum compressive strength if the specified minimum compressive strength is greater than 5,000 psi.~~

~~\_\_\_\_\_ 2. The average compressive strength with the previous two LOTs is equal to or exceeds the specified minimum compressive strength. This condition only applies if there are two or more previous LOTs to calculate the average.~~

~~\_\_\_\_\_ The Engineer will consider the concrete for a given LOT as structurally adequate and coring will not be allowed when a concrete compressive strength test result falls below the specified minimum strength but has met the above conditions.~~

When a verified concrete compressive strength test result falls below the specified minimum strength, and does not meet the structural adequacy described in 346-9.7 above conditions, perform one of the following options:

\_\_\_\_\_ 1. Submit an Engineering Analysis Scope in accordance with 6-4 to establish structural and durability adequacy. When the scope is approved by the Engineer, submit an Engineering Analysis Report (EAR) in accordance with 6-4 that includes a full structural analysis. If the results of the structural analysis indicate adequate strength to serve its intended purpose with adequate durability, and is approved by the Engineer, the Contractor may leave the concrete in place subject to the requirements of 346-11, otherwise, remove and replace the LOT of concrete in question at no additional expense to the Department.

\_\_\_\_\_ 2. At the Engineer's discretion, obtain drilled core samples as specified in this Section to determine the in-place strength of the LOT of concrete in question, at no additional expense to the Department. The Engineer will determine whether to allow coring of



the in-place concrete or require an engineering analysis based on the compressive strength of the test cylinders.

**346-10.21 Coring for Determination of Structural Adequacy:** Core strength test results obtained from the structure will be accepted by both the Contractor and the Department as the in-place strength of the LOT of concrete in question. The core strength test results will be used in lieu of the cylinder strength test results for determination of structural adequacy. The Department will calculate the strength value to be the average of the compressive strengths of the three individual cores. This will be accepted as the actual measured value.

~~Obtain the Engineer's written approval before taking any concrete core sample. Notify the Engineer 48 hours prior to taking core samples.~~ Obtain and test the cores in accordance with ASTM C42. ~~Report the test results to the Engineer within seven calendar days of the Engineer's written approval.~~ The Engineer will select the size and location of the drilled cores so that the structure is not impaired and does not sustain permanent damage after repairing the core holes. Obtain the Engineer's written approval before taking any concrete core sample. Notify the Engineer 48 hours prior to taking core samples.

~~Sample three undamaged cores taken from the same approximate location where the questionable concrete is represented by the low strength concrete test cylinders. Repair core holes after samples are taken with a product in compliance with Section 930 or 934 and meeting the approval of the Engineer. Report the test results to the Engineer within seven calendar days of obtaining testing the core samples.~~ Sample three undamaged cores taken from the same approximate location where the questionable concrete is represented by the low strength concrete test cylinders. Repair core holes after samples are taken with a product in compliance with Section 930 or 934 and meeting the approval of the Engineer. Report the test results to the Engineer within seven two calendar days of obtaining testing the core samples.

The Engineer, with input from the ~~District Materials Office~~, will consider the concrete as structurally adequate, in the area represented by core tests at the actual test age, if the average compressive strength of cores does not fall below the specified minimum compressive strength ( $f'_c$ ) by more than:

- a. 500 psi when the  ~~$f'_c$  specified minimum compressive strength~~ is equal to or less than 5,000 psi.
- b. 10% of the  ~~$f'_c$  specified minimum compressive strength~~ when the  ~~$f'_c$  specified minimum compressive strength~~ is greater than 5,000 psi.

The Engineer may also require the Contractor to perform additional testing as necessary to determine structural adequacy of the concrete.

ARTICLE 346-11 is deleted and the following substituted:

### **346-11 Pay Adjustments for Low Compressive Strength Concrete.**

**346-11.1 General:** For any LOT of concrete failing to meet the  ~~$f'_c$  specified minimum strength~~ as defined in 346-3, 346-9, ~~346-10~~ and satisfactorily meeting all other requirements of the Contract Documents, including structural adequacy, the Engineer will individually reduce the price of each low strength LOT in accordance with this Section.

**346-11.2 Basis for Pay Adjustments:** The Engineer will determine payment reductions based on the 28 day compressive strength, represented by either acceptance compressive strength or correlated cores strength test results based on the following criteria:

1. When the acceptance compressive strength test result falls below the specified minimum compressive strength, but no more than the limits established in ~~346-10.19.7~~ below the specified minimum strength, do not core hardened concrete for determining pay adjustments. Use the acceptance compressive strength test results.

2. When the acceptance compressive strength test result falls below the specified minimum compressive strength by more than the limits established in 346-10.19.7, the structure may be cored for determination of structural adequacy as directed by the Engineer. Use the result of the 28 day correlated core compressive strength or the acceptance compressive strength test, whichever is less.

A price adjustment will be applied to the certified invoice price the Contractor paid for the concrete or the precast product.

The Engineer will relate the strength at the actual test age to the 28 day strength for the design mix represented by the cores using appropriate strength time correlation equations.

In precast concrete operations, excluding prestressed concrete, ensure that the producer submits acceptable core sample test results to the Engineer. The producer may elect to use the products in accordance with this Section. Otherwise, replace the concrete in question at no additional cost to the Department. For prestressed concrete, core sample testing is not allowed for pay adjustment. The results of the cylinder strength tests will be used to determine material acceptance and pay adjustment.

**346-11.3 Calculating Pay Adjustments:** The Engineer will determine payment reductions for low strength concrete accepted by the Department. The 28-day strength is represented by either cylinders or correlated cores strength test results in accordance with 346-11.2.

Reduction in Pay is equal to the reduction in percentage of concrete compressive strength below the specified minimum strength:

$$\text{Reduction in Pay (\%)} = \left( \frac{f'_c - 28 \text{ day Strength}}{f'_c} \right) 100$$

For the elements that payments are based on the per foot basis, the Engineer will adjust the price reduction from cubic yards basis to per foot basis, determine the total linear feet of the elements that are affected by low strength concrete samples and apply the adjusted price reduction accordingly.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 12, 2021

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

Re: State Specifications Office  
Section: **413**  
Proposed Specification: **4130304 Sealing Cracks and Concrete Structure Surfaces.**

Dear Mr. Nguyen:

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

The changes are proposed by Guangming Wang from the State Materials Office to provide the services of an independent enterprise with prior experience on roadway friction testing with the equipment described to perform the friction test.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra  
Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer



**SEALING CRACKS AND CONCRETE STRUCTURE SURFACES**  
**(REV 5-13-21)**

SUBARTICLE 413-3.4.6 is deleted and the following substituted:

**413-3.4.6 Sand Distribution:** Apply sand over the monomer treated area within a timely period following the application of the polymer based on the manufacturer's recommendations for the existing conditions. Use equipment that will produce a uniform distribution of the sand over the treated area. If wheel mounted, use a sand spreader that has pneumatic tires compatible with the treatment material such that no tire footprints are left on the deck surface.

Use an initial application rate of 0.6 (plus or minus 0.05) pounds of sand per square yard of treated area, and adjust the rate as necessary to produce a friction number (FN) of no less than FN40R greater than or equal to 35 at 7 days. ~~Coordinate with the Engineer to conduct a preliminary on-site friction test to determine the actual sand application rate prior to the beginning of production application.~~ If friction numbers below those specified are obtained, completely remove all loose sand from the surface and re-apply the polymer at a rate of 150 square feet per gallon and spread additional sand as necessary to achieve the specified friction numbers. Remove the surface material by grinding, shot blasting, or other approved method if satisfactory friction values are not achieved. Friction tests ~~must~~will be conducted in accordance with AASHTO T242, using the ribbed tire option. ~~by the State Materials Office~~Secure the services of an independent enterprise with prior experience on roadway friction testing with the equipment described to perform the friction tests.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 6, 2021

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

Re: State Specifications Office  
Section: **430**  
Proposed Specification: **4300201 Pipe Culverts.**

Dear Mr. Nguyen:

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

The changes are proposed by Elizabeth Weber from the State Materials Office to reflect updates to Section 948 and Materials Manual 6.1 Volume II.  
Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to [daniel.strickland@dot.state.fl.us](mailto:daniel.strickland@dot.state.fl.us).

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

Sincerely,

Signature on File

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**PIPE CULVERTS**  
**(REV 5-14-21)**

SUBARTICLE 430-2.1 is deleted and the following substituted:

**430-2 Materials.**

**430-2.1 Pipe:** Meet the following requirements:

Concrete Pipe .....	Section 449
Steel Pipe .....	556-2.1
Round Rubber Gaskets .....	Section 942
Resilient Connectors* .....	Section 942
Corrugated Steel Pipe and Pipe Arch.....	Section 943
Corrugated Aluminum Pipe and Pipe Arch .....	Section 945
Corrugated Polyethylene Pipe.....	Section 948
Steel Reinforced Polyethylene Ribbed Pipe .....	Section 948
<u>Steel Reinforced Polyethylene Corrugated Pipe.....</u>	<u>Section 948</u>
Corrugated Polypropylene Pipe .....	Section 948
Corrugated Polyvinyl Chloride (PVC) Pipe .....	Section 948
Fiberglass Reinforced Polymer Pipe.....	Section 948
Liner Repair Systems.....	Section 948
Metal Grates.....	Section 962

\*Use resilient connector products listed on the Department’s Approved Product List (APL).

SUBARTICLE 430-4.1 is deleted and the following substituted:

**430-4 Laying Pipe.**

**430-4.1 General:** Lay all pipe, true to the lines and grades given, with bells up and spigot end fully entered into the bell. When pipe with quadrant reinforcement or circular pipe with elliptical reinforcement is used, install the pipe in a position such that the manufacturer’s marks designating “top” and “bottom” of the pipe are not more than five degrees from the vertical plane through the longitudinal axis of the pipe. Do not allow departure from and return to plan alignment and grade to exceed 1/16 inch per foot of nominal pipe length, with a total of not more than 1 inch departure from theoretical line and grade. Take up and relay any pipe that is not in true alignment or which shows any settlement after laying at no additional expense to the Department.

Do not use concrete pipe with lift holes except round pipe which has an inside diameter in excess of 54 inches or any elliptical pipe.

Repair lift holes, if present, with hand-placed, stiff, non-shrink, 1-to-1 mortar of cement and fine sand, after first washing out the hole with water. Completely fill the void created by the lift hole with mortar. Cover the repaired area with a 24 inch by 24 inch piece of filter fabric secured to the pipe. Use a Type D-3 filter fabric meeting the requirements specified in Section 985.

Secure the filter fabric to the pipe using a method that holds the fabric in place until the backfill is placed and compacted. Use grout mixtures, mastics, or strapping devices to secure the fabric to the pipe.

Do not cut or drill into or through the corrugations or ribs of plastic pipe except when necessary to meet the dimensional requirements shown in the Plans.

When installing pipes in structures, construct inlet and outlet pipes of the same size and kind as the connecting pipe shown in the Plans. Use the same pipe material within each continuous run of pipe. Extend the pipes through the walls for a distance beyond the outside surface sufficient for the intended connections, and construct the concrete around them neatly to prevent leakage along their outer surface as shown on Standard Plans, Index 425-001. Keep the inlet and outlet pipes flush with the inside of the wall. Resilient connectors as specified in 942-3 may be used in lieu of a masonry seal.

Furnish and install a filter fabric jacket around all pipe joints and the joint between the pipe and the structure in accordance with Standard Plans, Indexes 425-001 and 430-001. Use fabric meeting the physical requirements of Type D-3 specified in Section 985. Extend the fabric a minimum of 12 inches beyond each side of the joint or both edges of the coupling band, if a coupling band is used. The fabric must have a minimum width of 24 inches, and a length sufficient to provide a minimum overlap of 24 inches. Secure the filter fabric jacket against the outside of the pipe by metal or plastic strapping or by other methods approved by the Engineer.

Meet the following minimum joint standards:

Pipe Application	Minimum Standard
Storm and Cross Drains	Water-tight
Gutter Drain	Water-tight
Side Drains	Soil-tight

When rubber gaskets are to be installed in the pipe joint, the gasket must be the sole element relied on to maintain a tight joint. Soil tight joints must be watertight to 2 psi. Water-tight joints must be water-tight to 5 psi unless a higher pressure rating is required in the Plans.

When laying pipes that pass through mechanically stabilized earth (MSE) reinforced fill, connect the portion of the pipe within the wall to the external portion of the pipe run only after the full height of the wall supported embankment is in place.

When Wall Zone Pipes are shown in the Plans, meet the following requirements:

1. Use resilient connectors on pipes entering and leaving drainage structures.
2. Provide a 2 to 4 inch pipe overhang beyond the drainage structure internal walls.
3. For pipes without welded joints, meet the following additional requirements:

a. Pipe joints must be watertight to 10.8 psi when pulled out 2 inches from the fully home d position in both straight joint alignment and 5% deflection.

b. Do not allow the gap between sections of pipe to exceed 5/8 inch for all pipe diameters.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

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Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 8, 2021

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

Re: State Specifications Office  
Section: **450**  
Proposed Specification: **4500203 Precast Prestressed Concrete Construction.**

Dear Mr. Nguyen:

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

The changes are proposed by Thomas Frank from the State Materials Office to clarify camber tolerances, the length of exposed strand between adjacent ends of products vs. length of exposed strand between end header and stressing anchorage.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**PRECAST PRESTRESSED CONCRETE CONSTRUCTION**  
**(REV 5-3-21)**

SUBARTICLE 450-2.3 is deleted and the following substituted:

**450-2.3 Tolerances:**

Inspect all prestressed concrete products within five working days of detensioning to ensure their dimensions (other than sweep and camber) conform to the specified tolerances and to determine if there are any deficiencies.

Inspect the product for conformance with the product dimension tolerances shown in Appendix B of PCI Manual MNL-116, except as modified herein.

Apply the tolerances with respect to the theoretical positions and dimensions shown in the Plans. Apply the same tolerances for U-Beams as those specified for I-Beams, when inspecting the product for conformance with dimension tolerances.

For Florida U-Beam diaphragms, the tolerances are:

1. Plus 1 inch and minus 1/2 inch for the thickness of intermediate diaphragms.
2. Plus or minus 3 inches for the location of intermediate diaphragms, relative to design plan positions.
3. Plus 3 inches and minus 1/2 inch for the thickness of the end diaphragms.

The tolerance for beam strand sheathing is plus or minus 2 inches.

Ensure the tolerance on all miscellaneous shaping including, but not limited to, chamfers, miters, bevels, keys, tapers, radii, holes, inserts, and block outs is within plus or minus 1/8 inch of the control dimension of the shape.

The tolerances represent the total allowable tolerance that will be accepted in the finished product. Do not apply tolerances shown for the overall dimensions of a member to violate the tolerances shown for positions of reinforcing and prestressing steel or FRP. Apply the tolerances during and after the fabrication of prestressed products. Do not reduce the concrete cover for reinforcing steel, FRP reinforcing, prestressing steel, FRP prestressing strands, or any other metallic or polymeric objects specified in the Plans more than 1/4 inch. Do not reduce the concrete cover for reinforcing steel, FRP reinforcing, prestressing steel, FRP prestressing strands, or any other metallic or polymeric objects when the cover specified in the Plans is minimum cover.

Limit sweep to 1/2 inch for U-Beams and Inverted T-Beams.

The maximum allowable sweep for I-Beams and piles is 1/8 inch for every 10 feet, and will be determined by the following equation:

$$\text{Sweep (in)} = (0.0125 \text{ in/ft}) \times \text{Length (ft) of beam or pile}$$

Measure and record the sweep and camber of the beams immediately after detensioning and monthly. Keep the measurement records on file for review upon request by the Engineer.

Notify the Engineer immediately when the sweep or camber exceeds the specified tolerances.

If the actual camber is less than 50% of the predicted camber at release provided by the Plans, move the dunnage towards the center of the beam to a maximum of 5% of the total length at each end to induce camber.

If the camber ~~exceeds by 1 inch~~ **is outside** of the design camber shown in the Plans **by plus or minus 1 inch**, take appropriate actions ~~in accordance with 400 7.13.1~~ to accommodate the product in the structure.

If the sweep exceeds the tolerance specified, immediately propose measures to the Engineer to bring the sweep of the product back to within tolerance. Special storage conditions for the purpose of removing excessive sweep will not be restricted by requirements of this Section.

SUBARTICLE 450-6.4.1 is deleted and the following substituted:

#### **450-6.4 End Header Locations:**

**450-6.4.1 General:** Provide a minimum of 18 inches of exposed strands from the end header to the stressing anchorage **for all products. Provide a minimum of 18 inches of exposed strands** ~~and~~ between adjacent ends of all products except 24\_-inches square and smaller piles. Provide a minimum of 6 inches of exposed strands between adjacent ends of 24\_-inches square and smaller piles.

ARTICLE 450-13 is deleted and the following substituted:

#### **450-13 Repair Methods and Materials.**

**450-13.1 General:** Before beginning the repairs of bug holes, spalls, chips, surface porosity, and honeycomb, remove all laitance, loose material, form oil, curing compound and any other deleterious matter from the repair area. Repair cosmetic or minor deficiencies by methods specified herein. Submit alternative repair methods as needed.

For each project, maintain the record of deficiencies and their repair methods. Ensure the record includes information about product description, unit serial number, date cast, defect description including dimensions, repair method and materials, defect discovery date, and signature of producer's QC Manager indicating concurrence with the information.

Cure repaired surfaces for the full 72 hour curing time or for the curing time as recommended by recommendations from the manufacturer of the repair material. Ensure the repaired surfaces have a surface texture, finish and color which matches the appearance of the unaffected surrounding area of the product.

**450-13.1.1 Product Acceptance on the Project:** Use only non-shrink grout **and/or epoxy** that is listed on the Approved Product List (APL).

**450-13.2 Cosmetic Surface Filling:** Repair areas to be filled with an approved high-strength, non-metallic, non-shrink grout meeting the requirements of Section 934. Mix, apply and cure the grout in accordance with the manufacturer's recommendations. Coating of the prepared surface with epoxy bonding agent before grout placement is not required.

**450-13.3 Surface Restoration:** Maintain the surface continuously wet for a minimum of three hours before application of repair material. Repair areas to be restored with a mortar mix consisting by volume of one part cement, 2.5 parts sand that will pass a No. 16 sieve, and

sufficient water to produce a viscous slurry mix or repair areas to be restored with an approved high-strength, non-metallic, non-shrink grout meeting the requirements of Section 934. Mix, apply and cure the grout in accordance with the manufacturer's recommendations. Cure areas repaired with a mortar mix in accordance with 450-10.6. Coating of the prepared surface with epoxy bonding agent before grout placement is not required.

**450-13.4 Cutting and Filling:** Carefully cut all feathered edges of the area to be repaired back perpendicular to (or slightly undercut from) the surface to the depth of sound concrete or to a minimum depth of 1/2 inch, whichever is deeper. Coat the prepared surface with an approved epoxy bonding agent applied in accordance with the manufacturer's recommendations. Fill the cutout area with an approved high-strength, non-metallic, non-shrink grout mixed and applied in accordance with the manufacturer's recommendations. Firmly consolidate the grout mix in the cutout area.

**450-13.5 Restoration of Surfaces and Edges:** When reinforcing steel or prestressing strand is exposed, remove concrete from around the items to provide a 1-inch clearance all around. When less than one-half the reinforcement diameter is exposed, a positive connection utilizing anchor screws may be proposed in lieu of 1-inch clearance all around. Do not damage the reinforcement. Form surfaces and edges to the original dimensions and shape of the product. Coat the prepared surface with an approved epoxy bonding agent applied in accordance with the manufacturer's recommendations. Restore surfaces and edges with an approved high-strength, non-metallic, non-shrink grout mixed and applied in accordance with the manufacturer's recommendations. An epoxy mortar meeting the requirements of Section 926, Type F may be used as an alternative to non-shrink grout. Firmly consolidate the grout or epoxy mortar mix in the area to be repaired. Restore surfaces and edges to the original dimensions and shape of the product.

**450-13.6 Removal and Restoration of Unsound Concrete:** Carefully cut the area of unsound concrete to be repaired back perpendicular to (or slightly undercut from) the surface and to the depth of sound concrete or to a minimum depth of 1 inch, whichever is deeper. When reinforcing bars, prestressing strand, inserts or weldments are exposed, remove the concrete from around the items to provide a 1-inch clearance all around. When less than one-half the reinforcement diameter is exposed, a positive connection utilizing anchor screws may be proposed in lieu of 1-inch clearance all around. Do not damage the reinforcement. Coat the prepared surface with an approved epoxy bonding agent applied in accordance with the manufacturer's recommendations and then filled with an approved high-strength, non-metallic, non-shrink grout mixed and applied in accordance with the manufacturer's recommendations. An epoxy mortar meeting the requirements of Section 926, Type F may be used as an alternative to non-shrink grout. Firmly consolidate the grout or epoxy mortar mix in the area to be repaired. Restore surfaces and edges to the original dimensions and shape of the product.

**450-13.7 Surface Grinding:** Grind off misshaped formed surfaces with an abrasive stone. Apply two coats of penetrant sealer in accordance with the requirements of Section 413, to any surfaces which are not subsequently encased in concrete, immediately after grinding has been accepted. Do not apply a penetrant sealer to any surfaces to be subsequently encased in concrete.

**450-13.8 Treatment of Cracks:** Treat cracks in accordance with 450-12.3.6.





*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 12, 2021

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

Re: State Specifications Office  
Section: **455**  
Proposed Specification: **4550501 Structures Foundations.**

Dear Mr. Nguyen:

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

The changes are proposed by Juan Castellanos from the State Construction Office to provide modifications to the language regarding redrilling hole depths, steel piling measurements, and adjust measurement for grouted performed holes.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## STRUCTURES FOUNDATIONS

(REV ~~76-81~~-21)

SUBARTICLE 455-5.1 is deleted and the following substituted:

### 455-5 General Requirements.

**455-5.1 Predrilling of Pile Holes:** Predrilled pile holes are either starter holes to the depth described in this Subarticle or holes drilled through embankment/fill material down to the natural ground surface at no additional cost to the Department. When using low displacement steel piling such as structural shapes, drive them through the compacted fill without the necessity of drilling holes through the fill except when the requirements for predrilling are shown in the Plans. When using concrete or other high displacement piles, drill pile holes through fill, new or existing, to at least the elevation of the natural ground surface. Use the range of drill diameters listed below for square concrete piles.

12 inch square piles .....	15 to 17 inches
14 inch square piles .....	18 to 20 inches
18 inch square piles .....	22 to 26 inches
20 inch square piles .....	24 to 29 inches
24 inch square piles .....	30 to 34 inches
30 inch square piles .....	36 to 43 inches

For other pile sizes, use the diameter of the drills shown in the Plans or approved by the Engineer. Accurately drill the pile holes with the hole centered over the Plan location of the piling. Maintain the location and vertical alignment within the tolerances allowed for the piling.

For predrilled holes required through rock or other hard (i.e. debris, obstructions, etc.) materials that may damage the pile during installation, predrill hole diameters approximately 2 inches larger than the largest dimension across the pile cross-section. Fill the annular space around the piles as described in 455-5. 10.1 with clean A-3 sand or sand meeting the requirements of 902-3.3.

In the setting of permanent and test piling, the Contractor may initially predrill holes to a depth up to ~~10 feet or~~ 20% of the test pile length whichever is greater, unless required otherwise by the Engineer or shown in the Plans. Predrill holes for production piles in the same manner as the test piles. Where installing piles in compacted fill, predrill the holes to the elevation of the natural ground surface. With prior written authorization from the Engineer, the Contractor may predrill holes to greater depths to minimize the effects of vibrations on existing structures adjacent to the work and/or for other reasons the Contractor proposes.

SUBARTICLE 455-5.12.2 is deleted and the following substituted:

### 455-5.12.2 Wave Equation:

1. Use Wave Equation Analysis for Piles (WEAP) programs to evaluate the suitability of the proposed driving system (including the hammer, follower, capblock and pile

cushions) as well as to estimate the driving resistance, in blows per 12 inches or blows per inch, to achieve the pile bearing requirements and to evaluate pile driving stresses.

Use Wave Equation Analyses to show the hammer meets the requirements described in 455-5.3 and maximum allowed pile stresses are not exceeded.

2. Required Equipment for Driving: Hammer approval is based on satisfactory field performance including dynamic load test results. In the event piles require different hammer sizes, the Contractor may elect to drive with more than one size hammer or with a variable energy hammer, provided the hammer is properly sized and cushioned, will not damage the pile, and will develop the required resistance.

3. Maximum Allowed Pile Stresses:

a. General: The maximum allowed driving stresses for concrete, steel, and timber piles are given below. In the event dynamic load tests show that the hammer will overstress the pile, modify the driving system or method of operation as required to prevent overstressing the pile. In such cases provide additional cushioning, reduce the stroke, or make other appropriate agreed upon changes.

b. Prestressed Concrete Piles: Use the following equations to determine the maximum allowed pile stresses:

$$\underline{s_{apc} = 0.7 f'_c - 0.75 f_{cpe}} \quad \underline{s_{apc} = 0.7 f'_c - 0.75 f_{pe}} \quad (1)$$

$$s_{apt} = 6.5 (f'_c)^{0.5} + 1.05 f_{cpe} \quad (2a) \text{ for piles less than 50 feet long}$$

$$s_{apt} = 3.25 (f'_c)^{0.5} + 1.05 f_{cpe} \quad (2b) \text{ for piles 50 feet long and greater}$$

$$s_{apt} = 500 \quad (2c) \text{ within 20 feet of a mechanical splice}$$

where:

$s_{apc}$  = maximum allowed pile compressive stress, psi

$s_{apt}$  = maximum allowed pile tensile stress, psi

$f'_c$  = specified minimum compressive strength of concrete, psi

$f_{cpe}$  = effective prestress (after all losses) at the time of driving, psi, taken as 0.8 times the initial prestress force divided by the minimum net concrete cross-sectional area of the pile ( $f_{cpe} = 0$  for dowel spliced piles).

c. Steel Piles: Ensure the maximum pile compression and tensile stresses measured during driving are no greater than 0.9 times the yield strength ( $0.9 f_y$ ) of the steel.

d. Timber Piles: Ensure the maximum pile compression and tensile stresses measured during driving are no greater than 3.6 ksi for Southern Pine and Pacific Coast Douglas Fir and 0.9 of the ultimate parallel to the grain strength for piles of other wood.

ARTICLE 455-11 is deleted and the following substituted:

**455-11 Method of Measurement (All Piling).**

**455-11.1 General:** ~~The quantity to be paid for will be the length, in feet, furnished, placed, and accepted according to the authorized lengths list, including any additions and excluding any deletions thereto, as approved by the Engineer.~~

—————No adjustments in the length, in feet, of piling will be made if cut-offs are required after the pile has been driven to satisfactory bearing.

**455-11.2 Prestressed Concrete Piling:**

**455-11.2.1 Length:** The length of precast concrete piles will be considered as the overall length from head to tip. Final pay length will be based on the casting length as authorized in accordance with 455-5.15.3 subject to provisions of 455-11.2.3, ~~through~~ 455-11.2.4, 455-11.8, 455-11.9, ~~and~~ 455-11.12 ~~and~~ 455-11.13.

**455-11.2.2 Driving of Unplanned Epoxy-Bonded Dowel Splice:** If a pile is driven below cut-off and satisfactory bearing is not obtained, and additional driving is required after construction of a satisfactory splice, an additional 10 feet of piling will be paid for the additional driving. This compensation for driving of splice, however, will not be allowed for test piles that are spliced and redriven.

**455-11.2.3 Extracting Piles:** In the event that a pile is driven below cut-off without obtaining the required bearing, and the Engineer elects to have the pile extracted and a longer pile substituted, the pile extraction will be paid for as Unforeseeable Work. In the event a pile is damaged or mislocated, and the damage or mislocation is determined to be the Department's responsibility, and the Engineer elects to have the pile extracted, the pile extraction will be paid for as Unforeseeable Work. If a replacement pile is required, compensation will be made under the item for piling, for both the original pile and replacement pile. Redriving of an extracted and undamaged pile will be paid for at 30% of the Contract unit price for piling.

The Contractor may substitute a longer pile in lieu of splicing and building-up a pile. In this event, the Contractor will be paid for the original authorized length of the pile, plus any additional length furnished by the Contractor up to the authorized length of the build-up, as piling. The Contractor will be paid 30 feet of piling as full compensation for extracting the original pile.

**455-11.2.4 Underwater Driving:** When the Contractor selects one of the optional underwater driving methods, payment will be made by selecting the applicable method from the following:

1. Using a pile longer than the authorized length: Measurement for piling will be made only for the authorized length at that location unless the length of pile from cut-off elevation to the final tip elevation is greater than the authorized length, in which case payment for piling will be made from cut-off elevation to final tip elevation. No payment will be made for pile splice, when this option is selected, unless the pile is physically spliced and the splice is driven below cut-off elevation to achieve bearing.

2. Using an underwater hammer or a pile follower: Measurement will be in accordance with 455-11.2.1.

**455-11.3 Steel Piling:**

**455-11.3.1 Length:** The length of steel piles will be considered as the overall length from head to tip. Final pay length will subject to provisions of 455-11.8, 455-11.9, 455-11.10, 455-11.12, and 455-11.13.

**455-11.3.2 Steel Piling—Point Protectors:** The quantity to be paid for will be each for the total of point protectors authorized, furnished, and properly installed.

**455-11.4 Test Piles:** The quantity to be paid for of test piles of various types, will be the length, in feet, of test piling furnished, driven and accepted, according to the authorized length list, and any extensions thereof as approved by the Engineer.

Test piles left in place as permanent piles will be paid for only as test piling. Any extensions necessary to continue driving the pile for test purposes, as authorized by the Engineer, will be paid for as test piles. Other extensions of piles, additional length paid for splicing and build-ups will be included in the quantities of regular piling and will not be paid for as test piling.

**455-11.5 Dynamic Load Tests:** Payment will be based on the number of dynamic load tests shown in the Plans, authorized by the Engineer, or required in 455-5.12.7, completed and accepted in accordance with the Contract Documents. No separate payment will be made for dynamic load tests used to evaluate changes in the Contractor's driving equipment. No payment will be made for dynamic load tests used to evaluate the integrity of a pre-planned epoxy-bonded dowel splice. Include all costs associated with dynamically testing production piles with epoxy-bonded dowel splices under Pay Item No. 455-34. No payment will be made for dynamic load tests on test piles.

For structures with 100% dynamic testing, the cost of supplying and installing embedded gauges or attaching external gauges to each pile for dynamic load tests is included in the cost of the pile and no separate payment will be made.

For structures without 100% dynamic testing, the cost of supplying and installing embedded gauges or attaching external gauges to each production pile for dynamic load testing prior to initial driving, authorized by the Engineer, will be 20 feet of additional pile. No payment will be made for attaching dynamic testing equipment for set-checks or redrives. No payment will be made for dynamic load testing performed when driving using followers. No payment will be made for any dynamic load testing performed on temporary piles.

**455-11.6 Steel Sheet Piling:** The quantity to be paid for will be the plan quantity area, in square feet, measured from top of pile elevation to the bottom of pile elevation and beginning and end wall limits as shown in the Plans with no allowance for variable depth surface profiles. Approved alternate support structures would be paid for as plan quantity computed for sheet pile. Sheet piling used in cofferdams and to incorporate the Contractor's specific means and methods, and not ordered by the Engineer, will be paid for as required in Section 125.

**455-11.7 Concrete Sheet Piling:** The quantity to be paid for will be the product of the number of such piles satisfactorily completed, in place, times their lengths in feet as shown in the Plans or authorized by the Engineer. This quantity will be based upon piles 2-1/2 feet wide.

When the Engineer approves, the Contractor may furnish the concrete sheet piling in widths wider than shown in the Plans; then the number of piles shall be the actual number of units completed times the width used divided by the width in the Plans.

**455-11.8 Pile Splices:** The quantity to be paid for authorized drivable splices and build-ups greater than 5 feet in length in concrete piling, and test piling, which are made for the purpose of obtaining authorized pile lengths longer than shown as the maximum length in the Standard Plans Indexes, for obtaining greater lengths than originally authorized by the Engineer, to incorporate test piling in the finished structure, for further driving of test piling, or for splices shown in the Plans, will be 30 feet of additional prestressed concrete piling under Pay Item No. 455-34.

For concrete piles and test piles, where the build-up is 5 feet or less in length, the quantity to be paid for will be 9 feet of prestressed concrete piling under Pay Item No. 455-34 as compensation for drilling and grouting the dowels and all other costs for which provision has not otherwise been made.

The quantity to be paid for authorized splices in steel piling and test piling, for the purpose of obtaining lengths longer than the lengths originally authorized by the Engineer, will be 20 feet of additional steel piling under Pay Item No. 455-35.

**455-11.9 Set-Checks and Redrives:**

**455-11.9.1 Set Checks/Test Piles:** There will be no separate payment for the initial four set-checks performed the day of and the working day following initial driving. For each additional set-check ordered by the Engineer and performed within the following working day of initial driving, an additional quantity of 10 feet of piling will be paid.

**455-11.9.2 Set Checks/Production Piles:** There will be no separate payment for the initial two set-checks performed the day of and the working day following initial driving. For each additional set-check ordered by the Engineer and performed within the following working day of initial driving, an additional quantity of 10 feet of piling will be paid.

**455-11.9.3 Redrives:** The quantity to be paid for will be the number of redrives, each, authorized by the Engineer. Payment for any pile redrive (test pile or production pile) ordered by the Engineer will consist of 20 feet of additional piling.

**455-11.10 Pile Extraction:** Piles authorized to be extracted by the Engineer and successfully extracted as provided in 455-11.2.3 will be paid for as described in 455-11.2.3. No payment for extraction will be made for piles shown in the Plans to be extracted or piling damaged or mislocated by the Contractor that are ordered to be extracted by the Engineer.

**455-11.11 Static Load Tests:** The quantity to be paid for will be the number of static load tests of the designated tonnages, each, as shown in the Plans or authorized by the Engineer, actually applied to piles, completed and accepted in accordance with the Plans and these Specifications.

**455-11.12 Preformed Pile Holes:** The quantity added to the payment for piling will be 30% of the length of completed preformed pile holes from existing ground or the bottom of any required excavation, whichever is lower, to the bottom of preformed hole acceptably provided, complete for the installation of the bearing piles, regardless of the type of pile (test pile or production pile) installed therein. Only those holes authorized to be paid for, as provided in 455-5.10.3, will be included in the measurement for payment. The Engineer will authorize payment for preformed pile holes only when the pile has been placed in proper position and has achieved the required penetration.

**455-11.13 Grouted Preformed Pile Holes:** The quantity added to the payment for piling will be 70% of the length of grouted preformed pile holes from the bottom of preformed hole acceptably provided to the required top of grouting, regardless of the type of pile (test pile or production pile) installed therein. Only those holes required to be grouted, will be included in the measurement for payment.

SUBARTICLE 455-16.3 is deleted and the following substituted:

**455-16.3 Support, Alignment, and Tolerance:** Tie and support the reinforcing steel in the shaft so that the reinforcing steel will remain within allowable tolerances as specified in 455-20 and Section 415.



Ensure concentric spacing for the entire length of the cage. As a minimum, use centering devices consisting of wheels or other approved noncorrosive spacing devices within 3 feet of the bottom, within 6 feet of the top, and intervals not exceeding 10 feet along the cage length. When a casing with an inside diameter (I.D.) larger than the required shaft diameter is used, provide, within the portion of the oversized casing, centering devices specially dimensioned or other means to ensure the casing and the cage are concentric. Do not use block or wire type spacers. Ensure no permanent metallic elements will be within the concrete cover space. Use a minimum of one spacer per 30 inches of circumference of cage with a minimum of four at each level. Provide spacers at the bottom of the drilled shaft reinforcing cage as required to maintain the proper position of the cage.

Check the elevation of the top of the steel cage before and after placing the concrete. If the cage is not within the specified tolerances, correct, and submit a revised DSIP to the Engineer for approval. Do not construct additional shafts until receiving approval from the Engineer.

SUBARTICLE 455-17.6.1.3 is deleted and the following substituted:

**455-17.6.1.3 Required TITDS Reports:** Submit the TITDS data and analysis results to the Engineer in a signed and sealed report, together with all electronic data, within 48 hours of testing. The report shall include as minimum the following items:

1. Graphs displaying all temperature measurements and average temperature versus depth.
2. Indication of unusual temperatures, including cooler local deviations from the average at any depth from the overall average over the entire length.
3. A graph displaying the average temperature and theoretical temperature versus depth.
4. Variations in temperature between access tubes which may indicate variations in cage alignment.
5. The calculated radius of the shaft throughout the entire depth.
- ~~6. Alignment of the reinforcing cage along the shaft.~~
- ~~67.~~ Calculated concrete cover throughout the entire depth.
- ~~78.~~ Shaft Details, Probe Details, Environmental Details, Tube Run Selection and Shaft Adjustment Data that show the measurements, inputs and adjustments to the data. Screen captures of these pages from the TIP Reporter software will be acceptable.
- ~~89.~~ A conclusion stating whether the tested shaft is free from integrity defects, and meets the minimum concrete cover and diameter requirements by the specifications and the cage is properly aligned. When anomalies are detected, include in the report a three-dimensional rendering of the shape of the shaft.

SUBARTICLE 455-17.6.2 is deleted and the following substituted:

**455-17.6.2 Cross Sonic Logging (CSL) and Tomography:** When required by the Engineer, perform CSL testing in accordance with ASTM D6760. Engage a qualified Specialty Engineer to perform the CSL testing. The qualified CSL Specialty Engineer must be a Professional Engineer in the State of Florida and have a minimum six months experience of CSL

testing, supervising the collection of CSL data and interpretation of CSL results. The individual performing the CSL testing in the field must work for the Specialty Engineer firm and have a minimum of six months experience of CSL testing. The Contractor shall provide all necessary access and assistance to the CSL Specialty Engineer to satisfactorily perform the testing.

When a shaft contains four tubes, test every possible tube combination. For shafts with five or more tubes, test all pairs of adjacent tubes around the perimeter, and one-half of the remaining number of tube combinations, as chosen by the Engineer. Pull the probes simultaneously, starting from the bottoms of the tubes, over an electronic depth measuring device. Perform the CSL tests with the source and receiver probes in the same horizontal plane. Continuously record CSL signals at depth intervals of 2-1/2 inches or less from the bottom of the tubes to the top of each shaft. Remove all slack from the cables prior to pulling to provide accurate depth measurements in the CSL records. When the measurements indicate a 30% or greater reduction in velocity between one or more pairs, take one or two concrete cores to allow further evaluation and repair, or replace the shaft as directed by the Engineer. Determine the location of the concrete cores by performing 3D tomographic analysis using the CSL measurements. The core depths shall be at least 5 feet deeper than the bottom of the anomaly determined by the 3D tomography analysis or full depth if the anomaly is within 5 feet of the bottom of the shaft. The Engineer may accept a drilled shaft without rock cores if an EAR demonstrates that the anomaly does not affect the structural and the geotechnical axial capacity, the structural and geotechnical lateral stability, the settlement behavior of the shaft, and that the anomaly will not impact the durability of the foundation.

When repairs are done, perform CSL measurements in all tube pair combinations with the source and receiver running at the same horizontal plane and at the vertical offsets of 45 degrees above and below. Perform all measurements including the offset measurements from the point where the higher probe is at least 5 feet below the lower limit of the repaired zone to the point where the lower probe is at least 5 feet above the upper limit of the repaired zone. Offset measurements must be as follows: plus 45 degrees (source below receiver) and minus 45 degrees (source above receiver). Use the measurements of these two offsets in combination with the horizontal measurements to perform the 3D tomography. Provide the CSL measurements, CSL logs and 3D tomographic analysis at no additional cost to the Department.

After acceptance of production shafts by the Engineer, fill the tubes or core holes with a structural non-shrink grout in accordance with 455-17.6.1.

If the Contractor determines at any time during the non-destructive testing and evaluation of the drilled shaft that the drilled shaft should be replaced, no further testing or evaluation of that shaft is required.

ARTICLE 455-20 is deleted and the following substituted:

#### **455-20 Construction Tolerances.**

Meet the following construction tolerances for drilled shafts:

1. Ensure that the top of the drilled shaft is no more than 3 inches laterally in the X or Y coordinate from the position indicated in the Plans.
2. Ensure that the vertical alignment of the shaft excavation does not vary from the alignment shown in the Plans by more than 1/4 inches per foot of depth.



3. After placing all the concrete, ensure that the top of the reinforcing steel cage is no more than 6 inches above and no more than 3 inches below plan position.

4. Ensure that the reinforcing cage is concentric with the shaft within a tolerance of 1-1/2 inches. Ensure that concrete cover is a minimum of 4-1/2 inches unless shown otherwise in the Plans.

5. Ensure that the minimum diameter of the drilled shaft is not smaller than the specified shaft diameter minus 1 inch. All casing diameters shown in the Plans refer to I.D. (inside diameter) dimensions. However, the Contractor may use casing with an outside diameter equal to the specified shaft diameter if the extra length described in 455-15.7 is provided. In this case, ensure that the I.D. of the casing is not ~~smaller~~ less than the specified shaft diameter ~~minus~~ less 1 inch. When approved, the Contractor may elect to provide a casing larger in diameter than shown in the Plans to facilitate meeting this requirement. ~~Ensure that the minimum diameter of the drilled shaft is 1 inch less than the specified shaft diameter.~~ When conditions are such that a series of telescoping casings are used, provide the casing sized to maintain the minimum shaft diameters listed above.

6. Except when abutting or encroaching within a sidewalk, ensure that the top elevation of the drilled shaft concrete has a tolerance of plus 1 inch and minus 3 inches from the top of shaft elevation shown in the Plans.

7. When abutting or encroaching within a sidewalk, ensure that the top elevation of the drilled shaft is flush with the sidewalk surface.

8. The dimensions of casings are subject to American Petroleum Institute tolerances applicable to regular steel pipe.

9. Use excavation equipment and methods designed so that the completed shaft excavation will have a flat bottom. Ensure that the cutting edges of excavation equipment are normal to the vertical axis of the equipment within a tolerance of plus or minus 3/8 inches per foot of diameter.

ARTICLE 455-44 is deleted and the following substituted:

#### **455-44 Pile Installation.**

Meet the following requirements:

1. Locate the piles as shown on the drawings.

2. Should soft, compressible muck, organics, clay or other unsuitable materials (non A-1, A-3, A-2-4 or limestone materials) be encountered, remove the unsuitable material to a maximum depth of 5 feet and a radial distance around the pile centerline of two pile diameters, unless otherwise indicated in the Plans. Backfill with clean granular backfill materials (A-1, A-3, A-2-4), placed and compacted in maximum 12 inch lifts to at least 95% of maximum dry density as determined by FM 1-T180. Complete this work to the Engineer's satisfaction prior to ACP construction. Should more than 5 feet depth or excessive quantities of unsuitable material be encountered, immediately advise the Engineer and proceed with the work as directed by the Engineer.

3. Provide continuous auger flighting from the bottom of the pile to the top of ground at the time of drilling with no gaps or other breaks, except for connections. Ensure the auger flights are uniform in diameter throughout its length, and of the diameter specified for the piles less a maximum of 3%. Provide augers with a distance between flights of approximately half the diameter of the auger.

4. Use augers with the grout injection hole located at the bottom of the auger head below the bar containing the cutting teeth, and with pile auger leads containing a bottom guide.

5. Construct piles of the length and diameter shown on the Plans.

6. Clearly mark the auger leads to facilitate monitoring of the incremental drilling and grout placement. Provide individual foot marks with 5 foot increments highlighted and clearly visible. Provide a clear reference mark on the moving auger assembly to facilitate accurately monitoring the vertical movement of the auger.

7. Place piles by rotating a continuous flight hollow shaft auger into the ground at a continuous rate that prevents removal of excess soil. Stop advancement after reaching the predetermined depth.

8. Should auger penetration to the required depth prove difficult due to hard materials/refusal, the pile location may be predrilled, upon approval of the Engineer, through the obstruction using appropriate drilling equipment, to a diameter no larger than one-half the prescribed finish diameter of the ACP. Commence ~~ACP construction~~ grouting immediately upon ~~completion of reaching the required tip elevation~~ predrilling to minimize ground loss and soil relaxation. Should non-drillable material be encountered preventing placement to the depth required, immediately advise the Engineer and proceed with the work as directed by the Engineer. Refusal is defined as the depth where the penetration of the standard auger equipment is less than 12 inches per minute.

9. Plug the hole in the bottom of the auger prior to advancing into the ground.

10. Pump the grout with sufficient pressure as the auger is withdrawn to completely fill the auger hole, preventing hole collapse and to cause the lateral penetration of the grout into soft or porous zones of the surrounding soil or rock. Prior to commencing withdrawal of the auger, establish a head of at least 5 feet of grout by pumping a volume of grout equivalent to 5 feet of pile volume. Do not include the volume or strokes required to prime the grout pumping system in the volume required to build this initial head. Maintain this head of at least 5 feet of grout above the injection point around the perimeter of the auger to displace and remove any loose material from the hole. Maintain positive rotation of the auger at least until placement of the grout.

11. Once the grout head has been established, greatly reduce the speed of rotation of the auger and commence extraction at a rate consistent with the pump discharge. Maintain extraction at a steady rate to prevent a locked-in auger, necking of the pile, or a substantially reduced pile section. Ensure grout starts flowing out from the hole when the cutting head is at least 5 feet below the ground surface. Place a minimum volume of grout in the hole of at least 115% of the column of the auger hole from a depth of 5 feet to the tip. Place a minimum volume of grout in the hole of at least 100% of the column of the auger hole from the ground surface to a depth of 5 feet. Do not include any grout needed to create surplus grout head in the volume of grout placed into the hole. If the grout does not flow out from the hole when the cutting head is at least 5 feet below the ground surface, re-drill the pile under the direction of the Engineer. If grouting is interrupted for any reason, reinsert the auger by drilling at least 5 feet below the tip of the auger when the interruption occurred, and then regROUT.

Use this method of placement at all times. Do not depend on the stability of the hole without the earth filled auger.

12. Assume responsibility for the grout volume placed. If less than 115% of the theoretical volume of grout is placed in any 5 foot increment (100% in the top 5 foot increment),

reinstall the pile by advancing the auger 10 feet or to the bottom of the pile if that is less, followed by controlled removal and grout injection.

13. Furnish and install the reinforcing steel and anchoring bolts as shown in the Contract Documents. For ACP for miscellaneous structures and low clearance post options for noise walls, use wheels or other approved noncorrosive spacing devices within 3 feet of the bottom, within 3 feet of the top, and intervals not exceeding 10 feet along the pile to ensure concentric spacing for the entire length of the cage. Do not use block or wire type spacers. Use a minimum of one spacer per 30 inches of circumference or perimeter of cage with a minimum of three at each level. For noise wall ACP in which the full reinforcement is attached to the post, spacing devices within 3 ft of the top of the pile are not required.

14. Use reinforcement that is without kinks or nonspecified bends, free of mud, oil or other coatings that could adversely affect the bond. Make splices in reinforcement as shown on the Contract Documents, unless otherwise approved by the Engineer. Place the required steel reinforcement while the grout is still fluid, and immediately after finishing grouting and clearing it from any contaminating material. Install the steel cage into the grout by its own weight or manually. Do not use a mechanical equipment or tool to impact the steel cage or to force it into the grout. If the steel cage cannot be placed completely following this procedure, redrill and regrout the pile.

15. Leave any temporary supports of/for items placed into a grouted pile (reinforcement template, anchor bolt template, precast column supports, etc.) in place for a minimum of 12 hours after completion of the pile. Do not place wall panels or other loads, before piles are accepted and the grout has set a minimum of seven days or reached the 28 day strength.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 19, 2021

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

Re: State Specifications Office  
Section: **455**  
Proposed Specification: **REVISED 4550501 Structures Foundations.**

Dear Mr. Nguyen:

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

The changes are proposed by Juan Castellanos from the State Construction Office to provide modifications to the language regarding redrilling hole depths, steel piling measurements, and adjust measurement for grouted performed holes.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## STRUCTURES FOUNDATIONS

(REV ~~76-151~~-21)

SUBARTICLE 455-5.1 is deleted and the following substituted:

### 455-5 General Requirements.

**455-5.1 Predrilling of Pile Holes:** Predrilled pile holes are either starter holes to the depth described in this Subarticle or holes drilled through embankment/fill material down to the natural ground surface at no additional cost to the Department. When using low displacement steel piling such as structural shapes, drive them through the compacted fill without the necessity of drilling holes through the fill except when the requirements for predrilling are shown in the Plans. When using concrete or other high displacement piles, drill pile holes through fill, new or existing, to at least the elevation of the natural ground surface. Use the range of drill diameters listed below for square concrete piles.

12 inch square piles .....	15 to 17 inches
14 inch square piles .....	18 to 20 inches
18 inch square piles .....	22 to 26 inches
20 inch square piles .....	24 to 29 inches
24 inch square piles .....	30 to 34 inches
30 inch square piles .....	36 to 43 inches

For other pile sizes, use the diameter of the drills shown in the Plans or approved by the Engineer. Accurately drill the pile holes with the hole centered over the Plan location of the piling. Maintain the location and vertical alignment within the tolerances allowed for the piling.

For predrilled holes required through rock or other hard (i.e. debris, obstructions, etc.) materials that may damage the pile during installation, predrill hole diameters approximately 2 inches larger than the largest dimension across the pile cross-section. Fill the annular space around the piles as described in 455-5. 10.1 with clean A-3 sand or sand meeting the requirements of 902-3.3.

In the setting of permanent and test piling, the Contractor may initially predrill holes to a depth up to ~~10 feet or~~ 20% of the test pile length whichever is greater, unless required otherwise by the Engineer or shown in the Plans. Predrill holes for production piles in the same manner as the test piles. Where installing piles in compacted fill, predrill the holes to the elevation of the natural ground surface. With prior written authorization from the Engineer, the Contractor may predrill holes to greater depths to minimize the effects of vibrations on existing structures adjacent to the work and/or for other reasons the Contractor proposes.

SUBARTICLE 455-5.12.2 is deleted and the following substituted:

### 455-5.12.2 Wave Equation:

1. Use Wave Equation Analysis for Piles (WEAP) programs to evaluate the suitability of the proposed driving system (including the hammer, follower, capblock and pile

cushions) as well as to estimate the driving resistance, in blows per 12 inches or blows per inch, to achieve the pile bearing requirements and to evaluate pile driving stresses.

Use Wave Equation Analyses to show the hammer meets the requirements described in 455-5.3 and maximum allowed pile stresses are not exceeded.

2. Required Equipment for Driving: Hammer approval is based on satisfactory field performance including dynamic load test results. In the event piles require different hammer sizes, the Contractor may elect to drive with more than one size hammer or with a variable energy hammer, provided the hammer is properly sized and cushioned, will not damage the pile, and will develop the required resistance.

3. Maximum Allowed Pile Stresses:

a. General: The maximum allowed driving stresses for concrete, steel, and timber piles are given below. In the event dynamic load tests show that the hammer will overstress the pile, modify the driving system or method of operation as required to prevent overstressing the pile. In such cases provide additional cushioning, reduce the stroke, or make other appropriate agreed upon changes.

b. Prestressed Concrete Piles: Use the following equations to determine the maximum allowed pile stresses:

$$\cancel{s_{apc} = 0.7 f'_c - 0.75 f_{cpe}} \quad \cancel{s_{apc} = 0.7 f'_c - 0.75 f_{pe}} \quad (1)$$

$$s_{apt} = 6.5 (f'_c)^{0.5} + 1.05 f_{cpe} \quad (2a) \text{ for piles less than 50 feet long}$$

$$s_{apt} = 3.25 (f'_c)^{0.5} + 1.05 f_{cpe} \quad (2b) \text{ for piles 50 feet long and greater}$$

$$s_{apt} = 500 \quad (2c) \text{ within 20 feet of a mechanical splice}$$

where:

$s_{apc}$  = maximum allowed pile compressive stress, psi

$s_{apt}$  = maximum allowed pile tensile stress, psi

$f'_c$  = specified minimum compressive strength of concrete, psi

$f_{cpe}$  = effective prestress (after all losses) at the time of driving, psi, taken as 0.8 times the initial prestress force divided by the minimum net concrete cross-sectional area of the pile ( $f_{cpe} = 0$  for dowel spliced piles).

c. Steel Piles: Ensure the maximum pile compression and tensile stresses measured during driving are no greater than 0.9 times the yield strength ( $0.9 f_y$ ) of the steel.

d. Timber Piles: Ensure the maximum pile compression and tensile stresses measured during driving are no greater than 3.6 ksi for Southern Pine and Pacific Coast Douglas Fir and 0.9 of the ultimate parallel to the grain strength for piles of other wood.

ARTICLE 455-11 is deleted and the following substituted:

**455-11 Method of Measurement (All Piling).**

**455-11.1 General:** ~~The quantity to be paid for will be the length, in feet, furnished, placed, and accepted according to the authorized lengths list, including any additions and excluding any deletions thereto, as approved by the Engineer.~~

—————No adjustments in the length, in feet, of piling will be made if cut-offs are required after the pile has been driven to satisfactory bearing.

**455-11.2 Prestressed Concrete Piling:**

**455-11.2.1 Length:** The length of precast concrete piles will be considered as the overall length from head to tip. Final pay length will be based on the casting length as authorized in accordance with 455-5.15.3 subject to provisions of 455-11.2.3, ~~through~~ 455-11.2.4, 455-11.8, 455-11.9, ~~and~~ 455-11.12 and 455-11.13.

**455-11.2.2 Driving of Unplanned Epoxy-Bonded Dowel Splice:** If a pile is driven below cut-off and satisfactory bearing is not obtained, and additional driving is required after construction of a satisfactory splice, an additional 10 feet of piling will be paid for the additional driving. This compensation for driving of splice, however, will not be allowed for test piles that are spliced and redriven.

**455-11.2.3 Extracting Piles:** In the event that a pile is driven below cut-off without obtaining the required bearing, and the Engineer elects to have the pile extracted and a longer pile substituted, the pile extraction will be paid for as Unforeseeable Work. In the event a pile is damaged or mislocated, and the damage or mislocation is determined to be the Department's responsibility, and the Engineer elects to have the pile extracted, the pile extraction will be paid for as Unforeseeable Work. If a replacement pile is required, compensation will be made under the item for piling, for both the original pile and replacement pile. Redriving of an extracted and undamaged pile will be paid for at 30% of the Contract unit price for piling.

The Contractor may substitute a longer pile in lieu of splicing and building-up a pile. In this event, the Contractor will be paid for the original authorized length of the pile, plus any additional length furnished by the Contractor up to the authorized length of the build-up, as piling. The Contractor will be paid 30 feet of piling as full compensation for extracting the original pile.

**455-11.2.4 Underwater Driving:** When the Contractor selects one of the optional underwater driving methods, payment will be made by selecting the applicable method from the following:

1. Using a pile longer than the authorized length: Measurement for piling will be made only for the authorized length at that location unless the length of pile from cut-off elevation to the final tip elevation is greater than the authorized length, in which case payment for piling will be made from cut-off elevation to final tip elevation. No payment will be made for pile splice, when this option is selected, unless the pile is physically spliced and the splice is driven below cut-off elevation to achieve bearing.

2. Using an underwater hammer or a pile follower: Measurement will be in accordance with 455-11.2.1.

**455-11.3 Steel Piling:**

**455-11.3.1 Length:** The length of steel piles will be considered as the overall length from head to tip. Final pay length will subject to provisions of 455-11.8, 455-11.9, 455-11.10, 455-11.12, and 455-11.13.



**455-11.3.2 Steel Piling—Point Protectors:** The quantity to be paid for will be each for the total of point protectors authorized, furnished, and properly installed.

**455-11.4 Test Piles:** The quantity to be paid for of test piles of various types, will be the length, in feet, of test piling furnished, driven and accepted, according to the authorized length list, and any extensions thereof as approved by the Engineer.

Test piles left in place as permanent piles will be paid for only as test piling. Any extensions necessary to continue driving the pile for test purposes, as authorized by the Engineer, will be paid for as test piles. Other extensions of piles, additional length paid for splicing and build-ups will be included in the quantities of regular piling and will not be paid for as test piling.

**455-11.5 Dynamic Load Tests:** Payment will be based on the number of dynamic load tests shown in the Plans, authorized by the Engineer, or required in 455-5.12.7, completed and accepted in accordance with the Contract Documents. No separate payment will be made for dynamic load tests used to evaluate changes in the Contractor's driving equipment. No payment will be made for dynamic load tests used to evaluate the integrity of a pre-planned epoxy-bonded dowel splice. Include all costs associated with dynamically testing production piles with epoxy-bonded dowel splices under Pay Item No. 455-34. No payment will be made for dynamic load tests on test piles.

For structures with 100% dynamic testing, the cost of supplying and installing embedded gauges or attaching external gauges to each pile for dynamic load tests is included in the cost of the pile and no separate payment will be made.

For structures without 100% dynamic testing, the cost of supplying and installing embedded gauges or attaching external gauges to each production pile for dynamic load testing prior to initial driving, authorized by the Engineer, will be 20 feet of additional pile. No payment will be made for attaching dynamic testing equipment for set-checks or redrives. No payment will be made for dynamic load testing performed when driving using followers. No payment will be made for any dynamic load testing performed on temporary piles.

**455-11.6 Steel Sheet Piling:** The quantity to be paid for will be the plan quantity area, in square feet, measured from top of pile elevation to the bottom of pile elevation and beginning and end wall limits as shown in the Plans with no allowance for variable depth surface profiles. Approved alternate support structures would be paid for as plan quantity computed for sheet pile. Sheet piling used in cofferdams and to incorporate the Contractor's specific means and methods, and not ordered by the Engineer, will be paid for as required in Section 125.

**455-11.7 Concrete Sheet Piling:** The quantity to be paid for will be the product of the number of such piles satisfactorily completed, in place, times their lengths in feet as shown in the Plans or authorized by the Engineer. This quantity will be based upon piles 2-1/2 feet wide.

When the Engineer approves, the Contractor may furnish the concrete sheet piling in widths wider than shown in the Plans; then the number of piles shall be the actual number of units completed times the width used divided by the width in the Plans.

**455-11.8 Pile Splices:** The quantity to be paid for authorized drivable splices and build-ups greater than 5 feet in length in concrete piling, and test piling, which are made for the purpose of obtaining authorized pile lengths longer than shown as the maximum length in the Standard Plans Indexes, for obtaining greater lengths than originally authorized by the Engineer, to incorporate test piling in the finished structure, for further driving of test piling, or for splices shown in the Plans, will be 30 feet of additional prestressed concrete piling under Pay Item No. 455-34.



For concrete piles and test piles, where the build-up is 5 feet or less in length, the quantity to be paid for will be 9 feet of prestressed concrete piling under Pay Item No. 455-34 as compensation for drilling and grouting the dowels and all other costs for which provision has not otherwise been made.

The quantity to be paid for authorized splices in steel piling and test piling, for the purpose of obtaining lengths longer than the lengths originally authorized by the Engineer, will be 20 feet of additional steel piling under Pay Item No. 455-35.

**455-11.9 Set-Checks and Redrives:**

**455-11.9.1 Set Checks/Test Piles:** There will be no separate payment for the initial four set-checks performed the day of and the working day following initial driving. For each additional set-check ordered by the Engineer and performed within the following working day of initial driving, an additional quantity of 10 feet of piling will be paid.

**455-11.9.2 Set Checks/Production Piles:** There will be no separate payment for the initial two set-checks performed the day of and the working day following initial driving. For each additional set-check ordered by the Engineer and performed within the following working day of initial driving, an additional quantity of 10 feet of piling will be paid.

**455-11.9.3 Redrives:** The quantity to be paid for will be the number of redrives, each, authorized by the Engineer. Payment for any pile redrive (test pile or production pile) ordered by the Engineer will consist of 20 feet of additional piling.

**455-11.10 Pile Extraction:** Piles authorized to be extracted by the Engineer and successfully extracted as provided in 455-11.2.3 will be paid for as described in 455-11.2.3. No payment for extraction will be made for piles shown in the Plans to be extracted or piling damaged or mislocated by the Contractor that are ordered to be extracted by the Engineer.

**455-11.11 Static Load Tests:** The quantity to be paid for will be the number of static load tests of the designated tonnages, each, as shown in the Plans or authorized by the Engineer, actually applied to piles, completed and accepted in accordance with the Plans and these Specifications.

**455-11.12 Preformed Pile Holes:** The quantity added to the payment for piling will be 30% of the length of completed preformed pile holes from existing ground or the bottom of any required excavation, whichever is lower, to the bottom of preformed hole acceptably provided, complete for the installation of the bearing piles, regardless of the type of pile (test pile or production pile) installed therein. Only those holes authorized to be paid for, as provided in 455-5.10.3, will be included in the measurement for payment. The Engineer will authorize payment for preformed pile holes only when the pile has been placed in proper position and has achieved the required penetration.

**455-11.13 Grouted Preformed Pile Holes:** The quantity added to the payment for piling will be 70% of the length of grouted preformed pile holes from the bottom of preformed hole acceptably provided to the required top of grouting, regardless of the type of pile (test pile or production pile) installed therein. Only those holes required to be grouted, will be included in the measurement for payment.

SUBARTICLE 455-16.3 is deleted and the following substituted:

**455-16.3 Support, Alignment, and Tolerance:** Tie and support the reinforcing steel in the shaft so that the reinforcing steel will remain within allowable tolerances as specified in 455-20 and Section 415.

Ensure concentric spacing for the entire length of the cage. As a minimum, use centering devices consisting of wheels or other approved noncorrosive spacing devices within 3 feet of the bottom, within 6 feet of the top, and intervals not exceeding 10 feet along the cage length. When a casing with an inside diameter (I.D.) larger than the required shaft diameter is used, provide, within the portion of the oversized casing, centering devices specially dimensioned or other means to ensure the casing and the cage are concentric. Do not use block or wire type spacers. Ensure no permanent metallic elements will be within the concrete cover space. Use a minimum of one spacer per 30 inches of circumference of cage with a minimum of four at each level. Provide spacers at the bottom of the drilled shaft reinforcing cage as required to maintain the proper position of the cage.

Check the elevation of the top of the steel cage before and after placing the concrete. If the cage is not within the specified tolerances, correct, and submit a revised DSIP to the Engineer for approval. Do not construct additional shafts until receiving approval from the Engineer.

SUBARTICLE 455-17.6.1.3 is deleted and the following substituted:

**455-17.6.1.3 Required TITDS Reports:** Submit the TITDS data and analysis results to the Engineer in a signed and sealed report, together with all electronic data, within 48 hours of testing. The report shall include as minimum the following items:

1. Graphs displaying all temperature measurements and average temperature versus depth.
2. Indication of unusual temperatures, including cooler local deviations from the average at any depth from the overall average over the entire length.
3. A graph displaying the average temperature and theoretical temperature versus depth.
4. Variations in temperature between access tubes which may indicate variations in cage alignment.
5. The calculated radius of the shaft throughout the entire depth.
- ~~6. Alignment of the reinforcing cage along the shaft.~~
- ~~6~~7. Calculated concrete cover throughout the entire depth.
- ~~7~~8. Shaft Details, Probe Details, Environmental Details, Tube Run Selection and Shaft Adjustment Data that show the measurements, inputs and adjustments to the data. Screen captures of these pages from the TIP Reporter software will be acceptable.
- ~~8~~9. A conclusion stating whether the tested shaft is free from integrity defects, ~~and~~ meets the minimum concrete cover and diameter requirements by the specifications and the cage is properly aligned. When anomalies are detected, include in the report a three-dimensional rendering of the shape of the shaft.

SUBARTICLE 455-17.6.2 is deleted and the following substituted:

**455-17.6.2 Cross Sonic Logging (CSL) and Tomography:** When required by the Engineer, perform CSL testing in accordance with ASTM D6760. Engage a qualified Specialty Engineer to perform the CSL testing. The qualified CSL Specialty Engineer must be a Professional Engineer in the State of Florida and have a minimum six months experience of CSL

testing, supervising the collection of CSL data and interpretation of CSL results. The individual performing the CLS testing in the field must work for the Specialty Engineer firm and have a minimum of six months experience of CSL testing. The Contractor shall provide all necessary access and assistance to the CSL Specialty Engineer to satisfactorily perform the testing.

When a shaft contains four tubes, test every possible tube combination. For shafts with five or more tubes, test all pairs of adjacent tubes around the perimeter, and one-half of the remaining number of tube combinations, as chosen by the Engineer. Pull the probes simultaneously, starting from the bottoms of the tubes, over an electronic depth measuring device. Perform the CSL tests with the source and receiver probes in the same horizontal plane. Continuously record CSL signals at depth intervals of 2-1/2 inches or less from the bottom of the tubes to the top of each shaft. Remove all slack from the cables prior to pulling to provide accurate depth measurements in the CSL records. When the measurements indicate a 30% or greater reduction in velocity between one or more pairs, take one or two concrete cores to allow further evaluation and repair, or replace the shaft as directed by the Engineer. Determine the location of the concrete cores by performing 3D tomographic analysis using the CSL measurements. The core depths shall be at least 5 feet deeper than the bottom of the anomaly determined by the 3D tomography analysis or full depth if the anomaly is within 5 feet of the bottom of the shaft. The Engineer may accept a drilled shaft without rock cores if an EAR demonstrates that the anomaly does not affect the structural and the geotechnical axial capacity, the structural and geotechnical lateral stability, the settlement behavior of the shaft, and that the anomaly will not impact the durability of the foundation.

When repairs are done, perform CSL measurements in all tube pair combinations with the source and receiver running at the same horizontal plane and at the vertical offsets of 45 degrees above and below. Perform all measurements including the offset measurements from the point where the higher probe is at least 5 feet below the lower limit of the repaired zone to the point where the lower probe is at least 5 feet above the upper limit of the repaired zone. Offset measurements must be as follows: plus 45 degrees (source below receiver) and minus 45 degrees (source above receiver). Use the measurements of these two offsets in combination with the horizontal measurements to perform the 3D tomography. Provide the CSL measurements, CSL logs and 3D tomographic analysis at no additional cost to the Department.

After acceptance of production shafts by the Engineer, fill the tubes or core holes with a structural non-shrink grout in accordance with 455-17.6.1.

If the Contractor determines at any time during the non-destructive testing and evaluation of the drilled shaft that the drilled shaft should be replaced, no further testing or evaluation of that shaft is required.

ARTICLE 455-20 is deleted and the following substituted:

**455-20 Construction Tolerances.**

Meet the following construction tolerances for drilled shafts:

1. Ensure that the top of the drilled shaft is no more than 3 inches laterally in the X or Y coordinate from the position indicated in the Plans.
2. Ensure that the vertical alignment of the shaft excavation does not vary from the alignment shown in the Plans by more than 1/4 inches per foot of depth.

3. After placing all the concrete, ensure that the top of the reinforcing steel cage is no more than 6 inches above and no more than 3 inches below plan position.

4. Ensure that the reinforcing cage is concentric with the shaft within a tolerance of 1-1/2 inches. Ensure that concrete cover is a minimum of 4-1/2 inches unless shown otherwise in the Plans.

5. Ensure that the minimum diameter of the drilled shaft is not smaller than the specified shaft diameter minus 1 inch. All casing diameters shown in the Plans refer to I.D. (inside diameter) dimensions. However, the Contractor may use casing with an outside diameter equal to the specified shaft diameter if the extra length described in 455-15.7 is provided. In this case, ensure that the I.D. of the casing is not ~~smaller~~ less than the specified shaft diameter ~~minus~~ less 1 inch. When approved, the Contractor may elect to provide a casing larger in diameter than shown in the Plans to facilitate meeting this requirement. ~~Ensure that the minimum diameter of the drilled shaft is 1 inch less than the specified shaft diameter.~~ When conditions are such that a series of telescoping casings are used, provide the casing sized to maintain the minimum shaft diameters listed above.

6. Except when abutting or encroaching within a sidewalk, ensure that the top elevation of the drilled shaft concrete has a tolerance of plus 1 inch and minus 3 inches from the top of shaft elevation shown in the Plans.

7. When abutting or encroaching within a sidewalk, ensure that the top elevation of the drilled shaft is flush with the sidewalk surface.

8. The dimensions of casings are subject to American Petroleum Institute tolerances applicable to regular steel pipe.

9. Use excavation equipment and methods designed so that the completed shaft excavation will have a flat bottom. Ensure that the cutting edges of excavation equipment are normal to the vertical axis of the equipment within a tolerance of plus or minus 3/8 inches per foot of diameter.

ARTICLE 455-44 is deleted and the following substituted:

#### **455-44 Pile Installation.**

Meet the following requirements:

1. Locate the piles as shown on the drawings.
2. Should soft, compressible muck, organics, clay or other unsuitable materials (non A-1, A-3, A-2-4 or limestone materials) be encountered, remove the unsuitable material to a maximum depth of 5 feet and a radial distance around the pile centerline of two pile diameters, unless otherwise indicated in the Plans. Backfill with clean granular backfill materials (A-1, A-3, A-2-4), placed and compacted in maximum 12 inch lifts to at least 95% of maximum dry density as determined by FM 1-T180. Complete this work to the Engineer's satisfaction prior to ACP construction. Should more than 5 feet depth or excessive quantities of unsuitable material be encountered, immediately advise the Engineer and proceed with the work as directed by the Engineer.
3. Provide continuous auger flighting from the bottom of the pile to the top of ground at the time of drilling with no gaps or other breaks, except for connections. Ensure the auger flights are uniform in diameter throughout its length, and of the diameter specified for the piles less a maximum of 3%. Provide augers with a distance between flights of approximately half the diameter of the auger.

4. Use augers with the grout injection hole located at the bottom of the auger head below the bar containing the cutting teeth, and with pile auger leads containing a bottom guide.

5. Construct piles of the length and diameter shown on the Plans.

6. Clearly mark the auger leads to facilitate monitoring of the incremental drilling and grout placement. Provide individual foot marks with 5 foot increments highlighted and clearly visible. Provide a clear reference mark on the moving auger assembly to facilitate accurately monitoring the vertical movement of the auger.

7. Place piles by rotating a continuous flight hollow shaft auger into the ground at a continuous rate that prevents removal of excess soil. Stop advancement after reaching the predetermined depth.

8. Should auger penetration to the required depth prove difficult due to hard materials/refusal, the pile location may be predrilled, upon approval of the Engineer, through the obstruction using appropriate drilling equipment, to a diameter no larger than one-half the prescribed finish diameter of the ACP. Commence ~~ACP construction~~ grouting immediately upon ~~completion of reaching the required tip elevation~~ predrilling to minimize ground loss and soil relaxation. Should non-drillable material be encountered preventing placement to the depth required, immediately advise the Engineer and proceed with the work as directed by the Engineer. Refusal is defined as the depth where the penetration of the standard auger equipment is less than 12 inches per minute.

9. Plug the hole in the bottom of the auger prior to advancing into the ground.

10. Pump the grout with sufficient pressure as the auger is withdrawn to completely fill the auger hole, preventing hole collapse and to cause the lateral penetration of the grout into soft or porous zones of the surrounding soil or rock. Prior to commencing withdrawal of the auger, establish a head of at least 5 feet of grout by pumping a volume of grout equivalent to 5 feet of pile volume. Do not include the volume or strokes required to prime the grout pumping system in the volume required to build this initial head. Maintain this head of at least 5 feet of grout above the injection point around the perimeter of the auger to displace and remove any loose material from the hole. Maintain positive rotation of the auger at least until placement of the grout.

11. Once the grout head has been established, greatly reduce the speed of rotation of the auger and commence extraction at a rate consistent with the pump discharge. Maintain extraction at a steady rate to prevent a locked-in auger, necking of the pile, or a substantially reduced pile section. Ensure grout starts flowing out from the hole when the cutting head is at least 5 feet below the ground surface. Place a minimum volume of grout in the hole of at least 115% of the column of the auger hole from a depth of 5 feet to the tip. Place a minimum volume of grout in the hole of at least 100% of the column of the auger hole from the ground surface to a depth of 5 feet. Do not include any grout needed to create surplus grout head in the volume of grout placed into the hole. If the grout does not flow out from the hole when the cutting head is at least 5 feet below the ground surface, redrill the pile under the direction of the Engineer. If grouting is interrupted for any reason, reinsert the auger by drilling at least 5 feet below the tip of the auger when the interruption occurred, and then regROUT.

Use this method of placement at all times. Do not depend on the stability of the hole without the earth filled auger.

12. Assume responsibility for the grout volume placed. If less than 115% of the theoretical volume of grout is placed in any 5 foot increment (100% in the top 5 foot increment),

reinstall the pile by advancing the auger 10 feet or to the bottom of the pile if that is less, followed by controlled removal and grout injection.

13. Furnish and install the reinforcing steel and anchoring bolts as shown in the Contract Documents. For ACP for miscellaneous structures and low clearance post options for noise walls, use wheels or other approved noncorrosive spacing devices within 3 feet of the bottom, within 3 feet of the top, and intervals not exceeding 10 feet along the pile to ensure concentric spacing for the entire length of the cage. Do not use block or wire type spacers. Use a minimum of one spacer per 30 inches of circumference or perimeter of cage with a minimum of three at each level. For noise wall ACP in which the full reinforcement is attached to the post, spacing devices within 3 ft of the top of the pile are not required.

14. Use reinforcement that is without kinks or nonspecified bends, free of mud, oil or other coatings that could adversely affect the bond. Make splices in reinforcement as shown on the Contract Documents, unless otherwise approved by the Engineer. Place the required steel reinforcement while the grout is still fluid, and immediately after finishing grouting and clearing it from any contaminating material. Install the steel cage into the grout by its own weight or manually. Do not use a mechanical equipment or tool to impact the steel cage or to force it into the grout. If the steel cage cannot be placed completely following this procedure, redrill and regrout the pile.

15. Leave any temporary supports of/for items placed into a grouted pile (reinforcement template, anchor bolt template, precast column supports, etc.) in place for a minimum of 12 hours after completion of the pile. Do not place wall panels or other loads, before piles are accepted and the grout has set a minimum of seven days or reached the 28 day strength.





*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
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KEVIN J. THIBAUT, P.E.  
SECRETARY

June 21, 2021

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

Re: State Specifications Office  
Section: **461**  
Proposed Specification: **4610901 Multirotational Bearings.**

Dear Mr. Nguyen:

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

The changes are proposed by Dennis Golabek from the Structures Design Office to address pay item number for sole and masonry plates associated with multi-rotational bearings. Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to [daniel.strickland@dot.state.fl.us](mailto:daniel.strickland@dot.state.fl.us).

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**MULTIROTATIONAL BEARINGS**  
**(REV 3-22-21)**

SUBARTICLE 461-9.1 is deleted and the following substituted:

**461-9 Basis of Payment.**

**461-9.1 Basic Items of Bearings:** The Contract unit price per each for bearings will be full compensation for all work and materials necessary for the complete installation. Such price and payment will include, but not limited to, the following specific incidental itemswork:

1. testing,
2. tools and equipment required for installation,
3. any work to replace rejected bearings,
4. any repairs to the metalized coating on the bearings,
5. all costs associated with the manufacturer's installation technician,
6. sole plate, masonry plate, high strength bolt assemblies and anchor rod assemblies.





*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
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KEVIN J. THIBAUT, P.E.  
SECRETARY

July 21, 2021

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

Re: State Specifications Office  
Section: **523**  
Proposed Specification: **5230100 PATTERNED PAVEMENT.**

Dear Mr. Nguyen:

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

The changes are proposed by Sarah Smith to move all material requirements and APL to Division III. This proposed revision is associated with the proposed 9740000.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**PATTERNED PAVEMENT.**  
**(REV 6-8-21)**

SECTION 523 is deleted and the following substituted:

**SECTION 523**  
**PATTERNED PAVEMENT**

**523-1 Description.**

~~Install patterned pavement on asphalt or concrete pavement areas at locations and with the color and pattern as specified in the Plans. Use products listed on the Approved Product List (APL), as approved for use in areas subject to vehicular traffic or non-vehicular traffic, respectively, as specified herein. Install products in accordance with manufacturer's recommendations.~~

~~For the purpose of this Specification, Patterned pavements are defined as a post applied surface marking overlay to either the pavement surface or to an imprinted pavement surface. Vehicular traffic areas are defined as those areas subject to vehicles within the traveled way, shoulders and bicycle lanes. Non-vehicular travel traffic areas include medians, islands, curb extensions, sidewalks, borders, plazas and other areas typically subject to foot traffic only.~~

~~Install overlay products in areas subject to vehicular traffic to a thickness not exceeding 180 mils. Do not use products requiring removal of pavement or requiring blockouts or trenches below the top of pavement.~~

~~Variations within a pattern shall comply with ADA requirements.~~

**523-2 Materials.**

~~**523-2.1 General:** Use only patterned pavement products approved for use in vehicular and non-vehicular areas, as appropriate, and listed on the APL. Meet manufacturer's specifications for all patterns, textures, templates, sealers, coatings and coloring materials.~~

~~Use patterned pavement products listed on the Department's Approved Product List (APL) in accordance with meeting the requirements of Section 974. Material coatings used to achieve the pattern and color shall produce an adherent, weather resistant, skid resistant, wear resistant surface under service conditions. Color shall be integral and consistent throughout the installation. The composition of materials is intended to be left to the discretion of the manufacturer.~~

~~Prior to installation, submit pattern and color samples to the Engineer for confirmation that the product meets the pattern and color specified in the Plans. Do not begin installation until acceptance by the Engineer.~~

~~Materials shall be characterized as non-hazardous as defined by Resource Conservation and Recovery Act (RCRA), Subpart C, Table 1 of 40 CFR 261.24 "Toxicity Characteristic". Materials shall not exude fumes which are hazardous, toxic or detrimental to persons or property.~~

~~**523-2.2 Approved Product List (APL):** Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6 along with the following documentation:~~

~~1. Manufacturer's recommendations for applicability of use on concrete or asphalt surfaces.~~

~~2. Manufacturer's recommendation for applicability of use in vehicular or non-vehicular travel areas.~~

~~3. Manufacturer's specifications and procedures for materials and installation for each use above.~~

~~4. For products proposed for use in vehicular traffic areas, independent test data verifying the material meets the requirements of this Section including verification that the product, installed in accordance with the manufacturer's specifications and procedures, has been tested in accordance with either:~~

~~a. ASTM E 274, Skid Resistance of Paved Surfaces using a standard ribbed full scale tire at a speed of 40 mph (FN40R), and has a minimum FN40R value of 35, or~~

~~b. ASTM E 1911, Measuring Paved Surface Frictional Properties Using the Dynamic Friction Tester (DFT), at a speed of 40 mph (DFT40), and has a minimum DFT40 value of 40.~~

~~5. For products proposed for use in non-vehicular traffic areas, independent test data verifying the material meets the requirements of this Section including verification that the product, installed in accordance with the manufacturer's specifications and procedures, has been tested in accordance with ASTM E 303 using the British Pendulum Tester and has a British Pendulum Number (BPN) of at least 40.~~

~~**523-2.3 Performance Requirements for Products in Vehicular Travel Areas:** In addition to the submittal requirements of 523-2.2, APL approval will be contingent on a field service test demonstrating that the patterned pavement product meets the following performance measures at the end of three years from opening to traffic:~~

~~1. The average thickness shall be a minimum of 50% of the original thickness.~~

~~2. Wearing of the material coating shall not expose more than 15% of the underlying surface area as measured within the traveled way.~~

~~3. Friction performance of patterned/textured pavement materials shall meet or exceed one of the following test method values:~~

~~a. FN40R value of 35 in accordance with ASTM E 274; or,~~

~~b. DFT40 value of 40 in accordance with ASTM E 1911~~

~~Manufacturers shall provide a field service test installation of each product within a marked crosswalk on a roadway with an ADT of 6,000 to 12,000 vehicles per day per lane, on a site approved by the Department. The test installation shall be a minimum six feet wide and extend from pavement edge to pavement edge across all traffic lanes and shoulder pavement at the crosswalk location. The test installation shall be tested by the manufacturer in accordance with FM 5-592.~~

### **523-3 Construction Requirements.**

~~Install patterned pavement on asphalt or concrete pavement areas at locations and with the color and pattern as specified in the Plans. Prepare the surface and in accordance with the manufacturer's recommendations. Install patterned pavement in accordance with the manufacturer's installation instructions, using materials and equipment recommended and approved by the manufacturer. Color shall be integral and consistent throughout the installation.~~

~~Install overlay products in areas subject to vehicular traffic to a thickness not exceeding 180 mils.~~

~~Variations within the installation shall comply with ADA requirements.~~

~~**523-3.1 Product Submittals:** Prior to installation, submit pattern and color samples to the Engineer for confirmation that the product meets the pattern and color specified in the Plans. Do not begin installation until acceptance by the Engineer.~~

~~**523-3.2 Pavement Cuts:** Complete all utility, traffic loop detector, and other items requiring a cut and installation under the finished surface, prior to product installation.~~

~~**523-3.3 Surface Protection:** Protect treated surfaces from traffic and environmental effects until the product is completely installed, including drying and curing according to the manufacturer's instructions.~~

~~**523-3.4 Installation Acceptance:** For installation on new asphalt roadways, apply patterned pavement a minimum of 14 days after placement of the adjacent pavement.~~

~~Upon completion of the installation, the Engineer will check the area at random locations for geometric accuracy. If any of the chosen areas are found to be deficient, correct the entire patterned area at no additional cost to the Department.~~

~~Submit certification to the engineer, with including the APL number and that the patterned pavement was installed in accordance with the manufacturer's installations requirements instructions and this Section. **523-3.1 Product Submittals:** Prior to installation, submit pattern and color samples to the Engineer for confirmation that the product meets the pattern and color specified in the Plans. Do not begin installation until acceptance by the Engineer.~~

~~**523-3.2 Pavement Cuts:** Complete all utility, traffic loop detector, and other items requiring a cut and installation under the finished surface, prior to product installation.~~

~~**523-3.3 Surface Protection:** Protect treated surfaces from traffic and environmental effects until the product is completely installed, including drying and curing according to the manufacturer's instructions.~~

~~**523-3.4 Installation Acceptance:** For installation on new asphalt roadways, apply patterned pavement a minimum of 14 days after placement of the adjacent pavement.~~

~~Upon completion of the installation, the Engineer will check the area at random locations for geometric accuracy. If any of the chosen areas are found to be deficient, correct the entire patterned area at no additional cost to the Department.~~

~~Submit certification that the patterned pavement was installed in accordance with the manufacturer's requirements.~~

#### **523-4 Method of Measurement.**

The quantity to be paid will be the plan quantity in square yards of patterned pavement, completed and accepted. No deduction will be made for areas occupied by landscaping, manholes, inlets, drainage structures, or by any public utility appurtenances within the area.

#### **523-5 Basis of Payment.**

Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

- |               |    |   |
|---------------|----|---|
| Item No. 523- | 1- | Patterned Pavement (Vehicular Areas) - per square yard.     |
| Item No. 523- | 2- | Patterned Pavement (Non-Vehicular Areas) - per square yard. |



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 8, 2021

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

Re: State Specifications Office  
Section: **525**  
Proposed Specification: **5250200 Asphalt Concrete Curb.**

Dear Mr. Nguyen:

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

The changes are proposed by Wayne Rilko from the State Materials Office to update the Flexible Pavement Design Manual and remove the reference to traffic level A. The proposed specification change is associated with the changes to Section 234 and 334.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**ASPHALT CONCRETE CURB**  
**(REV 5-13-21)**

ARTICLE 525-2 is deleted and the following substituted:

**525-2 Materials.**

Use a Type SP-12.5 (Traffic Level ~~A<sub>7</sub>~~-B<sub>7</sub> or C) asphalt concrete mixture.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 21, 2021

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

Re: State Specifications Office  
Section: **527**  
Proposed Specification: **5270100 DETECTABLE WARNINGS.**

Dear Mr. Nguyen:

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

The changes are proposed by Karen Byram to move material requirements to Division III. New language is added in acceptance criteria and product selection for newly constructed and existing surfaces. This proposed revision is associated with the proposed 9740000.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**DETECTABLE WARNINGS.**(REV ~~6-87-15~~-21)

SECTION 527 is deleted and the following substituted:

**SECTION 527  
DETECTABLE WARNINGS****527-1 Description.**

~~Furnish and install d~~ Detectable warnings are products used for the visually impaired and installed on newly constructed and/or existing concrete or asphalt walking surfaces (sidewalk curb ramps, sidewalks, shared use paths, etc.). ~~constructed in accordance with Standard Plans, Index 522-002.~~

**527-2 Materials.**

~~527-2.1 Detectable Warnings: Provide detectable warnings in accordance with the Americans with Disabilities Act Standards for Transportation Facilities, Section 705. Use detectable warnings consisting of materials intended for exterior use subject to routine pedestrian traffic and occasional vehicular traffic. Use detectable warnings with size and pattern shown in the Plans comprised of truncated domes aligned in parallel rows in accordance with Standard Plans, Index 522-002. Do not use detectable warnings with a diagonal pattern.~~ Use detectable warnings as approved for use on uncured concrete, existing concrete, and asphalt surfaces. Use only products and materials appropriate for the surface on which they will be applied.

~~527-2.1.1 Preformed Materials: Use detectable warnings consisting of weather-resistant tiles or pavers that are cast into concrete, or tiles or mats that are surface applied to concrete or asphalt surfaces with adhesives and mechanical fasteners or torch applied preformed thermoplastic.~~

~~527-2.1.2 Field-Formed Materials: Use detectable warnings applied as a secondary application to the substrate.~~

~~527-2.2 Material Properties: Provide detectable warnings that meet the following minimum material property requirements when tested in accordance with the following:~~

PROPERTY	STANDARD	TEST VALUE
Slip Resistance	FM 3-C1028	Dry Coefficient of Friction—0.8 min. Wet Coefficient of Friction—0.65 min. (include recessed areas between truncated domes)
Wear Resistance	FM 5-594	Average Volume Loss: no more than 0.06 cm <sup>3</sup>
Water Absorption*	ASTM D570	Not to exceed 5%.
Adhesion/Bond Strength**	FM 5-589	150-psi min. tensile adhesion strength
Non-Hazardous Classification	Submit Material Safety Data Sheet (SDS)	Non-Hazardous, per RCRA Subtitle C

\* Applies only to plastic materials.

\*\* Applies only to surface applied materials.



~~527-2.3 Color/Contrast:~~ Use safety yellow, brick red, or black colored detectable warnings on concrete walking surfaces. Use safety yellow colored detectable warnings on asphalt walking surfaces. ~~Acceptable detectable warnings shall meet the following criteria for a duration of three years.~~

COLOR	LIGHT REFLECTANCE VALUES (LRV) CAP Y*
Safety Yellow	25—45
Brick Red	5—15
Black	0—5

\*When measured with a spectrophotometer

~~527-2.4 Approved Product List:~~ Methods or products used to form detectable warnings in wet concrete will not be permitted. Use detectable warnings listed on the Department's Approved Product List (APL) meeting the requirements of Section 974. ~~Manufacturers seeking evaluation of products for inclusion on the APL shall submit an application in accordance with Section 6 and include certified test reports from an independent lab showing the product meets the requirements of this Section and the Standard Plans, Index 522-002 Acceptance Criteria and manufacturer's drawings, specifications and procedures for materials and installation, including touch-up and repair.~~ Methods used to form detectable warnings in wet concrete will not be permitted.

### ~~527-3 Installation Procedures~~ **Construction Requirements.**

~~527-3.1 Surface Preparation and Installation:~~ Prepare the surface and install detectable warnings in accordance with the manufacturer's ~~recommendations~~ installation instructions, using materials and equipment recommended and approved by the manufacturer. Construct in accordance with Standard Plans, Index 522-002. Use only products and materials appropriate for the surface on which they will be applied. Install in accordance with the manufacturer's instructions, using materials and equipment recommended and approved by the manufacturer.

Open the walking surface to pedestrian traffic within 72 hours for uncured concrete surfaces. Immediately install detectable warnings on newly constructed surfaces and open the walking surface to pedestrian traffic for asphalt and existing concrete surfaces. For installations on newly placed concrete, install detectable warnings during casting or immediately upon completing the concrete curing period specified in 520-8. Install surface applied tiles or mats using adhesives applied over the entire surface and mechanical fasteners.

Surface color and texture shall be complete and uniform. Detectable warnings will be securely installed as recommended by the manufacturer and free from lifting, cracking, missing or partial domes, and with no significant defects. Surfaces shall not deviate more than 0.10" from a true plane.

### **527-4 Method of Measurement.**

Detectable warnings will be paid by plan quantity, per square foot, furnished, installed and accepted.

**527-5 Basis of Payment.**

Price and payment will be full compensation for all work specified in this Section, including all labor, surface preparation, materials and incidentals necessary to complete the work

Payment will be made under:

Item No. 527- 2- Detectable Warnings - per square foot.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 14, 2021

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

Re: State Specifications Office  
Section: **570**  
Proposed Specification: **5700600 PERFORMANCE TURF.**

Dear Mr. Nguyen:

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

The changes are proposed by Jason Russell to correct the Disputes Review Board (DRB) subarticle to the Statewide DRB and update the language in the Standard Specification.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**PERFORMANCE TURF.  
(REV 5-11-21)**

ARTICLE 570-6 is deleted and the following substituted:

**570-6 ~~Disputes Resolution~~ Statewide Disputes Review Board.**

~~The Contractor and the Department acknowledge that use of the Statewide Disputes Review Board is required and the determinations of the Statewide Disputes Review Board for disputes arising out of the performance turf specification will be binding on both the Contractor and the Department, with no right of appeal by either party, for the purposes of this Specification.~~

~~Any and all Statewide Disputes Review Board meetings after final acceptance of the Contract in accordance with 5-11 shall be requested and paid for by the Contractor. The Department will reimburse the Contractor for all fees associated with meetings.~~ The Statewide Disputes Review Board in effect for this Contract will resolve any and all disputes that may arise involving administration and enforcement of this Specification related to the remedial work performed during the warranty period. The Responsible Party and the Department acknowledge that use of the Statewide Disputes Review Board is required, and the determinations of the Statewide Disputes Review Board for disputes arising out of this Specification will be binding on both the Responsible Party and the Department, with no right of appeal by either party. Meet the requirements of 8-3.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 26, 2021

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

Re: State Specifications Office  
Section: **633**  
Proposed Specification: **6330600 Communication Cable.**

Dear Mr. Nguyen:

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

The changes are proposed by Derek Vollmer from the Traffic Engineering and Operations Office to clarify fiber optic cable locator for pay item based on Program Management Office recommendations.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**COMMUNICATION CABLE****(REV ~~76-2615~~-21)**

ARTICLE 633-6 is deleted and the following substituted:

**633-6 Method of Measurement.**

The quantities to be paid will be: the length, in feet, of fiber optic cable; the number, per each, of fiber optic connections; the number, per each, of fiber optic connection hardware; the number of calendar days from contract time start to final acceptance for fiber optic cable locator, ~~number, per day, of fiber optic cable locator;~~ and the length, per foot, of twisted pair cable, accepted by the Engineer.

The Contract unit price for communication cable, furnished and installed, will include furnishing, placement, and testing of all material, and for all tools, labor, equipment, installation hardware (such as support wire, cable ties, cable clamps, and lashing wire), supplies, support, personnel training, documentation, and incidentals necessary for a complete installation.

Payment for conductive cable terminal connectors and conductive cable grounding is considered incidental and shall be included in the price for twisted pair communication cable.

Fiber optic splices and terminations, as shown in the Plans, shall be measured per each fiber optic connection furnished and installed.

The price per day for a Fiber Optic Cable Locator, will include all tools, labor, equipment, locating and marking hardware (such as flags, paint, and shovels), supplies, support, personnel training, documentation, and incidentals.

ARTICLE 633-7 is deleted and the following substituted:

**633-7 Basis of Payment.**

Prices and payments will be full compensation for all work specified in this Section.

Payment will be made under:

- |                 |   |
|-----------------|---|
| Item No. 633- 1 | Fiber Optic Cable - per foot.               |
| Item No. 633- 2 | Fiber Optic Connection - each.              |
| Item No. 633- 3 | Fiber Optic Connection Hardware - each.     |
| Item No. 633- 4 | Twisted Pair Cable - per foot.              |
| Item No. 633- 6 | Fiber Optic <u>Cable</u> Locator - per day. |



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

June 29, 2021

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

Re: State Specifications Office  
Section: **646**  
Proposed Specification: **6460300 Aluminum Poles, Pedestals, and Posts.**

Dear Mr. Nguyen:

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

The changes are proposed by Jason Russell from the State Construction Office to provide additional articles for Remedial Work and Statewide Disputes Review Board for the painting of products covered by this specification. The following proposed changes are associated with changes to Section 649 and 715.

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

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

Sincerely,

Signature on File

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## ALUMINUM POLES, PEDESTALS, AND POSTS (REV 5-25-21)

SECTION 646 is expanded by the following new Articles:

### **646-3 Remedial Work.**

During the painting warranty period, the responsible party shall perform all painting remedial work necessary to meet the requirements of this Specification at no cost to the Department. Such remedial work shall be performed within 180 days of notification of a failure by the Department or by the determination of the Statewide Disputes Review Board. Failure to perform such remedial work within the time frame specified will result in the work being performed by other forces at the responsible party's cost.

If the responsible party is the fabricator, the fabricator will be removed from the Prequalified Painted Galvanized Steel and Aluminum Products Fabricators List for a minimum of six months or until payment in full for the correction of the deficiencies or defects has been made, whichever is longer.

If the responsible party is the Contractor, the Department will suspend, revoke, or deny the responsible party's certificate of qualification under the terms of Section 337.16(d)(2), Florida Statutes, for a minimum of six months or until payment in full for the correction of the deficiencies or defects has been made, whichever is longer.

### **646-4 Statewide Disputes Review Board.**

The Statewide Disputes Review Board in effect for this Contract will resolve any and all disputes that may arise involving administration and enforcement of this Specification related to the painting remedial work performed during the warranty period. The Responsible Party and the Department acknowledge that use of the Statewide Disputes Review Board is required, and the determinations of the Statewide Disputes Review Board for disputes arising out of this Specification will be binding on both the Responsible Party and the Department, with no right of appeal by either party. Meet the requirements of 8-3.

### **646-3.5 Installation.**

**646-3.5.1 General:** Verify the length of the column supports in the field prior to fabrication to permit the appropriate sign or signal height.

**646-3.5.2 Foundations:** Construct foundations in accordance with the applicable Standard Plans.

The Contractor may use precast foundations in augered or excavated holes that are a minimum of 12 inches larger than each axis dimension of the precast foundation. The holes must be clean and without loose material. Obtain precast foundations from a manufacturing plant that is currently on the Department's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105. Fill the voids around precast foundations with flowable fill meeting the requirements of Section 121 or clean sand placed using hydraulic methods to a level of 6 inches below grade.

**646-3.5.3 Setting Anchor Bolts:** Set anchor bolts 90 degrees apart with a bolt circle diameter of 14 inches. Adjust anchor bolts to a plumb line and hold rigidly in position to prevent displacement while pouring concrete.



**646-35.4 Installation:** Do not erect poles until the concrete strength is at least 2500 psi. Plumb the poles after erection using shims if necessary to obtain precise alignment.

**646-35.5 Grounding:** Meet the requirements of Section 620 and the applicable Standard Plans.

**646-46 Method of Measurement.**

The Contract unit price per each for aluminum pedestals and posts, furnished and installed, will include all materials and equipment as specified in the Contract Documents, and all labor and materials necessary for a complete and accepted installation.

Payment for removal of aluminum poles will include the complete removal of the pole and foundation, pedestrian detector and pedestrian signal. Separate payment for the removal of the pedestrian detector and pedestrian signal will be made only when the pole/pedestal is to remain.

Payment for grounding will be incidental to the pedestal or post.

**646-57 Basis of Payment.**

Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 646- Aluminum Poles - per each.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

June 29, 2021

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

Re: State Specifications Office  
Section: **649**  
Proposed Specification: **6490500 Galvanized Steel Poles, Mast Arms, and Monotube Assemblies.**

Dear Mr. Nguyen:

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

The changes are proposed by Jason Russell from the State Construction Office to update the articles for Remedial Work and Statewide Disputes Review Board. The following proposed changes are associated with changes to Section 646 and 715.

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

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

Sincerely,

Signature on File

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**GALVANIZED STEEL POLES, MAST  
ARMS, AND MONOTUBE ASSEMBLIES  
(REV 5-25-21)**

SECTION 649 is expanded by the following new Articles:

**649-5 Remedial Work.**

During the painting warranty period, the responsible party shall perform all painting remedial work necessary to meet the requirements of this Specification at no cost to the Department. Such remedial work shall be performed within 180 days of notification of a failure by the Department or by the determination of the Statewide Disputes Review Board. Failure to perform such remedial work within the time frame specified will result in the work being performed by other forces at the responsible party's cost.

If the responsible party is the fabricator, the fabricator will be removed from the Prequalified Painted Galvanized Steel Poles and Aluminum Products Fabricators List for a minimum of six months or until payment in full for the correction of the deficiencies or defects has been made, whichever is longer.

If the responsible party is the Contractor, the Department will suspend, revoke, or deny the responsible party's certificate of qualification under the terms of Section 337.16(d)(2), Florida Statutes, for a minimum of six months or until payment in full for the correction of the deficiencies or defects has been made, whichever is longer.

**649-6 Statewide Disputes Review Board.**

The Statewide Disputes Review Board in effect for this Contract will resolve any and all disputes that may arise involving administration and enforcement of this Specification related to the painting remedial work performed during the warranty period. The Responsible Party and the Department acknowledge that use of the Statewide Disputes Review Board is required, and the determinations of the Statewide Disputes Review Board for disputes arising out of this Specification will be binding on both the Responsible Party and the Department, with no right of appeal by either party. Meet the requirements of 8-3.

ARTICLES 649-5 through 649-7 are deleted and the following substituted:

**649-5-7 Installation.**

Install foundations in accordance with Section 455. Do not install poles, mast arm poles, or monotubes until the foundation has achieved 70% of the specified 28-day concrete strength and verifying test results have been submitted to the Engineer. Determine concrete strength from tests on a minimum of two test cylinders prepared and tested in accordance with ASTM C31 and ASTM C39. Before erecting the pole, clean the top of the foundation of any laitance, oils, grease or any other deleterious materials. Erect strain poles in an orientation which considering the rake and the application, cable forces will produce a plumb pole. Erect monotubes plumb at the time of installation. Plumb the pole supporting mast arms after the mast arms, traffic signals or sign panels have been placed.

If the traffic signals and/or sign panels are not in place within two working days after the mast arm is erected, furnish and install a 3 foot x 2 foot blank sign panel on the bottom of each

mast arm within 6 feet of the mast arm tip and plumb the pole. Re-plumb the pole supporting mast arms after installation of traffic signals and sign panels.

Install ASTM F3125, Grade A325 bolt, nut and washer assemblies in accordance with the following. Use bolt, nut and washer assemblies that are free of rust and corrosion and are lubricated properly as demonstrated by being able to easily hand turn the nut on the bolt thread for its entire length. Tighten nuts to a snug-tight condition to bring the faying surfaces of the assembly into firm contact with plies solidly seated against each other, but not necessarily in continuous contact. Snug-tight is defined as the maximum nut rotation resulting from the full effort of a person using an ordinary spud wrench. Visually inspect the connection after snugging all bolts, ensuring firm contact has been achieved at a minimum between faying surfaces beneath bolts within one bolt diameter of bolt hole edges. Re-snug bolts in a connection where faying surfaces are not in firm contact. After bringing the faying surfaces to a snug-tight condition, tighten nuts in accordance with Table 460-7, Nut Rotation from the Snug-Tight Condition. Maintain as close to uniform contact pressure as possible on the faying surfaces during snugging and turn-of-nut process by utilizing suitable erection methods and a bolt tightening pattern that balances the clamping force of each bolt, as closely as possible, with the equal clamping force of a companion bolt.

Base plate installation steps are as follows:

1. Clean and lubricate the exposed threads of all anchor bolts. Clean and lubricate the threads and bearing surfaces of all leveling nuts. Re-lubricate the exposed threads of the anchor bolts and the threads of the leveling nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and leveling nuts have become wet since they were first lubricated.
2. Verify that the nuts can be turned onto the bolts past the elevation corresponding to the bottom of each in-place leveling nut and be backed off by the effort of a person using an ordinary spud wrench, without employing a pipe extension on the wrench handle.
3. Turn the leveling nuts onto the anchor bolts and align the nuts to the same elevation less than or equal to one bolt diameter from the top of the foundation.
4. Place structural plate washers on top of the leveling nuts; one washer corresponding to each anchor bolt.
5. Install the base plate onto the leveling nut washers, place structural plate washers on top of the base plate; one washer corresponding to each anchor bolt, and turn full or half-size anchor nuts onto the anchor bolts.
6. Tighten anchor nuts against the top of the base plate to a snug-tight condition in a star pattern. A star tightening pattern is one in which the nuts on opposite or near opposite sides of the bolt circle are successively tightened in a pattern resembling a star. For an 8 bolt circle with bolts sequentially numbered 1 to 8, tighten nuts in the following bolt order: (1, 5, 7, 3, 8, 4, 6, 2).
7. Tighten leveling nuts to a snug-tight condition in a star pattern. The distance from the bottom of the leveling nuts to the top of the concrete must not exceed one anchor bolt diameter after tightening.
8. Tighten each full-size retainer nut until it is in firm contact with the top surface of the anchor nut; then while preventing the anchor nut from rotating, tighten the retainer nut until it is snug tight using a star pattern. Before final tightening of the retainer nuts, mark the reference position of each snug-tight nut on one flat with a corresponding reference mark on the

anchor nut and base plate on each bolt. Then while preventing the anchor nut from rotating, incrementally turn the retainer nuts using a star pattern until achieving the required nut rotation specified in Table 649-1. Turn the nuts at least two full tightening cycles (passes). After tightening, verify the nut rotation. Do not exceed the Table 649-1 value by more than 20 degrees.

9. Install a screen over the gap between the base plate and foundation concrete in accordance with 649-6, or place a structural grout pad in accordance with 649-7.

Anchor Bolt Diameter (inches)	Nut Rotation from Snug-Tight Condition
$\leq 1-1/2$	1/3 turn
$> 1-1/2$	1/6 turn

**649-57.1 Camera Lowering Device Installation:** Meet the requirements of 641-4.4.

### **649-68 Screen Installation.**

On steel strain poles and steel monotube assemblies, install a screen that will prevent vermin and debris from entering the gap between the bottom of the base plate and the top of the concrete foundation. Cover the entire gap with a wire screen, the bottom horizontal wire of which shall be in full contact with the surface of the concrete foundation and the top horizontal wire of which shall not extend beyond the top surface of the base plate. For the screen, use standard grade plain weave galvanized steel wire cloth with 1/2 inch x 1/2 inch mesh and 0.063 inch diameter wires. Vertical screen wires shall not extend beyond the top and bottom horizontal wires of the screen. Use one continuous section of screen with only one overlapping splice where the ends come together and overlap the layers 3 inches minimum. Attach the screen to the vertical side of the base plate with self-tapping stainless steel screws (No. 8, 1/2 inch long) with stainless steel washers (1/4 inch inside diameter). Drill pilot holes into the base plate to facilitate screw installation. Install screws on 9 inch centers maximum and at least one screw shall be installed through the overlapping splice to clamp the layers together. Also clamp the overlapping splice layers together just above the concrete foundation with an all stainless steel fastener assembly consisting of a machine screw (No. 8, 5/8 inch long), nut and two flat washers (1/4 inch inside diameter) and lock washer. Tightly clamp the screen layers between the flat washers.

### **649-79 Structural Grout Pads.**

On mast arm support structures, install a structural grout pad in accordance with the Standard Plans and manufacturer's instructions. Prior to grout placement, flush the top of the foundation with water to remove any dirt and debris.

Mix grout to a fluid state in accordance with the manufacturer's recommendations. Test the grout fluidity using ASTM C939 Flow Cone Method. Discard any grout with an unacceptable efflux time.

Do not use mechanical means to push or vibrate the grout. Clean any excess grout from the base plate. Verify that water inside the pole will drain freely through the installed drain hole.

ARTICLE 649-8 is deleted:

**~~649-8 Remedial Work.~~**

~~During the warranty period, the responsible party shall perform all remedial work necessary to meet the requirements of this Specification at no cost to the Department. Such remedial work shall be performed within 180 days of notification of a failure by the Department. Failure to perform such remedial work within the time frame specified will result in the work being performed by other forces at the responsible party's cost.~~

~~If the responsible party is the fabricator, the fabricator will be removed from the list of Prequalified Fabricators of Painted Galvanized Steel Poles, Mast Arms and Monotube Assemblies for a minimum of six months or until payment in full for the correction of the deficiencies or defects has been made, whichever is longer.~~

~~If the responsible party is the Contractor, the Department will suspend, revoke or deny the responsible party's certificate of qualification under the terms of Section 337.16(d)(2), Florida Statutes, for a minimum of six months or until payment in full for the correction of the deficiencies or defects has been made, whichever is longer.~~

ARTICLE 649-9 is deleted:

**~~649-9 Statewide Disputes Review Board.~~**

~~A Statewide Disputes Review Board will resolve any and all disputes that may arise involving administration and enforcement of this Specification. The responsible party and the Department acknowledge that use of the Statewide Disputes Review Board is required, and the determinations of the Statewide Disputes Review Board for disputes arising out of this Specification will be binding on both the responsible party and the Department, with no right of appeal by either party.~~



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 21, 2021

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

Re: State Specifications Office  
Section: **650**  
Proposed Specification: **6500200 Vehicular Traffic Signal Assemblies.**

Dear Mr. Nguyen:

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

The changes are proposed by Derek Vollmer from the Traffic Engineering and Operations Office to move the materials sections from Division II to Division III. This proposed specification revision is associated with the changes to Section 995.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## VEHICULAR TRAFFIC SIGNAL ASSEMBLIES (REV 5-14-21)

ARTICLE 650-2 is deleted and the following substituted:

### 650-2 Materials.

~~650-2.1 General:~~ Use vehicular signal assemblies that meet the requirements of Section 995 and are listed on the Department's Approved Product List (APL). Vehicular traffic signal assemblies must meet the requirements of Section 603 and the Institute of Transportation Engineers (ITE) Standard for Vehicle Traffic Control Signal Heads.

\_\_\_\_\_ Provide vehicular traffic signal assemblies as a complete and functioning unit. Components include, but are not limited to, signal housing, light emitting diode (LED) signal modules, visors, backplates, and assembly hardware.

\_\_\_\_\_ All sections of multi-section assemblies must be from the same manufacturer.

~~\_\_\_\_\_ Fastening hardware such as bolts, screws, nuts, washers, latches, and studs must be SAE Type 316 or 304 stainless steel.~~

~~\_\_\_\_\_ Horizontal signal assemblies must be constructed so the door hinges, when installed, are located on the bottom of the signal assembly. Vertical mounted five-section cluster assemblies must be constructed so that the door hinges, when installed, are located along the outside edges of the complete assembly and each section opens away from the horizontally adjacent section.~~

~~\_\_\_\_\_ Vehicular traffic signal assemblies must be permanently marked with the manufacturer's name or trademark, part or model number and date of manufacture or serial number.~~

~~650-2.2 Twelve Inch Signal Head Assemblies:~~ Construct the assembly of materials and alloys specified in the ITE Standard for Vehicle Traffic Control Signal Heads.

~~\_\_\_\_\_ Construct signal housings to allow adjustment in multiple directions for proper signal alignment. If a serrated connection is used for positioning and alignment of the signal, the top and bottom opening of each signal head section must include a circular 72-tooth serrated connection (2 inch nominal I.D.) capable of providing positive positioning and alignment in 5 degree increments. When assembled and tightened, these connections must prevent rotation or misalignment of the signal head as well as misalignment between sections. The serrated area must start at the outside of the 2 inch hole and be at least 1/8 inch wide. The teeth must have a minimum depth of 3/64 inch between peaks and valleys, be free from burrs or other imperfections, and provide positive locking with the grooves of mating sections, framework, and brackets. The serration on the top circular connection of a signal section must have a valley at the 0 degree position and the serration on the bottom circular connection must have a peak at the 0 degree position, both aligned perpendicular to the front of the section. Connections must permit the assembly of a multi-section signal with the front of each section aligned within 1 degree.~~

~~\_\_\_\_\_ Provide at least two latching points with latch pads and manual Type 316 or 304 stainless steel latching devices that are tamper resistant.~~

~~\_\_\_\_\_ If backplates are mechanically attached, each signal section must have four backplate mounting attachment points on the back of the signal, on or no more than three inches from each section corner. Attachment points must be capable of accepting No. 10-16x3/8 inch or No. 10-24x3/8 inch Type 316 or 304 stainless steel screws for attaching backplates.~~



Tri-stud washers, when utilized to secure signal sections, must have a minimum thickness of 0.090 inches. For five section cluster assemblies, tri-stud washers used to attach the top signal section to the multi-signal bracket and the multi-signal bracket to the bottom four signal sections must have a minimum thickness of 3/8 inches. When fastened together, washer distortion is not allowed.

Design each signal section to prevent the accumulation of standing water within the assembly. All sections comprising a single multi-section assembly must be securely fastened together to form a rigid and weather-proof unit.

**650-2.2.1 Doors:** Construct each signal section with at least two hinges for mounting a door. Hinge pins must be captive. Doors must remain captive and secure at all times and be capable of either left or right swing. The door latch must hold the door tightly closed. The door must include slotted pads that allow the door to be opened and closed by engaging or disengaging the latching device. The outside face of the door must include four holes equally spaced around the circumference of the lens opening for the attachment of a visor. The lens opening in the door must have a diameter of 11 to 11 1/2 inches.

**650-2.2.2 Visors:** The rear of the visor must have four tabs, notches, or holes for securing the visor to the signal housing door. The visor mounting method must permit the visor to be rotated and secured at 90 degrees for horizontal signal head installations. All visors must have a minimum length of 9 1/2 inches, and a minimum downward tilt of 3.5 degrees measured from the center of the lens. Tunnel visors must encircle and shield the lens from 300 degrees, plus or minus 10 degrees. Louvers may only be used in combination with full circle visors. Light must not escape between the visor and the door.

**650-2.2.3 Gaskets:** Gaskets must be constructed of weather-resistant material and be glued or sealed where they meet to provide one continuous length of gasket capable of providing a weatherproof seal for the signal assembly. Provide seals between the housing and door, between the lens and the door, and between any other mating surfaces where dust and moisture could enter. Gasket material must meet NEMA 250 and be constructed of temperature stabilized material that prevents any residue from collecting on the internal surfaces of the signal head.

**650-2.2.4 Terminal Blocks:** Provide at least one five connection terminal block in all three or more section signal head assemblies and at least three five connection terminal blocks in all five section signal head assemblies. Terminal block connections in the signal assembly must not require any tools other than a screwdriver.

Mount terminal blocks to the signal housing with Type 316 or 304 passivated stainless steel hardware. Use only non-corrosive wire attachment screws approved by the Department.

**650-2.2.5 Color and Finish:** The housing, doors, visors and backplates must be powder coated dull black (Federal Standard 595-37038) with a reflectance value not exceeding 25 percent as measured by ASTM E1347. For plastic heads, the black color must be incorporated into the plastic material before molding.

The finish on interior and exterior surfaces of aluminum signal head assemblies, visors, doors, and housing, must be painted in accordance with Military Standard MIL-PRF-24712A or American Architectural Manufacturers Association 2603-02 and must meet the requirements of ASTM D3359, ASTM D3363, and ASTM D522. Surface erosion, flaking, or oxidation must not occur within the normal life expectancy under typical installation conditions.

**650-2.2.6 Plastic Signal Housings and Visors:** Construct signal housing assembly, door, and visors of UV-stabilized plastic with a minimum thickness of 0.1 inches, plus or minus, 0.01 inches, with the following physical properties:

1. Specific Gravity: 1.17 minimum, as per ASTM D792
2. Vicat Softening Temperature: 305–325 F (152–163 C), as per ASTM D1525
3. Brittleness Temperature: Below –200 F (–129 C), as per ASTM D746
4. Flammability: Self-extinguishing, as per ASTM D635
5. Tensile Strength, yield: 8500 PSI (58 MPa) minimum, as per ASTM D638
6. Elongation at yield: 5.5–8.5 %, as per ASTM D638
7. Shear, strength, yield: 5500 PSI (38 Mpa) minimum, as per ASTM D732
8. Izod impact strength, [notched, 1/8 inch]: 15 ft lb/in (800 j/m) minimum, as per ASTM D256
9. Fatigue strength at 2.5 mm cycles: 950 PSI (6.5 MPa) minimum, as per ASTM D671

**650-2.2.7 Backplates:** Backplates may be constructed of either aluminum or plastic. Minimum thickness for aluminum backplates is 0.060 inch and the minimum thickness for plastic backplates is 0.120 inch. The required width of the top, bottom, and sides of backplates must measure between five to six inches. Color of backplates must be black in accordance with 650-2.2.5. Backplate thickness measurement must not include the retroreflective sheeting thickness.

If backplates are mechanically attached, provide a minimum of four corner mounting attachment points per signal section (for example, a three-section signal assembly would have 12 mounting points). Attachment points must not interfere with the operation of traffic signal section doors. Backplate outside corners must be rounded and all edges must be deburred.

If louvers are provided, louver orientation must be vertical on sides and horizontal on top and bottom of the backplate and must be at least 1/2 inch from the inner and outer edge of the backplate panel. Universal backplates must fit all traffic signals listed on the APL.

Mount the backplate securely to the signal assembly with Type 316 or 304 passivated stainless steel installation hardware. Backplates, if mechanically attached, must be marked in accordance with 650-2.1, on the long sides of the backplate.

Backplates must include retroreflective borders using Type IV yellow retroreflective sheeting listed on the APL. Place a 2-inch border on the entire outer perimeter of the backplate panel, no closer than 1/2 inch from any louvers.

All materials must be designed for exterior use and be UV-stable.

**650-2.2.7.1 Flexible Backplates:** Flexible backplates must allow the entire length of longer portions of the backplate to flex 90 degrees, or until the backplate width is reduced to 2.5 inches or less, when influenced by high-wind conditions, and return to zero degrees after the wind conditions subside. Flexible backplates must maintain visibility of the retroreflective border to approaching traffic, with up to 40 mph winds.

~~650-2.2.8 Light-Emitting Diode Optical Unit:~~ The LED optical unit must conform to the requirements of ITE's Performance Specification, Vehicle Traffic Control Signal Heads—Light Emitting Diode (LED) Circular Signal Supplement, dated June 27, 2005 or Vehicle Traffic Control Signal Heads—Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement, dated July 1, 2007, with the following exceptions:

~~650-2.2.8.1 Physical and Mechanical Requirements:~~ Retrofit LED signal modules must be compatible with all traffic signal housings listed on the APL. The rear of the LED signal module must be marked in accordance with 650-2.1.

~~650-2.2.8.2 LED Signal Module Lens:~~ The lens must be tinted with an appropriate color (red, amber, or green) to reduce sun phantom affect and enhance on/off contrast. The tinting must be uniform across the face of the lens and be free from streaks, wrinkles, chips, bubbles, or other imperfections. If a polymer lens is used, a surface coating must be incorporated to provide abrasion resistance.

~~650-2.2.8.3 Minimum Maintained Luminous Intensity Values:~~ Red and green modules must meet the requirements of ITE's Performance Specification, Vehicle Traffic Control Signal Heads—Light Emitting Diode (LED) Circular Signal Supplement, dated June 27, 2005, with the exception that yellow modules must be 1.7 times brighter than the ITE specification. Arrow modules must meet the requirements of ITE's Performance Specification, Vehicle Traffic Control Signal Heads—Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement, dated July 1, 2007.

~~650-2.2.9 Electrical:~~ Electrical conductors for LED signal modules must be a minimum of 36 inches in length. Each lead from the LED module must be terminated with insulated slide-on terminals. The conductors must be color coded to identify the color of the module as follows:

- ~~1. White must identify the neutral lead.~~
- ~~2. Red circular signals must be identified with a red lead, yellow circular signals with a yellow lead, and green circular signals with a green lead.~~
- ~~3. Red arrows must be identified with a red and black tracer lead, yellow arrows with a yellow and black tracer lead, and green arrows with a green and black tracer lead.~~



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 21, 2021

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

Re: State Specifications Office  
Section: **653**  
Proposed Specification: **6530000 Pedestrian Signal Assemblies.**

Dear Mr. Nguyen:

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

The changes are proposed by Derek Vollmer from the Traffic Engineering and Operations Office to move the materials section from Division II to Division III. This proposed specification revision is associated with the changes to Section 995.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## PEDESTRIAN SIGNAL ASSEMBLIES (REV 5-14-21)

SECTION 653 is deleted and the following substituted:

### 653-1 Description.

Furnish and install pedestrian signal assemblies as shown in the Plans and Standard Plans, Index 653-001. Meet the requirements of Section 603.

### 653-2 Materials.

~~653-2.1 General:~~ Use pedestrian signals that meet the requirements of Section 995 and are listed on the Department's Approved Product List (APL). Pedestrian signal assemblies must meet the requirements of the latest edition of the Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) and the Institute of Transportation Engineers (ITE) standard for Pedestrian Traffic Control Signal Indications.

~~653-2.2 Housing and Visor: The housing must be weatherproof, sectional and may consist of as many sections as optical units. The housing must prevent light from escaping from one unit to another. The top and bottom opening of the housing must include a circular 72 tooth serrated connection (2 inch nominal I.D.) capable of providing positive positioning and alignment in 5 degree increments. When assembled and tightened, these connections must prevent rotation or misalignment. The serrated area must start at the outside of the 2 inch hole and be at least 1/8 inch wide. The teeth must have a minimum depth of 3/64 inch between peaks and valleys, free from burrs or other imperfections, and provide positive locking with the grooves of mating sections, framework, and brackets. The serration on the top circular connection of a signal section must have a valley at the 0 degree position and the serration on the bottom circular connection must have a peak at the 0 degree position, both aligned perpendicular to the front of the section. Housings must include latch pads and manual stainless steel latching devices that are captive, or non removable. Housings must have at least two latching points.~~

~~Reinforce all mounting points and adjacent housing material. The door enclosing the lens must be hinged and held securely to the housing. Provide a gasket meeting the requirements of ASTM D1056, Grade 2B2 between the housing and door and between the lens and door. If the fitting between the housing and door is weather tight, the gasket may be omitted.~~

~~Provide a visor or egg crate louver that eliminates sun phantom for each signal face. Visor must be three sided and extend a minimum of 7 inches at the top from the face of the lens. The visor must be constructed of noncorrosive No. 18 gauge sheet metal, not less than 0.05 inch thick, or 0.1 inch thick polycarbonate.~~

~~All metal housings and visors must be powder coat painted black in accordance with Military Standard MIL-PRF-24712A or AAMA-2603-02 with a reflectance value not exceeding 25 percent as measured by ASTM E97. For polycarbonate heads, the black color must be incorporated into the material before the molding process.~~

~~The housing must be constructed of a non-corrosive material. Cast metal parts must have a minimum tensile strength of 1 ksi (117 MPa) and sheet metal parts a minimum tensile strength of 27 ksi (186 MPa).~~

~~653-2.2.1 Die Castings: Meet the requirements in ASTM B85 for the physical characteristics and chemical content for alloys S12A, S12B, SC84A, SC84B, SG100A and SG100B.~~

~~653-2.2.2 Sand Castings: Meet the requirements in ASTM B26 for the physical characteristics and chemical content for alloys S5A and CS72A.~~

~~653-2.2.3 Permanent Mold Castings: Meet the requirements in ASTM B108 for the physical characteristics and chemical content for alloys S5A and CS72A.~~

~~653-2.2.4 Polycarbonate: Polycarbonate housing assemblies, doors and visors must be molded from ultraviolet stabilized polycarbonate plastic with a minimum thickness of 0.1 inches, plus or minus 0.01 inch, and provide the following physical properties:~~

Test	Minimum Requirement	Method
Specific Gravity	1.17	ASTM D 792
Vicat Softening Temp.	305–325°F (152–163°C)	ASTM D 1525
Brittleness Temp.	Below 200°F (–129°C)	ASTM D 746
Flammability	Self-extinguishing	ASTM D 635
Tensile Strength	Yield, 8500 psi (58 MPa)	ASTM D 638
Elongation at yield	5.5–8.5%	ASTM D 638
Shear Strength	Yield, 5500 psi (38 MPa)	ASTM D 732
Izod impact strength	15ft-lb/in (800 J/m)	ASTM D 256
Fatigue strength	950 psi (6.5MPa) at 2.5 mm cycles	ASTM D 671

~~653-2.3 Light Emitting Diode (LED) Pedestrian Signal Optical Unit (State Standard): Provide a countdown pedestrian signal module meeting the requirements of the latest ITE LED Pedestrian Signal Specifications.~~

~~653-2.4 Electrical: Wiring and terminals must meet the size, insulation, length and color-coding of the current ITE Pedestrian Traffic Control Signal Indicators LED specification. Wires must not have bare wiring exposed where wires are secured.~~

~~The pedestrian signal must include a terminal block containing a minimum of three circuits, each with two noncorrosive screw type terminals. Each terminal must accommodate three No. 18 AWG conductors and be labeled for ease of identification. The terminal block must not be obstructed and be visible when the housing is open.~~

~~653-2.5 Hardware: All brackets used to mount pedestrian signals must be an aluminum alloy cast fitting, pipe or equivalent material approved by the Department. Aluminum and aluminum alloy bars, rods, wires, profiles, and tubes must meet ASTM B221. Aluminum alloy sand casting must meet ASTM B26. All mounting hardware must be painted black with a reflectance value not exceeding 25 percent as measured by ASTM E97.~~

~~Ensure that all assembly hardware, including nuts, bolts, external screws and locking washers less than 5/8 inch in diameter, are Type 304 or 316 passivated stainless steel. Stainless Steel bolts, screws and studs must meet ASTM F593. Nuts must meet ASTM F594. All assembly hardware greater than or equal to 5/8 inch in diameter must be galvanized. Bolts, studs, and threaded rod must meet ASTM A307. Structural bolts must meet ASTM F3125, Grade A325.~~

### 653-3 Installation.

**653-3.1 General:** Use pedestrian signal assemblies capable of being maintained, adjusted, and disassembled with ordinary hand tools. Pre-assemble the pedestrian signal, with the

exception of mounting hardware, prior to installation at the site. Construct the pedestrian signal assembly (including the mounting hardware) to be a weather-tight unit. Conceal all conductors.

**653-3.2 Placement:** Position pedestrian signals and all mounting assembly members as either plumb or level, and symmetrically arranged. Align signals in the line of the pedestrian's vision for the crosswalk being used.

**653-3.3 Installation Sequence:** Install all pedestrian signal assemblies at any intersection as a single operation unless a staged operation is approved by the Engineer. Do not install signals at any intersection until all other signal equipment, including the controller, and pedestrian detectors are in place and ready for operation, unless completely covered in accordance with 650-3.10.

**653-4 Method of Measurement.**

The Contract unit price per assembly for pedestrian signal assembly, furnished and installed, (including mounting hardware but not including poles or pedestals) will include all materials and equipment as specified in the Contract Documents, and all labor and materials necessary for a complete and accepted installation.

Payment for removal of pedestrian signal assemblies will be made only when the pole/pedestal is to remain. Otherwise, the removal of pedestrian signal assemblies are included in the removal of the pole or pedestal.

**653-5 Basis of Payment.**

Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 653-                      Pedestrian Signal - per assembly.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 12, 2021

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

Re: State Specifications Office  
Section: **654**  
Proposed Specification: **6540205 Midblock Crosswalk Enhancement Assemblies.**

Dear Mr. Nguyen:

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

The changes are proposed by Derek Vollmer from the Traffic Engineering and Operations Office to remove the AC/DC battery charger from the specification as it is not needed for solar permanent installations.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer



**MIDBLOCK CROSSWALK ENHANCEMENT ASSEMBLIES**  
**(REV 5-14-21)**

SUBARTICLE 654-2.5 is deleted and the following substituted:

**654-2.5 Electrical Specifications:** Equipment must operate on solar power or a nominal voltage of 120 V alternating current ( $V_{AC}$ ). If the device requires operating voltages of less than 120  $V_{AC}$ , supply the appropriate voltage converter. Solar powered systems must be designed to operate for minimum of 100 activations per day and provide 10 days of operation without sunlight. Each activation must be 30 seconds in duration. Solar powered systems must automatically charge batteries and prevent overcharging and over-discharging. Solar powered systems must include a charge indicator ~~and AC/DC battery charger~~.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 19, 2021

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

Re: State Specifications Office  
Section: **676**  
Proposed Specification: **6760207 Traffic Cabinets.**

Dear Mr. Nguyen:

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

The changes are proposed by Derek Vollmer from the Traffic Engineering and Operations Office to clarify the size of small equipment enclosure.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**TRAFFIC CABINETS****(REV ~~75-164~~-21)**

SUBARTICLE 676-2.7 is deleted and the following substituted:

**676-2.7 Small Equipment Enclosures:**

~~Small equipment enclosures, such as equipment cabinets less than 13 inches high by 10 inches wide by 11 inches deep.~~ Small equipment enclosures are a minimum NEMA 3R rated and are smaller than 16 inches wide by 24 inches tall by 12 inches deep. The enclosure must be constructed of aluminum or non-metallic materials. Enclosures must include a safe means of removing power from the installed equipment for servicing and replacement, such as a switch, fuse, or breaker. Discrete markings, such as manufacturer name and model, are permitted on the outside of small enclosures.

All fasteners less than 5/8 inch exposed to the elements must be Type 304 or 316 stainless steel.

Construct aluminum enclosures of 5052 sheet aluminum alloy with a minimum thickness of 0.090 inches. Aluminum enclosures must have a uniform natural finish or be powder coat painted in accordance with AAMA-2603-02 specifications. All welds, bends, and seams must be neatly formed and free of cracks, blow holes and other irregularities. All inside and outside edges of the enclosure must be free of burrs, rivet holes, visible scratches, and gouges and have a smooth, uniform finish.

Non-metallic enclosures must be UL 508A listed, be rated for outdoor use, and resist chemicals, corrosion, and ultraviolet rays. ~~Enclosures must be NEMA 3R (IP 66) rated, minimum.~~

Enclosure doors must include a vandal resistant hinge and be secured with a locking latch or a minimum of two quick-release Type 304 or 316 stainless steel latches with padlock hasps. Removal of the hinge or hinge pin must not be possible while the enclosure is closed. Provide two sets of keys with each lock.

Enclosures may be vented. Holes larger than 1/8 inches must be covered by heavy duty screen.

Post mounted enclosures must be supplied with mounting hardware for attaching the enclosure to a 4-1/2 inch (OD) aluminum post.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 23, 2021

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

Re: State Specifications Office  
Section: **676**  
Proposed Specification: **REVISED 6760207 Traffic Cabinets.**

Dear Mr. Nguyen:

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

The changes are proposed by Derek Vollmer from the Traffic Engineering and Operations Office to clarify the size of small equipment enclosure.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**TRAFFIC CABINETS****(REV ~~75-194-21~~)**

SUBARTICLE 676-2.7 is deleted and the following substituted:

**676-2.7 Small Equipment Enclosures:**

~~Small equipment enclosures, such as equipment cabinets less than 13 inches high by 10 inches wide by 11 inches deep.~~ **Small equipment enclosures must be a minimum NEMA 3R rated and smaller than 16 inches wide by 24 inches tall by 12 inches deep. The enclosure must** be constructed of aluminum or non-metallic materials. Enclosures must include a safe means of removing power from the installed equipment for servicing and replacement, such as a switch, fuse, or breaker. Discrete markings, such as manufacturer name and model, are permitted on the outside of small enclosures.

All fasteners less than 5/8 inch exposed to the elements must be Type 304 or 316 stainless steel.

Construct aluminum enclosures of 5052 sheet aluminum alloy with a minimum thickness of 0.090 inches. Aluminum enclosures must have a uniform natural finish or be powder coat painted in accordance with AAMA-2603-02 specifications. All welds, bends, and seams must be neatly formed and free of cracks, blow holes and other irregularities. All inside and outside edges of the enclosure must be free of burrs, rivet holes, visible scratches, and gouges and have a smooth, uniform finish.

Non-metallic enclosures must be UL 508A listed, be rated for outdoor use, and resist chemicals, corrosion, and ultraviolet rays. ~~Enclosures must be NEMA 3R (IP 66) rated, minimum.~~

Enclosure doors must include a vandal resistant hinge and be secured with a locking latch or a minimum of two quick-release Type 304 or 316 stainless steel latches with padlock hasps. Removal of the hinge or hinge pin must not be possible while the enclosure is closed. Provide two sets of keys with each lock.

Enclosures may be vented. Holes larger than 1/8 inches must be covered by heavy duty screen.

Post mounted enclosures must be supplied with mounting hardware for attaching the enclosure to a 4-1/2 inch (OD) aluminum post.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
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KEVIN J. THIBAUT, P.E.  
SECRETARY

August 3, 2021

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

Re: State Specifications Office  
Section: **695**  
Proposed Specification: **6950000 Traffic Monitoring Site Equipment and Materials.**

Dear Mr. Nguyen:

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

The changes are proposed by Eric Griffin from the Transportation Data and Analytics Office to move all selected materials of Division III and add in Weigh-in-Motion Electronic Sensor. The proposed specification is associated with Section 997.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**TRAFFIC MONITORING SITE EQUIPMENT AND MATERIALS****(REV ~~86-322-21~~)**

SECTION 695 is deleted and the following substituted:

**695-1 Description.**

Furnish or furnish and install a complete, operable traffic monitoring site (TMS) as shown in the Plans and Standard Plans. The Department uses TMS to monitor the volume, speed, number of axles, weight of wheels, axles or vehicles, or vehicular axle classification types.

**695-2 General.**

**695-2.1 Traffic Monitoring Site Component Approval:** ~~Use only components that meet the requirements of this Section and are listed on the Department's Approved Products List (APL).~~

~~Submit forms in accordance with 603-5.~~ Any electronics unit or software submitted for approval must be compatible with or convert the data into a format compatible with the Department's polling and processing software. Any substitute software modules submitted must be tested and approved.

**695-2.2 Marking of Approved Equipment:**

~~695-2.2.1 Manufacturer's Identification:~~ All TMS equipment must be permanently marked with the manufacturer's name or trademark, part or model number and date of manufacture or serial number.

~~695-2.2.2 Submittal Data Requirements: Submit forms in accordance with 603-5.~~

**695-2.3 Notification:** Notify the Engineer 10 days prior to beginning work in the area of the TMS to coordinate the removal of existing TMS equipment.

A TMS Inspector must be onsite during TMS installation. Notify the Engineer 10 days prior to installation of the TMS to coordinate the scheduling of a TMS Inspector.

**695-2.4 Poles for Cabinets, Non-Intrusive Sensors and Solar Panels:**

**695-2.4.1 Requirements:** Meet the requirements of Section 646 for aluminum poles.

**695-2.4.2 Installation:** ~~Use cabinets that meet the requirements of Section 676 and are listed on the Department's Approved Product List (APL).~~ Install cabinets in accordance with Section 676. Install the weather head and ground the pole in accordance with Section 620 and Standard Plans, Index 695-001.

**695-2.5 Manufacturer's Warranty Provisions:**

**695-2.5.1 General:** Secure all warranties provided by the equipment manufacturer for the specific equipment included in the Contract. Ensure that all warranties are fully transferable from the Contractor to the Department. Transfer warranties upon final acceptance in accordance with 5-11. Document all warranties and warranty transfers and submit to the Engineer. The Engineer will submit warranty forms received from the Contractor to the ~~Transportation Statistics Office (TranStat)~~ Transportation Data and Analytics Office (TDA) TMS Manager.

**695-2.5.2 Terms and Conditions:** Ensure that the terms and conditions of warranties are documented by the manufacturer when submitting a request to the Department for

certification and for equipment submittal for construction projects. Include terms for a specified service performance with provisions for repair parts and labor, or for replacement.

Ensure the terms and conditions define the equipment installation date as the date for such warranty to be in effect. The installation date for construction projects is the day the site is accepted by the [FranStat TDA](#) TMS Manager. For warehouse purchases, the installation date is the date of visual inspection approval, not to exceed ten days after delivery date.

Ensure warranties require the manufacturer to furnish replacements within 10 calendar days of notification for any part or equipment found to be defective during the manufacturer's warranty period at no cost to the Department.

Leave a copy of the warranty in the cabinet once it is installed and submit the warranty to the Engineer. The Engineer will submit warranty forms received from the Contractor to the [FranStat TDA](#) TMS Manager. Comply with the terms of the warranty. The Department may suspend the certification for non-compliance.

### 695-3 Vehicle Sensor (Non-Weight) Applications.

**695-3.1 General:** Install TMS vehicle sensors of the type and at the location shown in the Plans. Use vehicle sensors listed on the Department's APL [meeting the requirements of Section 997](#) and compatible with the electronics unit to which they will be connected.

#### 695-3.2 Axle Sensor (In-Roadway):

<a href="#">Table 695-1</a> <a href="#">Physical Characteristics, Axle Sensor Sensors</a>	
<a href="#">Sensor Element Dimensions</a>	<a href="#">6 ft. to 10 ft. in length (as specified in Plans); 3/16 in. to 3/8 in. in diameter (varies by manufacturer)</a>
<a href="#">Sensor Element Material</a>	<a href="#">Pressure sensing piezoelectric</a>
<a href="#">Pavement Operating Temperature</a>	<a href="#">0°F to +150°F</a>
<a href="#">Output Signal</a>	<a href="#">Minimum +200mV for passenger/pickup truck axle @ 70°F with less than 10% negative signal</a>

**695-3.2.1 Installation:** Install sensors in accordance with the requirements of this Section and Standard Plans, Index 695-001. Ensure axle sensors are installed in the roadway and secured using an adhesive bonding material listed on the APL.

Install axle sensors in the right-hand wheel-path midway between the leading and trailing loops as detailed in Standard Plans, Index 695-001. Install axles sensors in the left-hand wheel-path when no paved shoulder exists and sensor lead exit windows are installed at the right-hand edge of the roadway surface or in a lane which is to the left of and adjacent to an open lane of traffic.

Install the axle sensor such that the cable end is closest to the pull box to which the sensor lead cable will be routed. Install the end of the sensor mid-way into the edge line stripe or lane line stripe. Ensure that the axle sensor being installed has lead-in cables of sufficient length to reach the cabinet without splicing. Do not splice axle sensor lead-in cables.



Route the sensor lead to the pull box then to the TMS cabinet. Mark the sensor lead at the pull box and at termination in the cabinet. Submit lane numbering information as specified in Standard Plans, Index 695-001.

Allow newly applied asphalt to cure for a minimum of 30 days prior to the installation of in-road sensors. Use a chalk line or string and paint to layout the position of the sensor and lead-in cable slots.

Ensure saw cuts do not deviate more than 0.5 inches from the chalk line. Use a single blade or ganged blade saw wide enough to cut the axle sensor slot at full width in a single pass. Cutting two slots and chipping out roadway material between them is not allowed.

Cut the slot the length of the sensor plus an additional 3 to 4 inches. Ensure the depth and width of the slot is installed as recommended by the sensor manufacturer, typically 0.75 inches wide by 1.5 to 2 inches deep.

Use clips or jigs provided by the manufacturer to suspend the sensor at a uniform depth in the slot. Mix and apply the bonding agent ensuring the slot is completely full with no voids beneath the sensor.

**695-3.2.2 Test Requirements:** Perform the manufacturer's recommended on-site pre-installation test to determine the sensor's condition using an Inductive Capacitance Resistance meter. Install only those sensors that pass the pre-installation test.

Record all test results by lane on the warranty form provided by the manufacturer and leave a copy in the cabinet.

Repeat the test at the termination point in the cabinet after installation. Use an oscilloscope to view and record typical waveforms and signal intensity measurements for the axles of passenger cars and large trucks. Remove and replace any sensor that fails the test at no additional charge to the Department.

### 695-3.3 Non-Intrusive Vehicle Sensors (Off-Roadway):

**695-3.3.1 General:** Install wireless (radar or microwave) vehicle sensors on a pole as shown in the Plans. Use vehicle detection systems that meet the requirements of Section 997 and are listed on the Department's Approved Product List (APL).

Detection Zone	A minimum of 8 distinguishable lanes within a minimum of 200 ft. of detection zone
Enclosure	Weatherproof aluminum, stainless steel or polycarbonate housing
Dimensions	Typically up to 15 in. X 12 in. X 6 in.
Weight	Typically less than 10 lb.
Operating Temperature (Ambient)	0°F to 140°F
Operating Frequency	Wireless transmission in FCC approved band or unlicensed RF range
Communications	RS-232, RS-485 or RJ-45 ports and supports a minimum baud rate of 19,200
Data Interface	Compatible with the Department's field storage devices (counters) and transmits detection data via contact closure signal using a hardwired connection

**695-3.3.2 Installation Requirements:** Install the sensor on a pole perpendicular to the target lanes of traffic with room to perform horizontal and vertical aiming adjustments.

Ensure that the wireless vehicle sensor has sufficient cable length to reach the cabinet without splicing. Fasten the cable to the pole so wind does not move it, or route the cable within the pole cavity to the cabinet termination point. Provide 18 to 24 inches of slack in the cable at the connections to the sensor and in the cabinet to ensure the cable is stress-free. Include the appropriate mounting hardware, contact closure signal that corresponds to vehicle presence and the manufacturer's recommended surge suppression as a part of the installation.

Set up the lane detection zones using the manufacturer's instructions and software and verify that the sensor's orientation is perpendicular to the roadway.

Configure the wireless vehicle sensor for vehicle volume unless otherwise specified in the Plans.

**695-3.3.3 Test Requirements:** Conduct a visual test to determine that all detection zones are being counted accurately.

Connect a personal computer (PC) to the electronics unit and observe traffic in every lane, verifying that each vehicle is displayed on-screen. A minimum of 20 vehicles should be observed for each lane of traffic with all vehicles counted; assuming a clear line of sight between the sensor and the vehicle being observed is maintained.

If any vehicles are not counted, reconfigure the wireless vehicle sensor and repeat the visual observation test until all lanes count correctly. If the sensor fails to provide accurate counts after three test attempts, it must be replaced with a new unit at no expense to the Department.

Provide a time synchronized video of testing, if requested. Submit a 48 hour verification (class, speed and volume) report for all TMS to the Engineer. The Engineer will submit video received from the Contractor to the [FranStat TDA](#) TMS Manager. Submit all documents to the Engineer and leave a copy in the cabinet.

**695-3.4 Method of Measurement.** The Contract unit price for each vehicle sensor will include the vehicle sensor, lead-in cables, bonding agent; and all equipment, materials, testing and labor necessary for a complete and accepted installation.

**695-3.5 Basis of Payment:** Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 695- 1- TMS Vehicle Axle Sensor (In-Roadway)- Non-Weight Applications- each.

Item No. 695- 2- TMS Vehicle Non-Intrusive – Non-Weight Applications (Off-Roadway) – each.

#### **695-4 Vehicle Speed/Classification Unit.**

**695-4.1 General:** Furnish and install TMS vehicle speed/classification unit (electronics unit) in the TMS cabinet at the locations shown in the Plans.

##### **695-4.2 Materials:**

**695-4.2.1 General:** Use a vehicle speed/classification unit listed on the Department's APL [meeting the requirements of 997 and](#) compatible with the other components installed at the TMS. Ensure that the vehicle speed/classification unit and equipment cables are compatible and constructed in accordance with the Standard Plans.

Ensure that the vehicle speed/classification unit is marked in accordance with 695-2.2 and the markings are visible after installation.

**695-4.2.2 Vehicle Speed/Classification Unit Requirements:** Provide an electronics unit that outputs data compatible with the Department's polling computer system or furnish a software module that converts the data into a format compatible with the Department's polling computer system.

The electronics unit operates in an unattended mode, accumulating data for later retrieval by downloading via the polling computer system. Ensure that the electronics unit is capable of downloading data through direct connection with a PC, without deleting or marking the files.

Submit complete operating procedures with all software.

**695-4.2.2.1 Compatibility:** Provide an electronics unit that is compatible with the weigh-in-motion sensors, embedded inductive loops, axle sensors, magnetometers and non-intrusive vehicle sensors in place at the TMS.

Ensure that each electronics unit is capable of determining the count and classification by type and speed of all vehicles for both directions of traffic on the roadway.

Provide real-time polling software with each electronics unit, capable of operating on a PC using the Department recommended operating system and meeting the following requirements:

1. Capable of communicating with the traffic counter/classifier, and downloading data via cellular modem and producing reports of 15 minute, hourly, weekly, monthly and annual volume and classification data.
2. Capable of displaying and entering operating parameters into the vehicle class/counter, and allowing the display of real-time traffic volumes in addition to routine data collection activities.
3. Capable of processing and storing all vehicle data retrieved in routine mode, regardless of the selected parameters.

**695-4.2.3 Functional Requirements:** The electronics unit must be fully functional when receiving input from two 6 foot by 6 foot embedded inductive loops, spaced 12 to 24 feet apart, leading edge to leading edge, with a single axle sensor located between the loops, in each lane of a six lane (minimum) roadway. Ensure that each electronics unit is capable of collecting data from each of the lanes of traffic in any combination of counts, classification, speed, or direction.

Provide electrical components of solid-solid-state design, constructed so that they will not be damaged by jolts and vibrations encountered during shipping and everyday use.

Ensure that all electronics units are functionally identical and interchangeable except as follows:

1. The electronics unit may be constructed utilizing plug in modules; however, when plug in modules are used, each electronics unit must be identical except for the number and type of modules used. Ensure that modules of the same type are identical and interchangeable.
2. Should more than two electronics units be required in the same cabinet, ensure that each electronics unit has a unique, individual electronics unit number. The

electronics unit number must reside in non-volatile memory, so that it is not changed when a “cold or warm boot” is performed or by a power interruption.

Provide an electronics unit having the capability of obtaining and providing the following:

1. Volume, speed, classification, and classification by speed data simultaneously.

2. Volume data by lane.

3. Speed data by lane in a minimum of 15 bins, programmable in 5 mph increments.

4. Classification by lane in vehicle type by axle class in 15 bins (minimum) in accordance with FHWA Classification Scheme “F” in Florida’s Traffic Forecasting Handbook, Chapter 2, Figure 2.2 which can be accessed on the Department’s website at the following URL address:

[https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/planning/systems/programs/traffanalysis/2019-project-traffic-forecasting-handbook.pdf?sfvrsn=e105e71d\\_2](https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/planning/systems/programs/traffanalysis/2019-project-traffic-forecasting-handbook.pdf?sfvrsn=e105e71d_2).

5. A minimum of 95% accuracy of vehicle class, speed and volume.

Ensure that each electronics unit has the capability of providing real-time monitoring of volume data by lane or direction in user selected intervals of as little as 15 minutes, when required, without disrupting the above selected programs.

Provide an electronics unit capable of communicating directly with a PC or through a modem at a minimum rate of 19,200 bps.

Ensure that, at a minimum, the following parameters are programmable by direct connection to the electronics unit by Ethernet or via modem:

1. Six digit site number.

2. Number of lanes and directions.

3. Date and time.

4. Data operating and transmission parameters.

5. Sensor spacing.

6. Recording interval.

7. Vehicle parameter table with axle spacing ranges for each type of vehicle.

8. Number and range of speed categories, axle and length classifications, and headway.

Should an axle sensor or a loop in one or more lanes fail, the electronics unit must continue to provide the speed and volume from the remaining functioning sensors.

Ensure that the sensitivity level for each axle sensor is individually adjustable using software, by direct PC connection and remotely via telemetry.

Ensure that the loop detectors are internal and self-tuning. Ensure that the sensitivity level and any additional parameters necessary to prevent “loop crosstalk” for each embedded inductive loop can be adjusted individually using software, both by direct PC connection and remotely via telemetry.

Provide a means of introducing a time delay, or “de-bounce” value for ignoring spurious axle signals (ghost axles) in the electronics unit software.

**695-4.2.4 Power Requirements:** Provide an electronics unit that is field configurable to be powered 12 V<sub>DC</sub> and does not consume more than a total of 12 watts.

If an internal battery is required, it must be capable of being recharged and shall be furnished and included with the electronics unit at no extra cost.

**695-4.2.5 Mechanical Requirements:** Provide a modular electronics unit which is completely enclosed in a durable housing of sheet metal or cast aluminum with a durable finish. When configured for operation the electronics unit including all cables must fit into a Type IV cabinet.

**695-4.2.6 Environmental Requirements:** Provide an electronics unit which operates as specified when the ambient temperature and humidity inside the controller cabinet are within the following limits:

**695-4.2.6.1 Ambient Temperature:** The operating ambient temperature range must be between minus 0 to 140°F.

The rate of change in ambient temperature must not exceed 63°F per hour, during which the relative humidity must not exceed 90%.

**695-4.2.6.2 Humidity:** The relative humidity must not exceed 90% over the temperature range of 40 to 109°F. Above 109°F, constant absolute humidity must be maintained as seen in Table 695-13. The relative humidity range shown in Table 695-13 is for dynamic testing.

Table 695-13		
At 14.6 psi Barometric Pressure		
Dry Bulb °F	Relative Humidity (%)	Wet Bulb °F
40	75	37
50	80	46
60	83	57
70	86	66
80	87	77
90	89	88
100	89	97
109	90	108
120	70	109
130	50	109
140	38	109
150	28	109
160	21	109
165	18	109

**695-4.2.7 Cables and Connectors:** Furnish all cables and connectors for a complete and functional installation of each electronics unit in accordance with Standard Plans, Index 695-001.

Ensure that the cables are properly terminated for the prescribed use without further modification by the Department.

Furnish one serial port cable for interconnecting each electronics unit with a PC.

**695-4.3 Installation Requirements:** Install the electronics unit and equipment cables in accordance with the manufacturer's recommended installation procedure, Standard Plans, Index 695-001, and the Contract Documents.

**695-4.4 Method of Measurement:** The Contract unit price per assembly for electronics unit includes the electronics unit and equipment cable, all equipment, materials and labor necessary for a complete and accepted installation.

**695-4.5 Basis of Payment:** Prices and payments will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 695- 3- TMS Vehicle Speed/Classification Unit - per assembly.

### **695-5 Weigh-In-Motion Electronic Sensor.**

**695-5.1 General:** Install Traffic Monitoring Site (TMS) Weigh-In-Motion Electronic Sensor in the configuration shown on the Standard Plans, Index 695-001, and meet the requirements in Section 997.

**695-5.2 Materials:** Use Weigh-In-Motion Electronic Sensors that meet the requirements of Section 997 and are listed on the Department's Approved Products List (APL).

Use bonding agents listed on the APL and which are compatible with the Weigh-In-Motion sensor being installed.

### **695-5.3 Installation Requirements:**

**695-5.3.1 General:** The installer must have a valid certification from the manufacturer for installing the Weigh-In-Motion Electronics Sensors.

Provide lead in cables of sufficient length to extend to the traffic monitoring site cabinet without splicing.

To avoid delays during installation, compile and check all construction tools required for the installation before beginning.

**695-5.3.2 Saw Cuts:** Use a chalk line or equivalent method to outline the perimeter of the sensor on the pavement and routes for lead-in cables. Do not allow the saw cut in the pavement to deviate more than 1.0 inch from the chalk line. Ensure that all saw cuts are free of any dust, dirt, or other debris and completely dry prior to the installation.

**695-5.4 Bending Plate:** Install two weigh pads adjacent to each other or in each wheel path in a staggered array to cover a 12-foot lane in the roadway. Connect the weigh pads to an interface processor.

Install the bending plate (weigh pad) frames into concrete slabs of 6 inches or more without constructing a special foundation socket. The frames, including weigh pad embedded in it, have an average depth of 1.5 inches.

If the concrete slab is less than 6 inches or if the roadway material is asphaltic concrete, install a special foundation socket of concrete under the frame, just as wide as the frame. Bore 1-inch diameter anchors to a minimum of 8 inches into the base course.

Install a 2 to 4 inch diameter pipe from lower side of the foundation frame towards the slope into the drain water shaft. Ensure that water does not accumulate in the frame and properly drains the frame.

Install a temperature sensor in the roadway or paved shoulder to monitor pavement temperature. Ensure that the sensor provides data to the vehicle/speed classification unit to compensate for temperature variation.



Install the bending plate sensors in accordance with the manufacturer's installation procedures and in the presence of the manufacturer's representative. Ensure that the procedures are approved by the Engineer.

**695-5.5 Piezoelectric Weigh-In-Motion Axle Sensor:** Install piezoelectric sensors in concrete or asphaltic concrete roadways. Install two 6-foot piezoelectric Weigh-In-Motion sensors (Class I) in each pathway per lane, in a staggered array in accordance with Standard Plans, Index 695-001. Place the leading Piezoelectric Weigh-In-Motion sensor (Class I) onto the right side edge of the driving lane perpendicular to the flow of the traffic, covering half of the lane width (6 feet). Place the trailing Piezoelectric Weigh-In-Motion Sensor (Class I) onto the left side edge of the driving lane (6 feet). Orient all lead-in cables and connectors toward the nearest pull box, beyond the outside travel lanes. Ensure that the end of the sensor element or channel is centered on the lane stripe.

Install a temperature sensor in the roadway or paved shoulder to monitor pavement temperature to compensate for temperature variation.

Install piezoelectric Weigh-In-Motion axle sensors in accordance with the manufacturer's installation procedures and in the presence of the manufacturer's representative.

**695-5.5.1 Piezoelectric Weigh-In-Motion Axle Sensor (Class I):** Install the unencapsulated piezoelectric Weigh-In-Motion sensor (Class I) by sawing a slot into the pavement perpendicular to the flow of traffic, equal to the length of the sensor plus 4 inches, by 3/4 inch wide, and by 1 inch deep. Sawcut a 1 inch wide by 2 inches deep cable run slot from the end of the sensor slot to the edge of the pavement shoulder.

Suspend the sensor within the slot with jigs. Prepare and apply bonding agent in accordance with the sensor manufacturer instructions, ensuring that there are no voids around the sensor. Ensure that the bonding agent is fully cured and ready for traffic within four hours of application. Remove the jigs after the bonding agent has cured.

Route the sensor lead-in cables to the pull box and through the conduit to the traffic monitoring site cabinet. Mark the sensor lead-in cables at the pull boxes and at the point of termination within the traffic monitoring site cabinet with an indelible marker, numbering the lanes as specified in the Plans and in accordance with the Standard Plans, Index 695-001.

**695-5.5.2 Quartz Piezoelectric Weigh-In-Motion Sensor:** Install the quartz piezoelectric sensor by sawing slots into the pavement perpendicular to the flow of traffic, equal to the length of the sensor plus 1 inch, by 2.875 inches wide, and by 2.125 inches deep. Sawcut a 1 inch wide by 2 inches deep cable run slot from the end of the sensor slot to the edge of the pavement shoulder.

Install the quartz piezoelectric sensor into the slot, properly aligned and positioned using specially constructed installation and leveling beams. Pour the manufacturer recommended epoxy grout into the cavity until it is at the proper height above the road surface and allow it to set. After the epoxy hardens, grind it to be level with the road surface. The top of the sensor must not deviate more than 1/24" above the height of the pavement surface over the length of the sensor.

Route the sensor lead-in cables to the pull box and through the conduit to the traffic monitoring site cabinet. Mark the sensor lead-in cables at the pull boxes and at the point of termination within the traffic monitoring site cabinet with an indelible marker, in accordance with Standard Plans, Index 695-001. Connect the cable to the interface card installed in the traffic monitoring cabinet.

**695-5.6 Weigh-In-Motion Electronics Sensor Test Requirements:**

Perform the manufacturer's recommended on-site pre-installation test to determine the Weigh-In-Motion electronics sensor's condition. Install only those Weigh-In-Motion electronics sensors that pass the pre-installation test.

Repeat the test, following installation, at the lead-in point of connection in the traffic monitoring site cabinet. Remove and replace any Weigh-In-Motion electronics sensor which fails the test at no additional cost to the Department. Prior to post-installation acceptance, the Contractor shall demonstrate in the presence of the Engineer that the equipment supplied and installed for the system is in full compliance with the Plans and Specification herein.

The Department will operate the complete system for 30 consecutive days without failures prior to Final Acceptance. The Department will poll the site and statistically check data from historical data, field collected data and field observations. In the event of failures, the Contractor shall correct the problem(s) and restart the 30-day test. Any equipment or labor that is found to be defective prior to Final Acceptance shall be replaced or corrected at no expense to the Department. Final Acceptance will be made upon the successful completion of the 30-day test.

Place a copy of the final test results, including the date of installation, manufacturer's name, model number for each Weigh-In-Motion electronics sensor, laboratory calibration sheet provided by the manufacturer, and type of bonding agent used in a waterproof package in the cabinet and furnish one copy to the Engineer.

**695-5.7 Guaranty Provisions:**

**695-5.7.1 Contractor's Responsibility:** Secure all guaranties that are customarily issued by the equipment manufacturers for the specific equipment included in the Contract. Ensure that the form in which such guaranties are delivered includes the provision that they are subject to transfer to the Department and is accompanied by proper validation of such fact. Transfer guaranties at final acceptance of the work (or equipment) by the Department.

**695-5.7.2 Terms:** Ensure that the manufacturers of the equipment stipulate the terms of guaranties when submitting a request to the Department for certification and for equipment submittal for construction projects. Include terms for a specified service performance with provisions for repair parts and labor, or for replacement. Provisions shall define the equipment "installation date" as the date for such guaranty to be in effect. For construction projects, the "installation date" is the first day of equipment "burn-in". For warehouse purchases, the "installation date" is the date of visual inspection approval, not to exceed ten days after delivery date.

**695-5.7.3 Conditions:** When guaranty is available, ensure that a written and signed guaranty accompanies the manufacturer's billing invoice. The Engineer will sign and retain the original and provide a copy to the manufacturer. If the Contractor does not comply with the terms of the guaranty, the Department may suspend the certification. Comply with additional terms and conditions as stated in purchasing agreements.

**695-5.8 Method of Measurement:**

The Contract unit price for each Weigh-In-Motion Electronics Sensor, furnished and installed, will consist of the Weigh-In-Motion sensor, temperature sensor, lead-in cable(s), Manufacturers' recommended bonding agent, all equipment, materials, and labor necessary for a complete and accepted installation.

**695-5.9 Basis of Payment:**



Price and payment will be full compensation for all work specified in this Section. Payment will be made under:

Item No.695- 9- TMS Weigh-In-Motion Electronics sensor - each.

### **695-6 Solar Power Unit.**

**695-6.1 General:** Install TMS solar power units at the locations and as shown in the Plans and Standard Plans. Solar power units are used to power TMS that collect vehicular data on a continuous basis. The solar power unit consists of the following components: solar panel(s) and mounting hardware; 12 V storage battery; and voltage regulator with wiring and associated mounting hardware.

**695-6.2 Materials:** Use solar power unit components listed on the Department's APL meeting the requirements of Section 997 and compatible with the other components installed at the location. Ensure that the solar power unit is marked in accordance with 695-2.2Section 997 and the markings are visible after installation.

695-6.2.1 Solar Panel Configured for Nominal 12 V<sub>DC</sub>: Meet the following requirements:

1. Peak power range of 80 to 130 watts, as specified in the Contract Documents.
2. Voltage at maximum power greater than 16.5 V at 77°F.
3. Current at maximum power greater than 2.85 A at 77°F.
4. Photovoltaic modules constructed of mono or poly crystalline cells.
5. Capable of multiple arrays and series or parallel wiring configurations.
6. Anodized aluminum frame.
7. Anodized, Galvanized or Stainless Steel Mounting hardware.

Ensure that solar panels do not have internal voltage regulators. When multiple panels are required, use panels of the same model and manufacture.

695-6.2.2 Battery 12 V: Meet the following requirements:

1. Rechargeable for photovoltaic application.
2. Valve regulated lead-calcium gelled electrolyte.
3. ABS Plastic or Polypropylene case.
4. Minimum current discharge rate of 100 hours at 0.9 amperes.
5. Approximate overall dimensions of 12 inches by 7 inches by 9 inches.

695-6.2.3 Voltage Regulator Configured for Nominal 12 V<sub>DC</sub>: Meet the following requirements:

1. Minimum of 13.5 V<sub>DC</sub> for battery charging.
2. Begin charging when battery voltage is 13.3 V or less.
3. Discontinue charging when battery voltage is 14.5 V.
4. Quiescent current of 15 mA or less.
5. Operating temperature range of 0 to 122°F.
6. Approximate overall dimensions of 2 inches by 5 inches by 1 inch.

**695-6.3 Installation Requirements:** Install the solar power units in accordance with the manufacturer's recommended installation procedure, Standard Plans, Index 695-001 and the Contract Documents.

**695-6.3.1 Pole Placement:** Ensure that the pole is placed to allow for the proper placement of the solar panels.

**695-6.3.2 Solar Panel Orientation:** Mount and orient the solar panels to the south. Angle the solar panels in accordance with Standard Plans, Index 695-001.

Install a weather head and route the wires in accordance with Standard Plans, Index 695-001.

**695-6.4 Method of Measurement:** The Contract unit price ~~for each~~~~each for~~ solar power unit includes the solar power unit as specified in the Contract Documents, all equipment, materials, and labor necessary for a complete and accepted installation.

**695-6.5 Basis of Payment:** Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 695- 5- TMS Solar Power Unit - each.

### **695-7 Inductive Loop Assembly.**

**695-7.1 General:** Install TMS inductive loop assembly at the locations shown in the Plans meeting the requirements of this specification. Ensure that all materials furnished, assembled, or installed are new products.

**695-7.2 Materials:** Furnish and install inductive loop assembly components listed on the Department's APL that are compatible with the other components installed at the location.

**695-7.2.1 Loop Wire:** Use loop wire in accordance with Standard Plans, Index 695-001.

**695-7.2.2 Shielded Lead-In Cable:** Use shielded lead-in cable in accordance with Standard Plans, Index 695-001.

**695-7.2.3 Splicing:** No splicing loop wire less than 150 feet.

**695-7.3 Installation Requirements:** Install inductive loop assembly components and materials in accordance with the Plans and the Standard Plans.

**695-7.3.1 Saw Cuts:** Loop layout will be as shown in Standard Plans, Index 695-001.

Perform saw cuts across concrete pavement expansion joints as detailed in Standard Plans, Index 695-001.

For pavement less than 3 inches deep, make saw cuts deep enough to allow 1 to 1-1/2 inch of sealant cover over the installed loop wire.

**695-7.3.2 Loop Wire:** Ensure that all loops have four complete turns of wire, wound in a clockwise manner. Do not damage the insulation.

Ensure that the hold down material is non-metallic; placed in the saw slot using segments 1 to 2 inches long, spaced 12 inches apart; and the distance from the top of the hold down material to the final roadway surface is not less than 1-1/2 inches.

**695-7.3.3 Loop Wire Twisted Pair Lead:** Create a loop wire twisted pair lead by twisting the loop wire pair a minimum of 8 to 16 twists per foot from the edge of the loop to the termination point in the cabinet. Provide a minimum of 3 feet of twisted loop wire pair lead in the pull box located adjacent to the roadway.

**695-7.3.4 Loop Sealant:** Use loop sealant in accordance with Section 660. Prepare and apply the sealant in accordance with the manufacturer's instructions. Remove excess sealant from the roadway surface. Ensure that the loop sealant has cured completely before allowing vehicular traffic to travel over the sealant.

**695-7.3.5 Shielded Lead-In Cable:** Install the shielded lead-in cable and perform all splices in accordance with Standard Plans, Index 695-001.

Ensure that the shielded lead-in cable is of sufficient length to extend through the conduits to the cabinet without additional splicing.

**695-7.4 Testing:** Conduct all testing with the leads disconnected from the backplane.

**695-7.4.1 Loop Resistance:** Ensure new loops have a resistance reading of 3.0  $\Omega$  or less.

**695-7.4.2 Inductance:** Ensure new loops have a minimum inductance reading of 100 M $\Omega$

**695-7.4.3 Insulation Resistance (Megging):** Ensure new loops have a minimum reading of 200 M $\Omega$  at 500 V.

**695-7.5 Method of Measurement:** The Contract unit price ~~per for each~~ ~~each for~~ inductive loop assembly includes loop wire, loop sealant and shielded lead-in cable, all equipment, materials, and labor necessary for a complete and accepted installation.

**695-7.6 Basis of Payment:** Prices and payments will be full compensation for all work specified in this Section, except conduit and pull and junction boxes.

Conduit will be paid for as specified in Section 630 and pull and junction boxes will be paid for as specified in Section 635.

Payment will be made under:

Item No. 695- 6- TMS Inductive Loop Assembly – each.

## **695-8 Site Cabinet.**

**695-8.1 General:** Install Type III, IV or V TMS cabinets in accordance with Section 676 and Standard Plans, Index 695-001.

### **695-8.2 Materials:**

**695-8.2.1 General:** Only use TMS cabinets and components currently listed on the Department's APL. Ensure that the cabinet and components are compatible with the other components installed at the location.

**695-8.2.2 Shelf:** Ensure that the cabinet has an adjustable shelf, constructed of 0.08 inch thick aluminum, that is adjustable to within 15 inches of the top of the cabinet and to within 26 inches of the bottom of the cabinet in 2 inch increments.

**695-8.2.3 Backplane and Cabinet Cable:** Furnish and install as specified in the Standard Plans, Index 695-001.

**695-8.3 Installation Requirements:** Install the TMS cabinet in accordance with the Plans, Standard Plans and manufacturer's recommended installation procedure. Ensure that all conduit entrance holes or field drilled holes are reamed and free of burrs. Use clear silicone rubber sealant to make all conduit connections to the cabinet watertight. Perform all excavation and backfill in accordance with 125-4 and 125-8.2.

**695-8.3.1 Pole Mounted Traffic Monitoring Site Cabinets (Types III and IV):** Install pole mounted traffic monitoring site cabinets in accordance with Standard Plans, Index 676-001 and 695-001.

**695-8.3.2 Base Mounted (Type IV and V) and Pedestal Mounted (Type III) Traffic Monitoring Site Cabinets:** Install base and pedestal mounted traffic monitoring site cabinets in accordance with Standard Plans, Index 676-001 and 695-001.

Ensure that the end of the conduit riser is a minimum of 2 inches above the finished surface of the concrete base.

**695-8.4 Method of Measurement:** The Contract unit price ~~for each~~ ~~each for~~ TMS cabinet includes the TMS cabinet, shelf, and backplane components as specified in the Contract

Documents, all equipment, materials, and labor necessary for a complete and accepted installation.

The cost of the base or pedestal, as shown in the Standard Plans, is included in the cost of the cabinet. The cost of the pole for pole mounts will be paid in accordance with Section 646.

**695-8.5 Basis of Payment:** Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 695- 7- TMS Cabinet - each.

### **695-9 Site Modem.**

**695-9.1 General:** Install TMS modem and antenna in the cabinet at the TMS location shown in the Plans.

#### **695-9.2 Materials:**

**695-9.2.1 General:** Use a TMS modem listed on the Department's APL meeting the requirements of Section 997 and compatible with the other components installed at the location.

**695-9.2.2 Modem:** Furnish and install all cables required to connect the modem to the electronics unit including the antenna.

The device shall be field configurable to be powered from 12 V<sub>DC</sub>.

~~695-9.2.2.1 Network Service: The device shall have the ability and be configured to utilize a network service that shall be at a minimum 3G EV-DO with fallback to CDMA 1xRTT.~~

~~695-9.2.2.2 Protocols: The device shall have the ability to utilize, at a minimum, the following protocols:~~

- ~~1. Network: TCP/IP, UDP/IP, DNS~~
- ~~2. Routing: NAT, Host Port Routing, DHCP, PPPoE, VLAN, VRRP, Reliable Static Route~~
- ~~3. Application: SMS, Telnet/SSH, Reverse Telnet, SMTP, SNMP, SNTTP~~
- ~~4. Serial: TCP/UDP PAD Mode, Modbus (ASCII, RTU, Variable), PPP~~

~~695-9.2.2.3 Event Reporting: The device shall have the capability to record and report, at a minimum, the following events in plain text:~~

- ~~1. Network parameters~~
- ~~2. Data usage~~
- ~~3. Power~~
- ~~4. Device temperature~~

~~695-9.2.2.4 Security: The device shall have the following security provisions:~~

- ~~1. Ability to establish VPN tunnels~~
- ~~2. IPsec, SSL, and GRE VPN client~~
- ~~3. Port forwarding and DMZ~~
- ~~4. Port filtering~~
- ~~5. Trusted IP~~
- ~~6. MAC address filtering~~

~~695-9.2.2.5 Environmental:~~ The device shall operate at temperatures from 0 to 158°F.

**695-9.2.3 Antenna:** Use ~~an~~ the furnished antenna that meets the following requirements in Section 997.:

- ~~1. Frequencies: F<sub>1</sub>=824 to 896 MHz, F<sub>2</sub>=1850 to 1990 MHz~~
- ~~2. VSWR of 1.5:1 or less at resonant point~~
- ~~3. 50  $\Omega$  nominal impedance~~
- ~~4. Gain of 3.0 dB~~
- ~~5. Omni-directional radiation pattern~~
- ~~6. Vertical polarization~~
- ~~7. Glass-filled polypropylene radome~~
- ~~8. Adhesive mounting~~
- ~~9. SMA male plug connectors~~
- ~~10. 10 foot. (minimum) coaxial length~~

**695-9.3 Commercial Software Registration:** Ensure that the Department is registered as the end-user of software installed on the system communications.

**695-9.4 Installation Requirements:** Install the TMS modem in accordance with the manufacturer's recommended installation procedure, unless otherwise specified in the Contract Documents.

**695-9.5 Method of Measurement:** The Contract unit price ~~for each~~ each for TMS modem will include the antenna and all equipment, materials, and labor necessary for a complete and accepted installation.

**695-9.6 Basis of Payment:** Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 695- 8- TMS System Communications Modem - per each



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

August 24, 2021

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

Re: State Specifications Office  
Section: **695**  
Proposed Specification: **6950000 Traffic Monitoring Site Equipment and Materials.**

Dear Mr. Nguyen:

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

The changes are proposed by Eric Griffin from the Transportation Data and Analytics Office to move all selected materials of Division III and add in Weigh-in-Motion Electronic Sensor. The proposed specification is associated with Section 997.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra  
Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**TRAFFIC MONITORING SITE EQUIPMENT AND MATERIALS**(REV ~~86-2322~~-21)

SECTION 695 is deleted and the following substituted:

**695-1 Description.**

Furnish or furnish and install a complete, operable traffic monitoring site (TMS) as shown in the Plans and Standard Plans. The Department uses TMS to monitor the volume, speed, number of axles, weight of wheels, axles or vehicles, or vehicular axle classification types.

**695-2 General.**

**695-2.1 Traffic Monitoring Site Component Approval:** ~~Use only components that meet the requirements of this Section and are listed on the Department's Approved Products List (APL).~~

~~Submit forms in accordance with 603-5.~~ Any electronics unit or software submitted for approval must be compatible with or convert the data into a format compatible with the Department's polling and processing software. Any substitute software modules submitted must be tested and approved.

**695-2.2 Marking of Approved Equipment:**

~~695-2.2.1 Manufacturer's Identification:~~ All TMS equipment must be permanently marked with the manufacturer's name or trademark, part or model number and date of manufacture or serial number.

~~695-2.2.2 Submittal Data Requirements: Submit forms in accordance with 603-5.~~

**695-2.3 Notification:** Notify the Engineer 10 days prior to beginning work in the area of the TMS to coordinate the removal of existing TMS equipment.

A TMS Inspector must be onsite during TMS installation. Notify the Engineer 10 days prior to installation of the TMS to coordinate the scheduling of a TMS Inspector.

**695-2.4 Poles for Cabinets, Non-Intrusive Sensors and Solar Panels:**

**695-2.4.1 Requirements:** Meet the requirements of Section 646 for aluminum poles.

**695-2.4.2 Installation:** Use cabinets that meet the requirements of Section 676 and are listed on the Department's Approved Product List (APL). Install cabinets in accordance with Section 676. Install the weather head and ground the pole in accordance with Section 620 and Standard Plans, Index 695-001.

**695-2.5 Manufacturer's Warranty Provisions:**

**695-2.5.1 General:** Secure all warranties provided by the equipment manufacturer for the specific equipment included in the Contract. Ensure that all warranties are fully transferable from the Contractor to the Department. Transfer warranties upon final acceptance in accordance with 5-11. Document all warranties and warranty transfers and submit to the Engineer. The Engineer will submit warranty forms received from the Contractor to the Transportation Data and Analytics Office (TDA) ~~Transportation Statistics Office (TranStat)~~ TMS Manager.

**695-2.5.2 Terms and Conditions:** Ensure that the terms and conditions of warranties are documented by the manufacturer when submitting a request to the Department for



certification and for equipment submittal for construction projects. Include terms for a specified service performance with provisions for repair parts and labor, or for replacement.

Ensure the terms and conditions define the equipment installation date as the date for such warranty to be in effect. The installation date for construction projects is the day the site is accepted by the [FranStat TDA](#) TMS Manager. For warehouse purchases, the installation date is the date of visual inspection approval, not to exceed ten days after delivery date.

Ensure warranties require the manufacturer to furnish replacements within 10 calendar days of notification for any part or equipment found to be defective during the manufacturer's warranty period at no cost to the Department.

Leave a copy of the warranty in the cabinet once it is installed and submit the warranty to the Engineer. The Engineer will submit warranty forms received from the Contractor to the [FranStat TDA](#) TMS Manager. Comply with the terms of the warranty. The Department may suspend the certification for non-compliance.

### 695-3 Vehicle Sensor (Non-Weight) Applications.

**695-3.1 General:** Install TMS vehicle sensors of the type and at the location shown in the Plans. Use vehicle sensors listed on the Department's APL [meeting the requirements of Section 997](#) and compatible with the electronics unit to which they will be connected.

#### 695-3.2 Axle Sensor (In-Roadway):

<a href="#">Table 695-1</a> <a href="#">Physical Characteristics, Axle Sensor Sensors</a>	
<a href="#">Sensor Element Dimensions</a>	<a href="#">6 ft. to 10 ft. in length (as specified in Plans); 3/16 in. to 3/8 in. in diameter (varies by manufacturer)</a>
<a href="#">Sensor Element Material</a>	<a href="#">Pressure sensing piezoelectric</a>
<a href="#">Pavement Operating Temperature</a>	<a href="#">0°F to +150°F</a>
<a href="#">Output Signal</a>	<a href="#">Minimum +200mV for passenger/pickup truck axle @ 70°F with less than 10% negative signal</a>

**695-3.2.1 Installation:** Install sensors in accordance with the requirements of this Section and Standard Plans, Index 695-001. Ensure axle sensors are installed in the roadway and secured using an adhesive bonding material listed on the APL.

Install axle sensors in the right-hand wheel-path midway between the leading and trailing loops as detailed in Standard Plans, Index 695-001. Install axles sensors in the left-hand wheel-path when no paved shoulder exists and sensor lead exit windows are installed at the right-hand edge of the roadway surface or in a lane which is to the left of and adjacent to an open lane of traffic.

Install the axle sensor such that the cable end is closest to the pull box to which the sensor lead cable will be routed. Install the end of the sensor mid-way into the edge line stripe or lane line stripe. Ensure that the axle sensor being installed has lead-in cables of sufficient length to reach the cabinet without splicing. Do not splice axle sensor lead-in cables.



Route the sensor lead to the pull box then to the TMS cabinet. Mark the sensor lead at the pull box and at termination in the cabinet. Submit lane numbering information as specified in Standard Plans, Index 695-001.

Allow newly applied asphalt to cure for a minimum of 30 days prior to the installation of in-road sensors. Use a chalk line or string and paint to layout the position of the sensor and lead-in cable slots.

Ensure saw cuts do not deviate more than 0.5 inches from the chalk line. Use a single blade or ganged blade saw wide enough to cut the axle sensor slot at full width in a single pass. Cutting two slots and chipping out roadway material between them is not allowed.

Cut the slot the length of the sensor plus an additional 3 to 4 inches. Ensure the depth and width of the slot is installed as recommended by the sensor manufacturer, typically 0.75 inches wide by 1.5 to 2 inches deep.

Use clips or jigs provided by the manufacturer to suspend the sensor at a uniform depth in the slot. Mix and apply the bonding agent ensuring the slot is completely full with no voids beneath the sensor.

**695-3.2.2 Test Requirements:** Perform the manufacturer's recommended on-site pre-installation test to determine the sensor's condition using an Inductive Capacitance Resistance meter. Install only those sensors that pass the pre-installation test.

Record all test results by lane on the warranty form provided by the manufacturer and leave a copy in the cabinet.

Repeat the test at the termination point in the cabinet after installation. Use an oscilloscope to view and record typical waveforms and signal intensity measurements for the axles of passenger cars and large trucks. Remove and replace any sensor that fails the test at no additional charge to the Department.

### **695-3.3 Non-Intrusive Vehicle Sensors (Off-Roadway):**

**695-3.3.1 General:** Install wireless (radar or microwave) vehicle sensors on a pole as shown in the Plans. Use vehicle detection systems that meet the requirements of Section 997 and are listed on the Department's Approved Product List (APL).

Detection Zone	A minimum of 8 distinguishable lanes within a minimum of 200 ft. of detection zone
Enclosure	Weatherproof aluminum, stainless steel or polycarbonate housing
Dimensions	Typically up to 15 in. X 12 in. X 6 in.
Weight	Typically less than 10 lb.
Operating Temperature (Ambient)	0°F to 140°F
Operating Frequency	Wireless transmission in FCC approved band or unlicensed RF range
Communications	RS-232, RS-485 or RJ-45 ports and supports a minimum baud rate of 19,200
Data Interface	Compatible with the Department's field storage devices (counters) and transmits detection data via contact closure signal using a hardwired connection

**695-3.3.2 Installation Requirements:** Install the sensor on a pole perpendicular to the target lanes of traffic with room to perform horizontal and vertical aiming adjustments.

Ensure that the wireless vehicle sensor has sufficient cable length to reach the cabinet without splicing. Fasten the cable to the pole so wind does not move it, or route the cable within the pole cavity to the cabinet termination point. Provide 18 to 24 inches of slack in the cable at the connections to the sensor and in the cabinet to ensure the cable is stress-free. Include the appropriate mounting hardware, contact closure signal that corresponds to vehicle presence and the manufacturer's recommended surge suppression as a part of the installation.

Set up the lane detection zones using the manufacturer's instructions and software and verify that the sensor's orientation is perpendicular to the roadway.

Configure the wireless vehicle sensor for vehicle volume unless otherwise specified in the Plans.

**695-3.3.3 Test Requirements:** Conduct a visual test to determine that all detection zones are being counted accurately.

Connect a personal computer (PC) to the electronics unit and observe traffic in every lane, verifying that each vehicle is displayed on-screen. A minimum of 20 vehicles should be observed for each lane of traffic with all vehicles counted; assuming a clear line of sight between the sensor and the vehicle being observed is maintained.

If any vehicles are not counted, reconfigure the wireless vehicle sensor and repeat the visual observation test until all lanes count correctly. If the sensor fails to provide accurate counts after three test attempts, it must be replaced with a new unit at no expense to the Department.

Provide a time synchronized video of testing, if requested. Submit a 48 hour verification (class, speed and volume) report for all TMS to the Engineer. The Engineer will submit video received from the Contractor to the [FranStat TDA](#) TMS Manager. Submit all documents to the Engineer and leave a copy in the cabinet.

**695-3.4 Method of Measurement.** The Contract unit price for each vehicle sensor will include the vehicle sensor, lead-in cables, bonding agent; and all equipment, materials, testing and labor necessary for a complete and accepted installation.

**695-3.5 Basis of Payment:** Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 695- 1- TMS Vehicle Axle Sensor (In-Roadway)- Non-Weight Applications- each.

Item No. 695- 2- TMS Vehicle Non-Intrusive – Non-Weight Applications (Off-Roadway) – each.

#### **695-4 Vehicle Speed/Classification Unit.**

**695-4.1 General:** Furnish and install TMS vehicle speed/classification unit (electronics unit) in the TMS cabinet at the locations shown in the Plans.

##### **695-4.2 Materials:**

**695-4.2.1 General:** Use a vehicle speed/classification unit listed on the Department's APL [meeting the requirements of 997 and](#) compatible with the other components installed at the TMS. Ensure that the vehicle speed/classification unit and equipment cables are compatible and constructed in accordance with the Standard Plans.

Ensure that the vehicle speed/classification unit is marked in accordance with 695-2.2 and the markings are visible after installation.

**695-4.2.2 Vehicle Speed/Classification Unit Requirements:** Provide an electronics unit that outputs data compatible with the Department's polling computer system or furnish a software module that converts the data into a format compatible with the Department's polling computer system.

The electronics unit operates in an unattended mode, accumulating data for later retrieval by downloading via the polling computer system. Ensure that the electronics unit is capable of downloading data through direct connection with a PC, without deleting or marking the files.

Submit complete operating procedures with all software.

**695-4.2.2.1 Compatibility:** Provide an electronics unit that is compatible with the weigh-in-motion sensors, embedded inductive loops, axle sensors, magnetometers and non-intrusive vehicle sensors in place at the TMS.

Ensure that each electronics unit is capable of determining the count and classification by type and speed of all vehicles for both directions of traffic on the roadway.

Provide real-time polling software with each electronics unit, capable of operating on a PC using the Department recommended operating system and meeting the following requirements:

1. Capable of communicating with the traffic counter/classifier, and downloading data via cellular modem and producing reports of 15 minute, hourly, weekly, monthly and annual volume and classification data.
2. Capable of displaying and entering operating parameters into the vehicle class/counter, and allowing the display of real-time traffic volumes in addition to routine data collection activities.
3. Capable of processing and storing all vehicle data retrieved in routine mode, regardless of the selected parameters.

**695-4.2.3 Functional Requirements:** The electronics unit must be fully functional when receiving input from two 6 foot by 6 foot embedded inductive loops, spaced 12 to 24 feet apart, leading edge to leading edge, with a single axle sensor located between the loops, in each lane of a six lane (minimum) roadway. Ensure that each electronics unit is capable of collecting data from each of the lanes of traffic in any combination of counts, classification, speed, or direction.

Provide electrical components of ~~solid~~-solid-state design, constructed so that they will not be damaged by jolts and vibrations encountered during shipping and everyday use.

Ensure that all electronics units are functionally identical and interchangeable except as follows:

1. The electronics unit may be constructed utilizing plug in modules; however, when plug in modules are used, each electronics unit must be identical except for the number and type of modules used. Ensure that modules of the same type are identical and interchangeable.
2. Should more than two electronics units be required in the same cabinet, ensure that each electronics unit has a unique, individual electronics unit number. The

electronics unit number must reside in non-volatile memory, so that it is not changed when a “cold or warm boot” is performed or by a power interruption.

Provide an electronics unit having the capability of obtaining and providing the following:

1. Volume, speed, classification, and classification by speed data simultaneously.

2. Volume data by lane.

3. Speed data by lane in a minimum of 15 bins, programmable in 5 mph increments.

4. Classification by lane in vehicle type by axle class in 15 bins (minimum) in accordance with FHWA Classification Scheme “F” in Florida’s Traffic Forecasting Handbook, Chapter 2, Figure 2.2 which can be accessed on the Department’s website at the following URL address:

[https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/planning/systems/programs/traffanalysis/2019-project-traffic-forecasting-handbook.pdf?sfvrsn=e105e71d\\_2](https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/planning/systems/programs/traffanalysis/2019-project-traffic-forecasting-handbook.pdf?sfvrsn=e105e71d_2).

5. A minimum of 95% accuracy of vehicle class, speed and volume.

Ensure that each electronics unit has the capability of providing real-time monitoring of volume data by lane or direction in user selected intervals of as little as 15 minutes, when required, without disrupting the above selected programs.

Provide an electronics unit capable of communicating directly with a PC or through a modem at a minimum rate of 19,200 bps.

Ensure that, at a minimum, the following parameters are programmable by direct connection to the electronics unit by Ethernet or via modem:

1. Six digit site number.

2. Number of lanes and directions.

3. Date and time.

4. Data operating and transmission parameters.

5. Sensor spacing.

6. Recording interval.

7. Vehicle parameter table with axle spacing ranges for each type of vehicle.

8. Number and range of speed categories, axle and length classifications, and headway.

Should an axle sensor or a loop in one or more lanes fail, the electronics unit must continue to provide the speed and volume from the remaining functioning sensors.

Ensure that the sensitivity level for each axle sensor is individually adjustable using software, by direct PC connection and remotely via telemetry.

Ensure that the loop detectors are internal and self-tuning. Ensure that the sensitivity level and any additional parameters necessary to prevent “loop crosstalk” for each embedded inductive loop can be adjusted individually using software, both by direct PC connection and remotely via telemetry.

Provide a means of introducing a time delay, or “de-bounce” value for ignoring spurious axle signals (ghost axles) in the electronics unit software.

**695-4.2.4 Power Requirements:** Provide an electronics unit that is field configurable to be powered 12 V<sub>DC</sub> and does not consume more than a total of 12 watts.

If an internal battery is required, it must be capable of being recharged and shall be furnished and included with the electronics unit at no extra cost.

**695-4.2.5 Mechanical Requirements:** Provide a modular electronics unit which is completely enclosed in a durable housing of sheet metal or cast aluminum with a durable finish. When configured for operation the electronics unit including all cables must fit into a Type IV cabinet.

**695-4.2.6 Environmental Requirements:** Provide an electronics unit which operates as specified when the ambient temperature and humidity inside the controller cabinet are within the following limits:

**695-4.2.6.1 Ambient Temperature:** The operating ambient temperature range must be between minus 0 to 140°F.

The rate of change in ambient temperature must not exceed 63°F per hour, during which the relative humidity must not exceed 90%.

**695-4.2.6.2 Humidity:** The relative humidity must not exceed 90% over the temperature range of 40 to 109°F. Above 109°F, constant absolute humidity must be maintained as seen in Table 695-~~13~~. The relative humidity range shown in Table 695-~~13~~ is for dynamic testing.

At 14.6 psi Barometric Pressure		
Dry Bulb °F	Relative Humidity (%)	Wet Bulb °F
40	75	37
50	80	46
60	83	57
70	86	66
80	87	77
90	89	88
100	89	97
109	90	108
120	70	109
130	50	109
140	38	109
150	28	109
160	21	109
165	18	109

**695-4.2.7 Cables and Connectors:** Furnish all cables and connectors for a complete and functional installation of each electronics unit in accordance with Standard Plans, Index 695-001.

Ensure that the cables are properly terminated for the prescribed use without further modification by the Department.

Furnish one serial port cable for interconnecting each electronics unit with a PC.

**695-4.3 Installation Requirements:** Install the electronics unit and equipment cables in accordance with the manufacturer's recommended installation procedure, Standard Plans, Index 695-001, and the Contract Documents.

**695-4.4 Method of Measurement:** The Contract unit price per assembly for electronics unit includes the electronics unit and equipment cable, all equipment, materials and labor necessary for a complete and accepted installation.

**695-4.5 Basis of Payment:** Prices and payments will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 695- 3- TMS Vehicle Speed/Classification Unit - per assembly.

### **695-5 Weigh-In-Motion Electronic Sensor.**

**695-5.1 General:** Install Traffic Monitoring Site (TMS) Weigh-In-Motion Electronic Sensor in the configuration shown on the Standard Plans, Index 695-001, and meet the requirements in Section 997.

**695-5.2 Materials:** Use Weigh-In-Motion Electronic Sensors that meet the requirements of Section 997 and are listed on the Department's Approved Products List (APL).

Use bonding agents listed on the APL and which are compatible with the Weigh-In-Motion sensor being installed.

### **695-5.3 Installation Requirements:**

**695-5.3.1 General:** The installer must have a valid certification from the manufacturer for installing the Weigh-In-Motion Electronics Sensors.

All lead in cables shall have 3 feet of slack tied inside the pull box and 3 feet inside the cabinet.

To avoid delays during installation, compile and check all construction tools required for the installation before beginning.

**695-5.3.2 Saw Cuts:** Use a chalk line or equivalent method to outline the perimeter of the sensor on the pavement and routes for lead-in cables. Do not allow the saw cut in the pavement to deviate more than 1.0 inch from the chalk line. Ensure that all saw cuts are free of any dust, dirt, or other debris and completely dry prior to the installation.

**695-5.4 Bending Plate:** Install two weigh pads adjacent to each other or in each wheel path in a staggered array to cover a 12-foot lane in the roadway. Connect the weigh pads to an interface processor.

Install the bending plate (weigh pad) frames into concrete slabs of 6 inches or more without constructing a special foundation socket. The frames, including weigh pad embedded in it, have an average depth of 1.5 inches.

If the concrete slab is less than 6 inches or if the roadway material is asphaltic concrete, install a special foundation socket of concrete under the frame, just as wide as the frame. Bore 1-inch diameter anchors to a minimum of 8 inches into the base course.

Install a 2 to 4 inch diameter pipe from lower side of the foundation frame towards the slope into the drain water shaft. Ensure that water does not accumulate in the frame and properly drains the frame.

Install a temperature sensor in the roadway or paved shoulder to monitor pavement temperature. Ensure that the sensor provides data to the vehicle/speed classification unit to compensate for temperature variation.



Install the bending plate sensors in accordance with the manufacturer's installation procedures and in the presence of the manufacturer's representative. Ensure that the procedures are approved by the Engineer.

**695-5.5 Piezoelectric Weigh-In-Motion Axle Sensor:** Install piezoelectric sensors in concrete or asphaltic concrete roadways. Install two 6-foot piezoelectric Weigh-In-Motion sensors (Class I) in each pathway per lane, in a staggered array in accordance with Standard Plans, Index 695-001. Place the leading Piezoelectric Weigh-In-Motion sensor (Class I) onto the right side edge of the driving lane perpendicular to the flow of the traffic, covering half of the lane width (6 feet). Place the trailing Piezoelectric Weigh-In-Motion Sensor (Class I) onto the left side edge of the driving lane (6 feet). Orient all lead-in cables and connectors toward the nearest pull box, beyond the outside travel lanes. Ensure that the end of the sensor element or channel is centered on the lane stripe.

Install a temperature sensor in the roadway or paved shoulder to monitor pavement temperature to compensate for temperature variation.

Install piezoelectric Weigh-In-Motion axle sensors in accordance with the manufacturer's installation procedures and in the presence of the manufacturer's representative.

**695-5.5.1 Piezoelectric Weigh-In-Motion Axle Sensor (Class I):** Install the unencapsulated piezoelectric Weigh-In-Motion sensor (Class I) by sawing a slot into the pavement perpendicular to the flow of traffic, equal to the length of the sensor plus 4 inches, by 3/4 inch wide, and by 1 inch deep. Sawcut a 1 inch wide by 2 inches deep cable run slot from the end of the sensor slot to the edge of the pavement shoulder.

Suspend the sensor within the slot with jigs. Prepare and apply bonding agent in accordance with the sensor manufacturer instructions, ensuring that there are no voids around the sensor. Ensure that the bonding agent is fully cured and ready for traffic within four hours of application. Remove the jigs after the bonding agent has cured.

Route the sensor lead-in cables to the pull box and through the conduit to the traffic monitoring site cabinet. Mark the sensor lead-in cables at the pull boxes and at the point of termination within the traffic monitoring site cabinet with an indelible marker, numbering the lanes as specified in the Plans and in accordance with the Standard Plans, Index 695-001.

**695-5.5.2 Quartz Piezoelectric Weigh-In-Motion Sensor:** Install the quartz piezoelectric sensor by sawing slots into the pavement perpendicular to the flow of traffic, equal to the length of the sensor plus 1 inch, by 2.875 inches wide, and by 2.125 inches deep. Sawcut a 1 inch wide by 2 inches deep cable run slot from the end of the sensor slot to the edge of the pavement shoulder.

Install the quartz piezoelectric sensor into the slot, properly aligned and positioned using specially constructed installation and leveling beams. Pour the manufacturer recommended epoxy grout into the cavity until it is at the proper height above the road surface and allow it to set. After the epoxy hardens, grind it to be level with the road surface. The top of the sensor must not deviate more than 1/24" above the height of the pavement surface over the length of the sensor.

Route the sensor lead-in cables to the pull box and through the conduit to the traffic monitoring site cabinet. Mark the sensor lead-in cables at the pull boxes and at the point of termination within the traffic monitoring site cabinet with an indelible marker, in accordance with Standard Plans, Index 695-001. Connect the cable to the interface card installed in the traffic monitoring cabinet.

**695-5.6 Weigh-In-Motion Electronics Sensor Test Requirements:**

Perform the manufacturer's recommended on-site pre-installation test to determine the Weigh-In-Motion electronics sensor's condition. Install only those Weigh-In-Motion electronics sensors that pass the pre-installation test.

Repeat the test, following installation, at the lead-in point of connection in the traffic monitoring site cabinet. Remove and replace any Weigh-In-Motion electronics sensor which fails the test at no additional cost to the Department. Prior to post-installation acceptance, the Contractor shall demonstrate in the presence of the Engineer that the equipment supplied and installed for the system is in full compliance with the Plans and Specification herein.

The Department will operate the complete system for 30 consecutive days without failures prior to Final Acceptance. The Department will poll the site and statistically check data from historical data, field collected data and field observations. In the event of failures, the Contractor shall correct the problem(s) and restart the 30-day test. Any equipment or labor that is found to be defective prior to Final Acceptance shall be replaced or corrected at no expense to the Department. Final Acceptance will be made upon the successful completion of the 30-day test.

Place a copy of the final test results, including the date of installation, manufacturer's name, model number for each Weigh-In-Motion electronics sensor, laboratory calibration sheet provided by the manufacturer, and type of bonding agent used in a waterproof package in the cabinet and furnish one copy to the Engineer.

**695-5.7 Guaranty Provisions:**

**695-5.7.1 Contractor's Responsibility:** Secure all guaranties that are customarily issued by the equipment manufacturers for the specific equipment included in the Contract. Ensure that the form in which such guaranties are delivered includes the provision that they are subject to transfer to the Department and is accompanied by proper validation of such fact. Transfer guaranties at final acceptance of the work (or equipment) by the Department.

**695-5.7.2 Terms:** Ensure that the manufacturers of the equipment stipulate the terms of guaranties when submitting a request to the Department for certification and for equipment submittal for construction projects. Include terms for a specified service performance with provisions for repair parts and labor, or for replacement. Provisions shall define the equipment "installation date" as the date for such guaranty to be in effect. For construction projects, the "installation date" is the first day of equipment "burn-in". For warehouse purchases, the "installation date" is the date of visual inspection approval, not to exceed ten days after delivery date.

**695-5.7.3 Conditions:** When guaranty is available, ensure that a written and signed guaranty accompanies the manufacturer's billing invoice. The Engineer will sign and retain the original and provide a copy to the manufacturer. If the Contractor does not comply with the terms of the guaranty, the Department may suspend the certification. Comply with additional terms and conditions as stated in purchasing agreements.

**695-5.8 Method of Measurement:**

The Contract unit price for each Weigh-In-Motion Electronics Sensor, furnished and installed, will consist of the Weigh-In-Motion sensor, temperature sensor, lead-in cable(s), Manufacturers' recommended bonding agent, all equipment, materials, and labor necessary for a complete and accepted installation.

**695-5.9 Basis of Payment:**



Price and payment will be full compensation for all work specified in this Section.  
Payment will be made under:

Item No.695- 9- TMS Weigh-In-Motion Electronics sensor - each.

### **695-6 Solar Power Unit.**

**695-6.1 General:** Install TMS solar power units at the locations and as shown in the Plans and Standard Plans. Solar power units are used to power TMS that collect vehicular data on a continuous basis. The solar power unit consists of the following components: solar panel(s) and mounting hardware; 12 V storage battery; and voltage regulator with wiring and associated mounting hardware.

**695-6.2 Materials:** Use solar power unit components listed on the Department's APL meeting the requirements of Section 997 and compatible with the other components installed at the location. Ensure that the solar power unit is marked in accordance with 695-2.2Section 997 and the markings are visible after installation.

**695-6.2.1 Solar Panel Configured for Nominal 12 V<sub>DC</sub>:** Meet the following requirements:

1. Peak power range of 80 to 130 watts, as specified in the Contract Documents.
2. Voltage at maximum power greater than 16.5 V at 77°F.
3. Current at maximum power greater than 2.85 A at 77°F.
4. Photovoltaic modules constructed of mono or poly crystalline cells.
5. Capable of multiple arrays and series or parallel wiring configurations.
6. Anodized aluminum frame.
7. Anodized, Galvanized or Stainless Steel Mounting hardware.

Ensure that solar panels do not have internal voltage regulators. When multiple panels are required, use panels of the same model and manufacture.

**695-6.2.2 Battery 12 V:** Meet the following requirements:

1. Rechargeable for photovoltaic application.
2. Valve regulated lead-calcium gelled electrolyte.
3. ABS Plastic or Polypropylene case.
4. Minimum current discharge rate of 100 hours at 0.9 amperes.
5. Approximate overall dimensions of 12 inches by 7 inches by 9 inches.

**695-6.2.3 Voltage Regulator Configured for Nominal 12 V<sub>DC</sub>:** Meet the following requirements:

1. Minimum of 13.5 V<sub>DC</sub> for battery charging.
2. Begin charging when battery voltage is 13.3 V or less.
3. Discontinue charging when battery voltage is 14.5 V.
4. Quiescent current of 15 mA or less.
5. Operating temperature range of 0 to 122°F.
6. Approximate overall dimensions of 2 inches by 5 inches by 1 inch.

**695-6.3 Installation Requirements:** Install the solar power units in accordance with the manufacturer's recommended installation procedure, Standard Plans, Index 695-001 and the Contract Documents.

**695-6.3.1 Pole Placement:** Ensure that the pole is placed to allow for the proper placement of the solar panels.

**695-6.3.2 Solar Panel Orientation:** Mount and orient the solar panels to the south. Angle the solar panels in accordance with Standard Plans, Index 695-001.

Install a weather head and route the wires in accordance with Standard Plans, Index 695-001.

**695-6.4 Testing Requirements:** Solar panels must have 20% efficiency rating and must be tested by setting the multi-meter to volts setting and connecting the positive lead to the solar panel's positive wire. Then connect the multi-meter's negative lead to the solar panel's negative wire. The volt reading on the multi-meter should be no less than 20 volts. If the volts are less, then there is a problem with the solar panel output. Go back and check all connections of the solar panel and check for cracks in the solar cells. Next test the solar panel for amperage by setting the multi-meter to amps setting and follow the above-mentioned steps. The amp reading should be no less than 4.25 amps. If the amperage is less, then there is a problem with the solar panel output. Go back and check all the connections of the solar panel and check for cracks in the solar cells.

**695-6.54 Method of Measurement:** The Contract unit price ~~for each~~~~each for~~ solar power unit includes the solar power unit as specified in the Contract Documents, all equipment, materials, and labor necessary for a complete and accepted installation.

**695-6.65 Basis of Payment:** Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 695- ~~65-~~ TMS Solar Power Unit - each.

### **695-7 Inductive Loop Assembly.**

**695-7.1 General:** Install TMS inductive loop assembly at the locations shown in the Plans meeting the requirements of this specification. Ensure that all materials furnished, assembled, or installed are new products.

**695-7.2 Materials:** Furnish and install inductive loop assembly components listed on the Department's APL that are compatible with the other components installed at the location.

**695-7.2.1 Loop Wire:** Use loop wire in accordance with Standard Plans, Index 695-001.

**695-7.2.2 Shielded Lead-In Cable:** Use shielded lead-in cable in accordance with Standard Plans, Index 695-001.

**695-7.2.3 Splicing:** No splicing loop wire less than 150 feet.

**695-7.3 Installation Requirements:** Install inductive loop assembly components and materials in accordance with the Plans and the Standard Plans.

**695-7.3.1 Saw Cuts:** Loop layout will be as shown in Standard Plans, Index 695-001.

Perform saw cuts across concrete pavement expansion joints as detailed in Standard Plans, Index 695-001.

For pavement less than 3 inches deep, make saw cuts deep enough to allow 1 to 1-1/2 inch of sealant cover over the installed loop wire.

**695-7.3.2 Loop Wire:** Ensure that all loops have four complete turns of wire, wound in a clockwise manner. Do not damage the insulation.

Ensure that the hold down material is non-metallic; placed in the saw slot using segments 1 to 2 inches long, spaced 12 inches apart; and the distance from the top of the hold down material to the final roadway surface is not less than 1-1/2 inches.

**695-7.3.3 Loop Wire Twisted Pair Lead:** Create a loop wire twisted pair lead by twisting the loop wire pair a minimum of 8 to 16 twists per foot from the edge of the loop to the termination point in the cabinet. Provide a minimum of 3 feet of twisted loop wire pair lead in the pull box located adjacent to the roadway.

**695-7.3.4 Loop Sealant:** Use loop sealant in accordance with Section 660. Prepare and apply the sealant in accordance with the manufacturer's instructions. Remove excess sealant from the roadway surface. Ensure that the loop sealant has cured completely before allowing vehicular traffic to travel over the sealant.

**695-7.3.5 Shielded Lead-In Cable:** Install the shielded lead-in cable and perform all splices in accordance with Standard Plans, Index 695-001.

Ensure that the shielded lead-in cable is of sufficient length to extend through the conduits to the cabinet without additional splicing.

**695-7.4 Testing:** Conduct all testing with the leads disconnected from the backplane.

**695-7.4.1 Loop Resistance:** Ensure new loops have a resistance reading of 3.0  $\Omega$  or less.

**695-7.4.2 Inductance:** Ensure new loops have a minimum inductance reading of 100 M $\Omega$

**695-7.4.3 Insulation Resistance (Megging):** Ensure new loops have a minimum reading of 200 M $\Omega$  at 500 V.

**695-7.5 Method of Measurement:** The Contract unit price ~~per for each~~ ~~each for~~ inductive loop assembly includes loop wire, loop sealant and shielded lead-in cable, all equipment, materials, and labor necessary for a complete and accepted installation.

**695-7.6 Basis of Payment:** Prices and payments will be full compensation for all work specified in this Section, except conduit and pull and junction boxes.

Conduit will be paid for as specified in Section 630 and pull and junction boxes will be paid for as specified in Section 635.

Payment will be made under:

Item No. 695- 6- TMS Inductive Loop Assembly – each.

## **695-8 Site Cabinet.**

**695-8.1 General:** Install Type III, IV or V TMS cabinets in accordance with Section 676 and Standard Plans, Index 695-001.

### **695-8.2 Materials:**

**695-8.2.1 General:** Only use TMS cabinets and components currently listed on the Department's APL. Ensure that the cabinet and components are compatible with the other components installed at the location.

**695-8.2.2 Shelf:** Ensure that the cabinet has an adjustable shelf, constructed of 0.08 inch thick aluminum, that is adjustable to within 15 inches of the top of the cabinet and to within 26 inches of the bottom of the cabinet in 2 inch increments.

**695-8.2.3 Backplane and Cabinet Cable:** Furnish and install as specified in the Standard Plans, Index 695-001.

**695-8.3 Installation Requirements:** Install the TMS cabinet in accordance with the Plans, Standard Plans and manufacturer's recommended installation procedure. Ensure that all conduit entrance holes or field drilled holes are reamed and free of burrs. Use clear silicone rubber sealant to make all conduit connections to the cabinet watertight. Perform all excavation and backfill in accordance with 125-4 and 125-8.2.

**695-8.3.1 Pole Mounted Traffic Monitoring Site Cabinets (Types III and IV):**

Install pole mounted traffic monitoring site cabinets in accordance with Standard Plans, Index 676-001 and 695-001.

**695-8.3.2 Base Mounted (Type IV and V) and Pedestal Mounted (Type III)**

**Traffic Monitoring Site Cabinets:** Install base and pedestal mounted traffic monitoring site cabinets in accordance with Standard Plans, Index 676-001 and 695-001.

Ensure that the end of the conduit riser is a minimum of 2 inches above the finished surface of the concrete base.

**695-8.4 Method of Measurement:** The Contract unit price ~~for each~~~~each for~~ TMS cabinet includes the TMS cabinet, shelf, and backplane components as specified in the Contract Documents, all equipment, materials, and labor necessary for a complete and accepted installation.

The cost of the base or pedestal, as shown in the Standard Plans, is included in the cost of the cabinet. The cost of the pole for pole mounts will be paid in accordance with Section 646.

**695-8.5 Basis of Payment:** Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 695- 7- TMS Cabinet - each.

**695-9 Site Modem.**

**695-9.1 General:** Install TMS modem and antenna in the cabinet at the TMS location shown in the Plans.

**695-9.2 Materials:**

**695-9.2.1 General:** Use a TMS modem listed on the Department's APL meeting the requirements of Section 997 and compatible with the other components installed at the location.

**695-9.2.2 Modem:** Furnish and install all cables required to connect the modem to the electronics unit including the antenna.

The device shall be field configurable to be powered from 12 V<sub>DC</sub>.

~~695-9.2.2.1 Network Service: The device shall have the ability and be configured to utilize a network service that shall be at a minimum 3G EV-DO with fallback to CDMA 1xRTT.~~

~~695-9.2.2.2 Protocols: The device shall have the ability to utilize, at a minimum, the following protocols:~~

- ~~1. Network: TCP/IP, UDP/IP, DNS~~
- ~~2. Routing: NAT, Host Port Routing, DHCP, PPPoE, VLAN, VRRP, Reliable-Static Route~~
- ~~3. Application: SMS, Telnet/SSH, Reverse Telnet, SMTP, SNMP, Sntp~~
- ~~4. Serial: TCP/UDP PAD Mode, Modbus (ASCII, RTU, Variable), PPP~~

~~695-9.2.2.3 Event Reporting: The device shall have the capability to record and report, at a minimum, the following events in plain text:~~

- ~~1. Network parameters~~
- ~~2. Data usage~~
- ~~3. Power~~

~~4. Device temperature~~

~~695-9.2.2.4 Security: The device shall have the following security provisions:~~

~~1. Ability to establish VPN tunnels~~

~~2. IPsec, SSL, and GRE VPN client~~

~~3. Port forwarding and DMZ~~

~~4. Port filtering~~

~~5. Trusted IP~~

~~6. MAC address filtering~~

~~695-9.2.2.5 Environmental: The device shall operate at temperatures from 0 to 158°F.~~

**695-9.2.3 Antenna:** Use ~~an~~ the furnished antenna that meets the following requirements in Section 997.:

~~1. Frequencies:  $F_1=824$  to 896 MHz,  $F_2=1850$  to 1990 MHz~~

~~2. VSWR of 1.5:1 or less at resonant point~~

~~3. 50  $\Omega$  nominal impedance~~

~~4. Gain of 3.0 dB~~

~~5. Omni-directional radiation pattern~~

~~6. Vertical polarization~~

~~7. Glass-filled polypropylene radome~~

~~8. Adhesive mounting~~

~~9. SMA male plug connectors~~

~~10. 10 foot. (minimum) coaxial length~~

**695-9.3 Commercial Software Registration:** Ensure that the Department is registered as the end-user of software installed on the system communications.

**695-9.4 Installation Requirements:** Install the TMS modem in accordance with the manufacturer's recommended installation procedure, unless otherwise specified in the Contract Documents.

**695-9.5 Method of Measurement:** The Contract unit price for each~~each for~~ TMS modem will include the antenna and all equipment, materials, and labor necessary for a complete and accepted installation.

**695-9.6 Basis of Payment:** Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 695- 8- TMS System Communications Modem - per each



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

June 30, 2021

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

Re: State Specifications Office  
Section: **700**  
Proposed Specification: **7000102 HIGHWAY SIGNING.**

Dear Mr. Nguyen:

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

The changes are proposed by Dana Knox to remove the type IV sheeting requirement and replace it with a type XI sheeting requirement in the Standard Specification.

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

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

Sincerely,

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**HIGHWAY SIGNING.****(REV 5-~~12~~20-21)**

SUBARTICLE 700-1.2.4 is deleted and the following substituted:

**700-1.2.4 Retroreflective Sign Sheeting:** Use signs that meet the material and process requirements of Section 994.

Use Type XI sheeting for all ~~regulatory, warning, and overhead~~ signs and retroreflective strips on signs unless otherwise specified. The R1-1, R1-2, R5-1 and R5-1a signs must use a sheeting system that includes a colorless film overlay.

~~Type XI sheeting shall also be used for all limited access advance exit and exit guide signs.~~

Use ~~Type IV~~ fluorescent yellow-green sheeting for the following signs:

1. school: S1-1, S3-1, S3-2, S4-5, S4-5a, S5-1 (SCHOOL portion),
2. bicycle: W11-1,
3. pedestrian: R1-6, R1-6a, R1-6b, R1-6c, R1-9, R1-9a, R10-15, W11-2,
4. shared use path (trail): W11-15, W11-15a,
5. supplemental panels used with signs in (1) through (4), above.

Do not mix signs having fluorescent yellow-green sheeting with signs having yellow retroreflective sheeting.

Use Type VI sheeting for Roll-up signs.

~~Use Type IV sheeting for all other signs.~~

~~Use Type IV or Type XI sheeting for retroreflective strips on signs.~~



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
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KEVIN J. THIBAUT, P.E.  
SECRETARY

July 21, 2021

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

Re: State Specifications Office  
Section: **700**  
Proposed Specification: **7000502 HIGHWAY SIGNING.**

Dear Mr. Nguyen:

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

The changes are proposed by Derek Vollmer to clarify Blank Out Sign (BOS) mounting, address password protection for configuration using Bluetooth, and remove the need for AC/DC charging in permanent solar installations to the Standard Specification.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer



## HIGHWAY SIGNING.

(REV ~~5-14-6-7-21~~)

SUBARTICLE 700-5.2 is deleted and the following substituted:

**700-5.2 Material:** EWS, EGS, ERS, ~~and~~ ESFS, and ground mounted BOS must allow attachment to vertical and horizontal support structures as part of a single or double sign post configuration. Bolts must be used for load bearing attachments.

For roadside sign assemblies, provide support structure in accordance with 646-2.

**700-5.2.1 Requirements Common to all EDS:** All EDS must be designed to withstand the loads defined in the Department's Structures Manual without deformation or damage. EDS, other than BOS, must provide an option to include flashing beacons. Printed circuit boards shall be protected with conformal coating. Housings that contain electronics shall be constructed of aluminum alloy sheet a minimum of .090 inches thick. Welding used during the construction of EDS must be accordance with Section 965.

**700-5.2.1.1 General:** Signs included on the APL will be designated with a size and type category and may be listed with restrictions, such as "requires District Traffic Operations Engineer approval", "school zones only", or "low speed only".

**700-5.2.1.2 Electronic Display Sign with Static Sign Panel:** EDS that include both a static sign panel and dynamic display may be a modular system comprised of a static sign panel with an attached electronic display. Static sign panels shall meet the Department's requirements for highway signing found in this Section.

**700-5.2.2 Electronic Display:** Electronic displays shall appear completely blank (dark) when not energized. No phantom characters or graphics will be allowed under any ambient light conditions.

**700-5.2.2.1 Housing:** The housing must protect and seal the dynamic display and other internal electronics. Any polycarbonate material used on the sign face must be a minimum 90% UV opaque and resistant to fading and yellowing. The housing shall be NEMA 3R rated and prevent unauthorized access. The housing shall include weather tight cable entry or connection points for any required power or data connections.

**700-5.2.2.2 Cabinet:** Any equipment cabinets provided with the EDS must be listed on the APL.

**700-5.2.2.3 Optical, Electrical, and Mechanical Specifications for Display Modules:** Ensure that all LEDs operate within the LED manufacturer's recommendations for typical forward voltage, peak pulsed forward current, and other ratings. Component ratings shall not be exceeded under any operating conditions.

**700-5.2.2.4 LED and Pixel Specifications:** Ensure that all LEDs used in the display have a wavelength output that varies no more than plus or minus two nanometers from the specified peak wavelength. Ensure that the display and LED pixel cone of vision is a minimum of 15 degrees (centered around the optical axis, or zero point, of the pixel). The cone perimeter is defined by the point where light output intensity is 50% of the intensity measured at the zero point of the pixel. For all colors other than white, ensure that the sign display produces an overall luminous intensity of at least 9200 candelas per square meter when operating at 100% intensity. For white or full color matrix displays ensure that the sign display produces white with an overall luminous intensity of at least 12,400 candelas per square meter when operating at 100% intensity. Submit documentation that indicates the LED brightness and color bins that are

used in each pixel. Ensure that LEDs are individually mounted on a PCB, and are able to be removed and replaced using conventional electronic repair methods. Encapsulated LEDs within a pixel are not allowed. ERS LEDs must be arranged and powered in a manner that maintains a discernible message in the event of a single LED or pixel failure.

**700-5.2.2.5 Character Size, Fonts, and Graphics:** The minimum numeral and letter size of the electronic display must meet or exceed the numeral and letter sizes prescribed in the MUTCD and the SHS. Fonts and graphics must mimic the characteristics of fonts and graphics defined in the MUTCD and SHS.

**700-5.2.3 Electronic Display Controller:** Any electronic display controller required for the operation of the EDS shall be housed within the sign and be equipped with a security lockout feature to prevent unauthorized use. The controller shall have the capability to provide a stipulated default message upon loss of controller function. A blank message is acceptable.

**700-5.2.3.1 Communication:** The electronic display controller shall possess a minimum of one serial, Ethernet, USB, or Bluetooth interface with the ability to connect to a laptop computer. The serial data interface shall support multiple data rates from 9,600 bps to 115,200 bps.

**700-5.2.3.2 Configuration and Management:** Ensure that the sign is provided with computer software from its manufacturer that allows a user to program, operate, exercise, diagnose, and read current status of all sign features and functions using a laptop.

Configuration and management functions must be password protected.

**700-5.2.4 Operation and Performance:** Ensure that the EDS is visible from a distance of at least 1/4 mile and legible from a distance of 400 feet for applications on roads with a speed limit less than 45 mph and visible from a distance of at least 1/2 mile and legible from a distance of at least 650 feet for roads with speed limits 45 mph or higher. In both cases, the requirements must be met under both day and night conditions.

The electronic display shall automatically adjust brightness for day and night operation. The EDS must be equipped with a light sensor that accurately measures ambient light level conditions at the sign location. The EDS must automatically adjust LED intensity based on the ambient light conditions in small enough increments that the sign's brightness changes smoothly, with no perceivable brightness change between adjacent levels. Stray headlights shining on the photoelectric sensor at night must not cause LED brightness changes.

Flashing messages must not exceed 150 flashes per minute.

**700-5.2.5 Mechanical Specifications:** EDS mounting provisions and mounting hardware must accommodate sign weight and wind loading requirements of the Department's Structures Manual. BOS must be designed to accommodate overhead attachment using a tri-stud signal hanger. Multiple tri-stud attachment points may be used to meet weight and wind loading requirements. Tri-stud attachment points must be weather-tight and structurally reinforced.

**700-5.2.5.1 Fasteners and Attachment Hardware:** Ensure that all assembly hardware, including nuts, bolts, external screws and locking washers less than 5/8 inch in diameter, are Type 304 or 316 passivated stainless steel. Stainless steel bolts, screws and studs must meet ASTM F593. Nuts must meet ASTM F594. All assembly hardware greater than or equal to 5/8 inch in diameter must be galvanized. Bolts, studs, and threaded rod must meet ASTM A307. Structural bolts must meet ASTM F3125, Grade A325.

**700-5.2.6 Electrical Specifications:** All power inputs must be fuse and reverse polarity protected. All EDS must be able to recover from power loss and return to their operational state without user intervention.

**700-5.2.6.1 Solar Power:** Solar powered signs must be capable of fully autonomous operation 24 hours per day, 365 days per year. Batteries must be a standard 12 volt deep cycle battery suitable for the application and operating environment. Flooded lead-acid batteries are prohibited.

Batteries must be capable of providing 10 days of continuous operation without sunlight. Charging system must use a solar charge controller with temperature compensation. The system must provide for automatic battery charging, overcharge protection, and have indications that display current status and faults.

**700-5.2.6.2 AC Power:** Fluctuations in line voltage must have no visible effect on the appearance of the display.

**700-5.2.7 Electronic Warning Signs (EWS):** The EWS must be designed to alert road users to conditions that might call for a reduction of speed or an action, in the interest of safety and efficient traffic operations. EWS must include a secure wireless connection to communicate with a nearby laptop.

**700-5.2.7.1 EWS Foreground/Background Colors:** If a black background is used on the changeable electronic display, the color used for the legend must match the background color that would be used on a standard sign for that type of legend, in accordance with the MUTCD. Black EWS display backgrounds must be flat black (FED-STD-595-37038) with a reflectance value not exceeding 25%. EWS must utilize yellow LEDs with a peak wavelength of either 585 or 590 nanometers. EWS must have a minimum one-inch contrasting margin around illuminated characters or graphics.

**700-5.2.7.2 Speed Detector:** EWS that detect or display the speed of approaching vehicles must be programmable for the posted speed limit and the maximum speed to display. When the detected speed exceeds the maximum programmed speed (high speed cut-off) threshold, the display must automatically blank. Alternately, the display may show an alert message such as "SLOW DOWN" when speeds above the maximum programmed speed threshold are detected.

The EWS must detect when the posted speed is exceeded by one mph and then activate the alert. When the alert is activated, the display shall be able to flash. When no advancing traffic is detected, the display must be blank. The speed detector must not activate alerts for vehicles outside the display cone of vision.

The speed detector must meet the requirements of FCC Title 47, Part 90 and not require an FCC operating license. The speed detector must operate on 10.8 to 16.6 V<sub>DC</sub> and draw less than three amperes. The EWS must monitor and display the speed of approaching traffic only. The EWS detector must be able to accurately detect and determine the speed of approaching vehicles. The EWS must be capable of measuring and displaying speeds of approaching traffic only between 10 and 99 mph with an accuracy of plus or minus one mph, 1,000 feet in advance of the sign.

**700-5.2.8 Electronic Guide Signs (EGS):** Meet the requirements of electronic warning sign (EWS) with the following exceptions: Use a white legend and green background in accordance with the MUTCD. EGSs must utilize white LEDs.

**700-5.2.9 Electronic Regulatory Signs (ERS):** The ERS must be designed to give notice of traffic laws or regulations, such as the posted speed limit. ERS used for variable

speed limit (VSL) applications must be able to display speed limits from 5-70 mph in five mph increments and mimic the physical appearance of a static regulatory speed limit sign as shown in the MUTCD and SHS. ERS for VSL applications shall use black characters on a white background. ERS for VSL applications must log the time and date of any speed limit change to internal non-volatile memory. The log must be able to record a minimum of 1,000 events in a first-in, first-out fashion.

#### **700-5.2.9.1 Foreground/Background Colors and Display Types:**

Display modules for all ERS must have a minimum two-inch contrasting margin around digits, text, or graphics. ERS must utilize LED technology for the dynamic display.

#### **700-5.2.9.2 Variable Speed Limit (VSL) ERS Controller**

**Communications:** ERS for variable speed applications must be equipped with a sign controller that includes a minimum of one Ethernet 10/100 Base TX 8P8C port.

#### **700-5.2.9.3 Configuration and Management Requirements for VSL**

**ERS:** Ensure that ERS for VSL applications can be managed remotely from a TMC or managed locally using a laptop computer. Ensure that the TMC or a laptop computer can be used to remotely reset VSL sign controllers. Ensure that ERS for VSL applications log and report status, errors, and failures, including data transmission errors, receipt of invalid data, communication failure recoveries, alternating current power failures, power recoveries, display errors, fan and airflow status, temperature status, power supply status, and information on the operational status of the temperature, photocell, airflow, humidity, and LED power supply sensors.

Ensure that the sign controller is addressable through an Ethernet communication network using software that complies with the NTCIP requirements published online by the Department's Transportation Traffic Engineering Research Laboratory (TERL) at: <https://www.fdot.gov/traffic/>. Ensure that the sign implements any NTCIP standards required to achieve interoperability and interchangeability. Ensure that any additional objects implemented by the software do not interfere with the standard operation of any mandatory objects. ERS must be compatible with the Department's SunGuide® software.

**700-5.2.9.4 ERS Battery Backup System:** AC powered signs must include a battery backup system that maintains full operation of the sign for a minimum of two hours in the event of utility power loss. Operation on battery backup can have no visible effect on the appearance of the display.

**700-5.2.10 Blank-Out Signs (BOS):** EDSs designed for BOS applications must have a black exterior finish (FED-STD-595-37038) with a reflectance value not exceeding 25%. Overhead BOS must include a visor.

**700-5.2.11 Electronic Speed Feedback Signs (ESFS):** The ESFS must be designed to alert road users of their speed as they approach the sign.

**700-5.2.11.1 ESFS Background/Foreground Colors:** The ESFS display background must be flat black (FED-STD-595-37038) with a reflectance value not exceeding 25%. ESFS must utilize amber LEDs with a peak wavelength of 590 nanometers. ESFS shall have a minimum one-inch contrasting margin around illuminated characters or graphics.

**700-5.2.11.2 Speed Detector:** The ESFS must be programmable for the posted speed limit and the maximum speed to display. When the detected speed exceeds the maximum programmed speed (high speed cut-off) threshold, the display must automatically blank. Alternately, the display may show an alert message such as "SLOW DOWN" when speeds above the maximum programmed speed threshold are detected. The ESFS must detect when the posted speed is exceeded by one mph and then activate the alert. When the alert is

activated, the display must flash at a rate of 50 to 60 cycles per minute. When no advancing traffic is detected, the display must be blank. The speed detector must not activate alerts or display speeds for vehicles outside the display's cone of vision. The ESFS must meet the requirements of FCC Part 90 and not require an FCC operating license. The speed detector must operate on 10.8 to 16.6 V<sub>DC</sub>. The ESFS must be capable of measuring speeds of approaching traffic between 10 and 99 mph with an accuracy of plus or minus one mph, 1,000 feet in advance of the sign.

**700-5.2.12 Environmental Requirements:** The EDS assembly must operate properly during and after being subjected to the environmental testing procedures described in NEMA TS 4-2016, Section 2. Fog, frost, or condensation must not form within the dynamic portion of the sign. Electronics must meet FCC Title 47, Subpart B Section 15.

**700-5.2.13 Warranty:** Ensure that the EDS systems and equipment furnished have a manufacturer's warranty covering defects in assembly, fabrication, and materials for a minimum of three years.

SUBARTICLE 700-6.2.4 is deleted and the following substituted:

**700-6.2.4 Electrical Specifications:** Provide equipment that operates on solar power or a nominal voltage of 120 V<sub>AC</sub>. If the device requires operating voltages of less than 120 V<sub>AC</sub>, supply the appropriate voltage converter. Solar powered beacon systems must be designed to provide 10 days of continuous operation without sunlight and must automatically charge batteries and prevent overcharging and over-discharging. Solar powered systems must include a charge indicator ~~and AC/DC battery charger~~.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
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KEVIN J. THIBAUT, P.E.  
SECRETARY

June 30, 2021

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

Re: State Specifications Office  
Section: **706**  
Proposed Specification: **7060000 RAISED PAVEMENT MARKERS AND  
BITUMINOUS ADHESIVE.**

Dear Mr. Nguyen:

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

The changes are proposed by Olivia Townsend to clarify that epoxy adhesive may be used with Raised Pavement Markers in the Standard Specification. This specification revision is associated with the revisions to Sections 102 and 970.

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

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

Sincerely,

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**RAISED PAVEMENT MARKERS AND BITUMINOUS ADHESIVE.**(REV ~~5-56-23~~-21)

SECTION 706 is deleted and replaced by the following:

**SECTION 706**  
**RAISED PAVEMENT**  
**MARKERS AND ~~BITUMINOUS~~MARKER ADHESIVE**

**706-1 Description.**

~~Place~~ Raised pavement markers (RPMs) and adhesive ~~, which upon installation produces~~ provide a positive guidance system to supplement other reflective pavement markings.

**706-2 Materials.**

Use only Class B markers, except as follows:

For center line rumble strip installations where RPMs are in conflict with the grinding, install Class D RPMs with the first application of standard paint. Remove Class D RPMs prior to grinding, then install Class B RPMs in an unground area after grinding.

Install Class F RPMs only when shown in the plans.

Meet the requirements of Section 970.

**706-2.1 Product Acceptance on the Project:** Use only RPMs and ~~bituminous~~ adhesive that are listed on the Department's Approved Product List (APL). For Class F RPMs, provide a warranty assigned to the Department in accordance with Section 970.

**706-3 Bituminous Adhesive Equipment.**

Use equipment having either thermostatically controlled double boiler type units utilizing heat transfer oil or thermostatically controlled electric heating pots to install hot applied bituminous adhesive. Use a melter/applicator unit suited for both melting and pumping the bituminous adhesive through heated applicator hoses.

Heat the bituminous adhesive to between 375°F and 425°F and apply directly to the bonding surface from the melter/applicator by either pumping or pouring. Maintain the application temperature between 375°F and 425°F. The bituminous adhesive may be reheated. However, do not exceed the manufacturer's recommendations for pot life at application temperatures.

**706-4 Application.**

Install RPMs in accordance with the Plans and Standard Plans, Indexes 706-001 and 711-003, prior to opening the road to traffic.

Apply RPMs to the bonding surface using bituminous or epoxy adhesives in accordance with the manufacturer's instructions. Use epoxy adhesives when applying RPMs on concrete pavement.

For Class F RPMs, installation may include the removal of roadway surface material to recess a portion of the RPM housing.

Prior to application of adhesive, clean the portion of the bonding surface of any material which would adversely affect the adhesive.

Apply the adhesive to the bonding surface (not the RPM) so that 100% of the bonding area of the RPM will be covered, in accordance with adhesive manufacturer's recommendations.



Apply sufficient adhesive to ensure that when the marker is pressed downward into the adhesive, adhesive will be forced out around the entire perimeter of the RPM.

Immediately remove excess adhesive from the bonding surface and exposed surfaces of the RPMs. Soft rags moistened with mineral spirits meeting Federal Specifications TT-T-291 or kerosene may be used to remove adhesive from exposed faces of the RPMs. Do not use any other solvent. If any adhesive, pavement marking materials or other foreign matter adheres to the traffic face of the RPM, replace the RPM at no cost to the Department.

Restore any areas impacted by the installation of Class F RPMs to original condition.

Ensure that all final RPMs are in place prior to opening the road to traffic.

If more than 2% of the RPMs fail in adhesion or alignment within the first 45 days under traffic, replace all failed RPMs at no expense to the Department. If more than 5% of the RPMs fail in adhesion and or alignment during the initial 45 day period, the Engineer will extend the replacement period an additional 45 days from the date that all replacement RPMs have been installed. If, at the end of the additional 45 day period, more than 2% of all RPMs (initial installation and 45 day replacements combined) fail in adhesion or alignment, replace all failed RPMs at no expense to the Department.

#### **706-5 Contractor's Responsibility for Notification.**

Notify the Engineer prior to the placement of RPMs. At the time of notification, submit the APL number and the batch or Lot numbers of RPMs and bituminous-adhesive to be used.

#### **706-6 Method of Measurement.**

The quantity of RPMs to be paid for under this Section will be the quantity per each, furnished and installed, completed and accepted.

#### **706-7 Basis of Payment.**

**706-7.1 Class B RPMs:** Price and payment for Class B RPMs will be full compensation for all work and materials in this Section.

**706-7.2 Class D RPMs:** Payment will be made in accordance with Section 102.

**706-7.3 Class F RPMs:** Price and payment for Class F RPMs will be full compensation for all work and materials in this Section.

**706-7.4 Payment Items:** Payment will be made under:

Item No. 706- 1- Raised Pavement Marker - per each.





*Florida Department of Transportation*

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KEVIN J. THIBAUT, P.E.  
SECRETARY

June 29, 2021

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

Re: State Specifications Office  
Section: **715**  
Proposed Specification: **7150300 Highway Lighting System.**

Dear Mr. Nguyen:

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

The changes are proposed by Jason Russell from the State Construction Office to provide additional articles for Remedial Work and Statewide Disputes Review Board for the painting of products covered by this Specification. The following proposed changes are associated with changes to Section 646 and 649.

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

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

Sincerely,

Signature on File

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**HIGHWAY LIGHTING SYSTEM**  
**(REV 5-25-21)**

SECTION 715 is expanded by the following new Articles:

**715-3 Remedial Work.**

During the painting warranty period, the responsible party shall perform all painting remedial work necessary to meet the requirements of this Specification at no cost to the Department. Such remedial work shall be performed within 180 days of notification of a failure by the Department or by the determination of the Statewide Disputes Review Board. Failure to perform such remedial work within the time frame specified will result in the work being performed by other forces at the responsible party's cost.

If the responsible party is the fabricator, the fabricator will be removed from the Prequalified Painted Galvanized Steel Poles and Aluminum Products Fabricators List for a minimum of six months or until payment in full for the correction of the deficiencies or defects has been made, whichever is longer.

If the responsible party is the Contractor, the Department will suspend, revoke, or deny the responsible party's certificate of qualification under the terms of Section 337.16(d)(2), Florida Statutes, for a minimum of six months or until payment in full for the correction of the deficiencies or defects has been made, whichever is longer.

**715-4 Statewide Disputes Review Board.**

The Statewide Disputes Review Board in effect for this Contract will resolve any and all disputes that may arise involving administration and enforcement of this Specification related to the painting remedial work performed during the warranty period. The Responsible Party and the Department acknowledge that use of the Statewide Disputes Review Board is required, and the determinations of the Statewide Disputes Review Board for disputes arising out of this Specification will be binding on both the Responsible Party and the Department, with no right of appeal by either party. Meet the requirements of 8-3.

ARTICLES 715-3 through 715-17 are deleted and the following substituted:

**715-3~~5~~ Shop Drawings and Working Drawings.**

Submit shop drawings and working drawings with descriptive specifications and engineering data for the service main, control panel enclosure, control panel main disconnect, lighting contactor, electrical panel, transformer, in-line fuse holders, surge protective devices, non-standard light poles (including brackets), luminaires, ballast, photo-electric cell, conduit and cable or any other item requested by the Engineer as specified in Section 5.

**715-4~~6~~ Materials and Equipment to be Installed.**

**715-4~~6~~.1 General:** Meet the materials and equipment requirements of Section 992.

**715-4~~6~~.2 Luminaires:** Use only luminaries listed on the Department's Approved Product List (APL).

**715-4~~6~~.3 Criterion Designation of Materials and Equipment:** Where a criterion specification is designated for any material or equipment to be installed, by the name or catalog

number of a specific manufacturer, understand that such designation is intended only for the purpose of establishing the style, quality, performance characteristics, etc., and is not intended to limit the acceptability of competitive products. The Engineer will consider products of other manufacturers which are approved as similar and equal as equally acceptable.

#### **715-~~5~~-7 Furnishing of Electrical Service.**

Provide service point in accordance with Section 639.

#### **715-~~6~~-8 Excavation and Backfilling.**

**715-~~6~~-8.1 General:** For excavation and backfilling, meet the requirements of Section 125, except that when rock is encountered, carry the excavation 3 inches below the required level and refill with sand or with selected earth material, 100% of which passes the 1 inch sieve.

**715-~~6~~-8.2 Trenches for Cable:** Construct trenches for cable or conduit no less than 6 inches in width and deep enough to provide a minimum cover in accordance with the Standard Plans.

**715-~~6~~-8.3 Placing Backfill for Cable:** For installation of the cable, place an initial layer of 6 inches thick, loose measurement, sand or selected earth material, 100% of which passes a 1 inch sieve. Place and compact the remaining material in accordance with 125-8.

#### **715-7-9 Foundations for Light Poles.**

**715-7-9.1 Concrete Foundations:** Provide foundations for light poles of the sizes and shapes shown in the Plans. Construct precast or cast-in-place concrete foundations in accordance with the Standard Plans. Obtain precast foundations 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.

**715-7-9.2 Setting Anchor Bolts:** Set anchor bolts according to manufacturer's templates and adjust to a plumb line, check for elevation and location, and hold rigidly in position to prevent displacement while pouring concrete.

**715-7-9.3 Installation:** Do not erect roadway light poles or high mast light poles until the concrete strength in the cast-in-place foundation is at least 2,500 psi. Determine concrete strength from tests on a minimum of two test cylinders sampled and tested in accordance with ASTM C31 and ASTM C39 and verifying test results have been submitted to the Engineer.

Fill the voids around precast concrete foundations under roadway light poles with flowable fill meeting the requirements of Section 121 or clean sands placed using hydraulic methods to a level 6 inches below grade.

#### **715-8-10 Pulling Conductors.**

Leave at least 3 feet of conductor where the cable enters and leaves conduit. Protect conductors pulled into conduit or ducts against abrasion, kinking, and twisting. Locate pull boxes so that the conductors are not subjected to excessive pulling stresses.

#### **715-9-11 Splicing.**

Make all conductor splices in the bases of the light poles, or in pull boxes designed for the purpose. Do not make underground splices unless specifically authorized by the Engineer, and then only as directed by him.

Unless otherwise shown in the Standard Plans or authorized by the Engineer, splices shall be made with split bolt connectors. The connector shall be sealed in silicone gel that easily peels

away leaving a clean connection. The gel will be contained in a closure that when snapped around the split bolt will provide a waterproof connection without the use of tools or taping. This closure will be UV resistant, impact resistant and abrasion resistant.

### **715-~~10~~-12 Conduit.**

Install conduit at the locations shown in the Plans and in accordance with Section 630.

### **715-~~11~~-13 Erecting Light Poles.**

**715-~~11~~-13.1 General:** Install the light poles at the locations and in accordance with the details shown in the Plans. Unless otherwise specifically approved by the Engineer, fasten bracket (truss) arms to the pole prior to erection. Erect light poles with the orientation of the access door on the opposite side of approaching traffic. Do not field weld on any part of the pole assembly. Plumb the poles after erection and use metal shims or leveling nuts if necessary to obtain precise alignment. Use a thin cement grout where necessary to eliminate unevenness or irregularities in the top of the base.

**715-~~11~~-13.2 Adjusting Anchor Bolts and Installing Nuts on Anchor Bolts:** Where poles are to be placed on existing foundations or bases with anchor bolts in place, furnish poles with a base which fits the anchor bolt spacing. Include the cost of any necessary extension of existing anchor bolts in the price bid for the lighting system. For high mast light pole bases, install nuts on anchor bolts in accordance with 649-5.

**715-~~11~~-13.3 Installation of Luminaire:** Install the luminaire on the truss arm in accordance with the manufacturer's instructions, and place it so that the light pattern is evenly distributed along the roadway.

**715-~~11~~-13.4 Electrical Connections:** Make primary ballast connections in accordance with manufacturer's instructions. Install sufficient cable to allow all connections to be made outside the light pole base. Connect the ground conductor to the ground stud provided.

**715-~~11~~-13.5 Pole Identification Plates:** Furnish and install a 2 inch by 8 inch aluminum identification plate on each light pole. Attach plates to the pole as approved by the Engineer. Attachment methods requiring screws, bolts, or rivets must be approved by the pole manufacturer. Install plates five feet above grade on the exterior traffic lane side of the pole. Use 3/4-inch black text on white or yellow background. Orient the text vertically on the plate with the following information: load center designation, circuit number, and the pole number. Number the poles as shown in the Plans.

**715-~~11~~-13.6 Screen Installation for High Mast Light Pole Bases:** Install a screen in accordance with 649-6.

### **715-~~12~~-14 Grounding.**

Ground in accordance with the NEC, and local codes which exceed these Specifications.

Ground each metal light pole, not on a bridge structure, with an approved rod, 20 feet in length and at least 5/8 inch in diameter.

For poles on bridge structures, bring the grounding conductors out to a pull box at each end of the structure and connect them to driven ground rods, 20 feet in length and at least 5/8 inch in diameter.

The 20 feet length of rod may be either two rods 10 feet in length connected by a threaded coupling and driven as a single rod or two rods 10 feet in length separated by at least 6 feet.

Make all bonds between ground wires and grounding electrode assemblies or arrays with an exothermic bond with the following exception: do not exothermically bond grounding electrode to grounding electrode connections.

The work specified in this Section will not be paid for directly, but will be considered as incidental work.

Ground all high mast poles in accordance with the details for grounding in the Standard Plans, Index 715-010.

#### **715-~~13~~15 Labeling.**

Stencil labels on the cases of transformer and panel board with white oil paint, as designated by the Engineer. Also, mark the correct circuit designations in accordance with the wiring diagram on the terminal marking strips of each terminal block and on the card holder in the panel board.

#### **715-~~14~~16 Tests of Installation.**

Upon completion of the work, test the installation to ensure that the installation is entirely free of ground faults, short circuits, and open circuits and that it is in satisfactory working condition. Furnish all labor, materials, and apparatus necessary for making the required tests. Remove and replace any defective material or workmanship discovered as a result of these tests at no expense to the Department, and make subsequent re-tests to the satisfaction of the Engineer.

Make all arrangements with the power supplier for power. Pay all costs, excluding energy charges, required for the test period.

Not less than 48 hours prior to the beginning of the test period, give the power supplier the schedule for such test.

Test the installation under normal operating conditions during the seven-day test period specified in 715-14, rather than as a continuous burn test period.

If the work is not open to traffic at the end of the seven-day test period, de-energize the lighting system until the work is opened.

#### **715-~~15~~17 Acceptance of Highway Lighting.**

**715-~~15~~17.1 Partial Acceptance:** The Engineer may make partial acceptance of the highway lighting based on satisfactory performance of all highway lighting for seven consecutive days. The seven-day evaluation period may commence upon written authorization by the Engineer that highway lighting is considered ready for acceptance evaluation. Contract Time will be charged during the entire highway lighting evaluation period. Correct any defects in materials or workmanship which might appear during the evaluation period at no expense to the Department.

**715-~~15~~17.2 Final Acceptance:** Upon acceptance of as-built drawings, transfer manufacturers' warranties to the Department upon final acceptance in accordance with 5-11. Submit all warranties and warranty transfers to the Engineer.

#### **715-~~16~~18 Method of Measurement.**

The quantities to be paid for will be as follows, completed and accepted:

1. Conduit: Payment will be made in accordance with Section 630.

2. Luminaire and Truss Arm: The Contract unit price will include the truss arm, luminaire with lamp, and all necessary mounting hardware as indicated in the Plans and Standard Plans.

3. Service Point: Payment will be made in accordance with Section 639.

4. Load Center: The Contract unit price will include the enclosure, panel boards, breakers, lightning arrestor, contactors, photo electric switch, grounding, and the concrete pad as shown in the Plans and Standard Plans.

5. Luminaire: The Contract unit price will include the luminaire with lamp and necessary mounting hardware as indicated in the Plans and Standard Plans.

6. Pull Box: Payment will be made in accordance with Section 635.

7. High Mast Lighting Pole Complete: The Contract unit price will include the pole, luminaires with lamps, lowering system, breakers and anchor bolts with lock nuts and washers, and foundation as indicated in the Plans and Standard Plans.

8. Conductor: The quantity to be paid for will be the plan quantity, in feet, completed and accepted. Measurement will be based on the horizontal distance between pull boxes, or between pull boxes and luminaire poles, plus 8 feet for each conductor entering and 8 feet for each conductor leaving the pull box and 8 feet for each conductor entering the luminaire pole.

9. Lighting Pole Complete: The Contract unit price will include the pole, internal vibration damping device, truss arm, luminaire with lamp, anchor bolts with lock nuts and washers, frangible base and foundation.

10. Pole Cable Distribution System: The Contract unit price will include the surge protector, fuse holders with fuses, waterproof connectors and the waterproof wiring connection to the luminaires.

**715-17-19 Basis of Payment.**

Prices and payments will be full compensation for all work specified in this Section, including all materials, equipment and tests.



*Florida Department of Transportation*

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KEVIN J. THIBAUT, P.E.  
SECRETARY

July 21, 2021

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 Wayne Rilko to update language to conform to AASHTO tests and references, and to clarify tack samples from the distributor shall be tested by the Department.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer



## BITUMINOUS MATERIALS.

(REV 5-~~325~~-21)

SUBARTICLE 916-2.1 is deleted and the following substituted:

### **916-2 Superpave PG Asphalt Binder.**

**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 High Polymer, and asphalt rubber binders (ARB), PG 76-22 (ARB), shall meet the requirements of 916-2 and AASHTO M 332-~~1920~~. 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-~~1920~~) shall be 26.5°C 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-~~1920~~) shall be 67°C.
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) and PG 76-22 (ARB) binders. Polyphosphoric acid may not be used in High Polymer binder.
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 D6352-19.
9. Re-refined engine oil bottoms (REOB)/vacuum tower asphalt extenders (VTAE) may be used as a modifier not exceeding 8.0% by weight of asphalt binder. REOB/VTAE are materials as defined in Asphalt Institute document IS-235.

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 dispersing 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, 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).

**916-2.1.2 High Polymer Binder Blending:** Existing high polymer binder may be blended in an asphalt producer’s storage tank to make a PG 76-22 binder provided the following requirements are met:

1. Notify the State Materials Office (SMO) and the local District Materials Office prior to blending.
2. Follow the blending instructions of the high polymer binder supplier.
3. Submit a sample of the blended binder to a SMO approved laboratory for testing. Provide test results to the SMO.
4. Use the newly blended binder only after approval from the SMO.

SUBARTICLE 916-2.3 is deleted and the following substituted:

**916-2.3 Reporting:** Specification compliance testing results shall be reported for the tests in Table 916-1 below, unless noted otherwise. Quality control (QC) testing results shall be reported for original binder DSR (G/sin  $\delta$  and phase angle, as applicable).

Table 916-1 SUPERPAVE PG ASPHALT BINDER		
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 (2018)	in Trichloroethylene	Minimum 99.0% (Not applicable for PG-76-22 (ARB))
Flash Point, AASHTO T_48-18	Cleveland Open Cup	Minimum 450°F
Rotational Viscosity, AASHTO T_316-19	275°F	Maximum 3 Pa·s <sup>(a)</sup>

Table 916-1 SUPERPAVE PG ASPHALT BINDER		
Dynamic Shear Rheometer <sup>(b)</sup> , AASHTO T-315- <del>19</del> 20	$G^*/\sin \delta$	Minimum 1.00 kPa
	Phase Angle, $\delta$ <sup>(c)</sup> PG 76-22 (PMA) and PG 76-22 (ARB) <sup>(d)</sup>	Maximum 75 degrees
Separation Test, ASTM D7173-20 and Softening Point, AASHTO T-53-09 (2018)	163±5°C  48 hours	Maximum 15°F (PG 76-22 (ARB) only)
Rolling Thin Film Oven Test Residue (AASHTO T-240-13 (2017))		
Rolling Thin Film Oven, AASHTO T240-13 (2017)	Mass Change %	Maximum 1.00
Multiple Stress Creep Recovery, $J_{nr, 3.2}$ AASHTO T-350-19	Grade Temperature (Unmodified binders only)	“S” = 4.50 kPa <sup>-1</sup> max
Multiple Stress Creep Recovery, $J_{nr, 3.2}$ <sup>(d, e, f)</sup> AASHTO T-350-19	67°C (Modified binders only)	“V” = 1.00 kPa <sup>-1</sup> max Maximum $J_{nr, diff} = 75\%$
	76°C (High Polymer binder only)	0.10 kPa <sup>-1</sup> max
Multiple Stress Creep Recovery, % Recovery <sup>(d, e)</sup> AASHTO T-350-19	67°C (Modified binders only)	$\%R_{3.2} \geq 29.371 (J_{nr, 3.2})^{-0.2633}$
	76°C (High Polymer binder only)	$\%R_{3.2} \geq 90.0$
Pressure Aging Vessel Residue (AASHTO R-28-12 (2016))		
Dynamic Shear Rheometer, AASHTO T-315- <del>19</del> 20	$G^* \sin \delta$ , 10 rad/sec.	<del>Maximum 5,000 kPa<sup>(g)</sup></del> Maximum 6,000 kPa <sup>(g, h)</sup>
Creep Stiffness, AASHTO T-313- <del>19</del> 20	S (Stiffness), @ 60 sec. m-value, @ 60 sec.	Maximum 300 MPa Minimum 0.300
$\Delta T_c$ , ASTM D7643-16	20 hours PAV aging S (Stiffness), @ 60 sec. m-value, @ 60 sec.	$\Delta T_c \geq -5.0^\circ\text{C}$
<p>(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.</p> <p>(b) Dynamic Shear Rheometer (AASHTO T 315-<del>19</del>20) shall be performed on original binders for the purposes of QC testing only. The original binder <math>G^*/\sin \delta</math> shall be performed at grade temperature. Grade temperature for High Polymer binder is 76°C.</p> <p>(c) The original binder phase angle (AASHTO T 315-<del>19</del>20) shall be performed at grade temperature.</p> <p>(d) AASHTO T 315-19 and AASHTO T 350-<del>19</del>20 will be performed at a 2-mm gap for PG 76-22 (ARB).</p> <p>(e) All binders with a high temperature designation &gt;67 will be tested at 67°C. PG 76-22 (PMA) and PG 76-22 (ARB) shall pass a “V” grade per AASHTO M 332-<del>19</del>20</p> <p>(f) A maximum <math>J_{nr, diff} = 75\%</math> does not apply for any <math>J_{nr}</math> value <math>\leq 0.50</math> kPa-1.</p> <p>(g) For <math>5000 \text{ kPa} \leq G^* \sin \delta &lt; \text{PG } 67</math>, perform the PAV residue testing at 26.5°C with a maximum of <del>56,000</del> 6,000 kPa, the phase angle, <math>\delta</math>, shall be a minimum of 42°.</p> <p>(h) For PG <del>7667</del> or higher grades, perform the PAV residue testing at 26.5°C with a maximum of 6,000 kPa.</p>		

SUBARTICLE 916-3.2 is deleted and the following substituted:

**916-3.2 Requirements:** Use a prime coat meeting the requirements of AASHTO M\_140\_1820 for anionic emulsions, AASHTO M\_208-18 or AASHTO M\_316\_189 for cationic emulsions, or as specified in the Producer's QC Plan. For anionic emulsions, the cement mixing test will be waived. For tack products, the minimum testing requirements shall include percent residue, naphtha content (as needed), one-day storage stability, sieve test, Saybolt Furol viscosity, original DSR, and solubility (on an annual basis). Residue testing shall be performed on residue obtained from distillation, (AASHTO T\_59-16) or low-temperature evaporation (AASHTO R\_78-16) (2020).

At the direction of the Engineer, sample tack from the distributor used on the project at a minimum frequency of once per project per product. The sample shall be tested by the Department for the following specified material properties: percent residue, contaminants, and the residue property  $G^*/\sin \delta$ . Should any of the test results fail the specification requirements, the tack material will be considered defective and shall not to be used on Department projects unless waived by the Engineer. Should a tack sample fail specifications, the Engineer may require three 6" diameter roadway cores be obtained from the day of production from which the tack sample was obtained. The roadway cores shall be tested for bond strength in accordance with FM 5-599. Individual bond strength results less than 80 psi will require removal and replacement. Failing bond strength results may result in bond strength testing for additional areas represented by the failing tack material.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
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KEVIN J. THIBAUT, P.E.  
SECRETARY

July 22, 2021

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

Re: State Specifications Office  
Section: **929**  
Proposed Specification: **9290400 SUPPLEMENTARY CEMENTITIOUS MATERIALS.**

Dear Mr. Nguyen:

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

The changes are proposed by Thomas Frank to address concrete durability concerns related to the alumina content of slag cement in the Standard Specification.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**SUPPLEMENTARY CEMENTITIOUS MATERIALS.****(REV 5-67-20-21)**

ARTICLE 929-4 is deleted and the following substituted:

**929-4 Slag Cement.**

Slag cement (ground granulated blast furnace slag, GGBFS) is the quenched, ground by-product of the iron ore refinement process conducted in blast furnaces. It is primarily an amorphous material of calcium aluminosilicate constituents.

**929-4.1 General:** Slag cement and reference cement used for determination of slag activity tests shall meet the requirements of ASTM C989. Sampling and testing procedures shall follow the requirements of ASTM C989.

**929-4.2 Acceptance Testing of Slag Cement:** Acceptance of slag cement from sources operating under an accepted QC Plan shall be based on the monthly test reports meeting the chemical and physical requirements of ASTM C989 and this Section. The test report shall include:

1. For slag granules, provide X-ray Fluorescence (XRF) elemental analysis of the granules, presented in oxide form. Include CaO, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, MgO, Mn<sub>2</sub>O<sub>3</sub>, TiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>, and sulfur (as sulfide).

2. For slag cement, provide XRF elemental analysis, presented in oxide form. Include CaO, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, MgO, Mn<sub>2</sub>O<sub>3</sub>, TiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>, sulfur as sulfide (S), sulfate sulfur (SO<sub>3</sub>), and total sulfur as sulfate (SO<sub>3</sub>).

3. The results of all testing listed under Test Methods section of ASTM C989.

4. Indicate the amount of any additions introduced during grinding of the slag granules and report compliance with Section 6 of ASTM C989.

a. Amount of limestone added and its CaCO<sub>3</sub> content.

b. Amount of other inorganic processing addition.

5. For calcium sulfate additions, indicate:

a. Amount of calcium sulfate added.

b. Form of calcium sulfate.

c. SO<sub>3</sub> content.

d. Method used to determine the amount of calcium sulfate that was added.

**929-4.2.1 Assessment of Sulfate Resistance:** Following guidance in ACI 233R-17 Guide to the Use of Slag Cement in Concrete and Mortar, slag cements with Al<sub>2</sub>O<sub>3</sub> contents greater than 11% should be interground with calcium sulfate to avoid an undersulfated cementitious system. Provide ASTM C1012 data with a 50:50 portland cement-slag cement blend, using a Type II (MH) portland cement on the Department's Production Facility Listing, with an alkali content of no more than 0.6%, when any of the following conditions occur:

1. The Al<sub>2</sub>O<sub>3</sub> content of the slag cement is equal to or greater than 12%.

2. The slag cement is a blend of slag granules from more than one source that are interground during production of the slag cement and for which one or more of the following are true:

a. The Al<sub>2</sub>O<sub>3</sub> contents of both slag sources are equal to or greater than 12%.

b. The average  $\text{Al}_2\text{O}_3$  content of the blend is equal to or greater than 12%.

c. One of the slag sources has an  $\text{Al}_2\text{O}_3$  content that is equal to or greater than 14%.

The Department will consider the ASTM C1012 data acceptable when the results indicate no more than 0.10% expansion at 12 months.

The Department may grant provisional acceptance if the expansion does not exceed 0.05% at 6 months.

For any slag cements with  $\text{Al}_2\text{O}_3$  content equal to or greater than 12%, perform a retest of ASTM C1012 if the monthly test report indicates that any of the following conditions have occurred:

1. The  $\text{Al}_2\text{O}_3$  content increases by greater than or equal to 1.0% of the content measured during qualification of the sulfate resistance.

2. The sulfate sulfur ( $\text{SO}_3$ ) content decreases by 0.25% less than that measured during qualification of the sulfate resistance.

3. The Blaine fineness increases by 50  $\text{m}^2/\text{kg}$  greater than that measured during qualification of the sulfate resistance.

The Department may grant provisional acceptance of the slag cement source if ASTM C1012 data is required for any of the above retesting conditions.



*Florida Department of Transportation*

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KEVIN J. THIBAUT, P.E.  
SECRETARY

July 14, 2021

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

Re: State Specifications Office  
Section: **932**  
Proposed Specification: **9320300 NONMETALLIC ACCESSORY MATERIALS  
FOR CONCRETE PAVEMENT AND CONCRETE STRUCTURES.**

Dear Mr. Nguyen:

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

The changes are proposed by Steve Nolan to add language to Tables 932-7 and 932-8, distinguishing CFRP Cable from CFRP bars. Acceptance data was added to Table 932-7.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## NONMETALLIC ACCESSORY MATERIALS FOR CONCRETE PAVEMENT AND CONCRETE STRUCTURES.

(REV ~~5-37-13~~-21)

ARTICLE 932-3 is deleted and the following substituted:

### 932-3 Fiber Reinforced Polymer (FRP) Reinforcing Bars.

**932-3.1 General:** Obtain FRP reinforcing bars from producers currently on the Department's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105.

Use only solid, round, thermoset basalt fiber reinforced polymer (BFRP), glass fiber reinforced polymer (GFRP) or carbon fiber reinforced polymer (CFRP) reinforcing bars. Single or multi-wire CFRP strands are permitted as spirals for reinforcing in concrete piling where specified in the Plans Contract Documents. Bars shall be manufactured using pultrusion, variations of pultrusion, or other suitable processes noted in the producer's Quality Control Plan, subject to the approval of the State Materials Office (SMO). For BFRP and CFRP bars only vinyl ester or epoxy resin systems are permitted. For GFRP, use only bars manufactured using vinyl ester resin systems and glass fibers classified as E-CR or R that meet the requirements of ASTM D578.

**932-3.2 Bar Sizes and Loads:** The sizes and loads of FRP reinforcing bars shall meet the requirements in Table 932-6. The measured cross-sectional area, including any bond enhancing surface treatments, shall be determined according to Table 932-7.

Bar Size Designation	Nominal Bar Diameter (in.)	Nominal Cross-Sectional Area (in <sup>2</sup> )	Measured Cross-Sectional Area (in <sup>2</sup> )		Minimum Guaranteed Tensile Load (kips)		
			Minimum	Maximum	BFRP and GFRP Bars	<u>CFRP (Type II) - Strands (Single &amp; 7-Wire Strands)</u>	CFRP (Type I) Bars
<u>2.1-CFRP</u>	<u>0.21</u>	<u>0.028</u>	<u>0.026</u>	<u>0.042</u>	-	<u>7.1</u>	-
2	0.250	0.049	0.046	0.085	6.1		10.3
<del>2.1-CFRP<sup>‡</sup></del>	<del>0.21</del>	<del>0.028</del>	<del>0.026</del>	<del>0.042</del>	-	<del>7.1</del>	-
<u>2.8-CFRP<sup>‡</sup></u>	<u>0.280</u>	<u>0.051</u>	<u>0.048</u>	<u>0.085</u>	-	<u>13.1</u>	-
3	0.375	0.11	0.104	0.161	13.2		20.9
<u>3.8-CFRP<sup>‡</sup></u>	<u>0.380</u>	<u>0.09</u>	<u>0.087</u>	<u>0.134</u>		<u>23.7</u>	
4	0.500	0.20	0.185	0.263	21.6		33.3
5	0.625	0.31	0.288	0.388	29.1		49.1
6	0.750	0.44	0.415	0.539	40.9		70.7
<u>6.3-CFRP<sup>‡</sup></u>	<u>0.630</u>	<u>0.19</u>	<u>0.184</u>	<u>0.242</u>	-	<u>49.8</u>	
7	0.875	0.60	0.565	0.713	54.1		-
<u>7.7-CFRP<sup>‡</sup></u>	<u>0.770</u>	<u>0.29</u>	<u>0.274</u>	<u>0.355</u>	-	<u>74.8</u>	



8	1.000	0.79	0.738	0.913	66.8		-
9	1.128	1.00	0.934	1.137	82.0		-
10	1.270	1.27	1.154	1.385	98.2		-
<del>q — Large tow grade carbon fiber (257 ksi)</del>							

**932-3.3 Material Requirements:** Producers shall submit to the State Materials Office (SMO), a test report of the physical and mechanical property requirements in Table 932-7 and Table 932-8 as applicable for the types and sizes of FRP reinforcing produced. Qualification testing shall be conducted by an independent laboratory approved by the Department for performing the FRP test methods.

Three production LOTS shall be randomly sampled at the production facility by a designee of the SMO. The minimum number of specimens per production LOT shall be as indicated in Table 932-7 and Table 932-8. The coefficient of variation (COV) for each test result shall be less than 6%. Outliers shall be subject to further investigation per ASTM E178. If the COV exceeds 6%, the number of test specimens per production LOT may be doubled, a maximum of two times, to meet the COV requirement. Otherwise, the results shall be rejected. A production LOT is defined as a LOT of FRP reinforcing produced from start to finish with the same constituent materials used in the same proportions without changing any production parameter, such as cure temperature or line speed.

Table 932-7 Physical and Mechanical Property Requirements for Straight FRP Reinforcing Bars			
Property	Test Method	Requirement	Specimens per LOT
Fiber Mass Fraction	ASTM D2584 or ASTM D3171	$\geq 70\%$	5 <sup>n</sup>
Short-Term Moisture Absorption	ASTM D570, Procedure 7.1; 24 hours immersion at 122°F	$\leq 0.25\%$	5 <sup>m</sup>
Long-Term Moisture Absorption	ASTM D570, Procedure 7.4; immersion to full saturation at 122°F	$\leq 1.0\%$	5 <sup>m</sup>
Glass Transition Temperature (T <sub>g</sub> )	ASTM D7028 (DMA) or ASTM E1356 (DSC; T <sub>m</sub> )/ASTM D3418 (DSC; T <sub>mg</sub> )	$\geq 230^\circ\text{F}$  $\geq 212^\circ\text{F}$	3 <sup>m</sup>
Total Enthalpy of Polymerization (Resin)	ASTM E2160	Identify the resin system used for each bar size and report the average value of three replicates for each system	--
Degree of Cure	ASTM E2160	$\geq 95\%$ of Total polymerization enthalpy	3 <sup>n</sup>
Measured Cross-Sectional Area	ASTM D7205	Within the range listed in Table 932-6	10 <sup>n</sup>
Guaranteed Tensile Load <sup>a</sup>		$\geq$ Value listed in Table 932-6	
Tensile Modulus		$\geq 6,500$ ksi for BFRP and GFRP $\geq 18,000$ ksi for <del>CRFRP</del> <b>CFRP (Type I) Bars</b> <u><math>&gt; 22,400</math> ksi for CFRP (-Type II) Strands</u>	
Alkali Resistance with Load	ASTM D7705; Procedure B, set sustained load to 30% of value in Table 932-6; 3 months test duration, followed by tensile strength per ASTM D7205	$\geq 70\%$ Tensile strength retention <u>for BFRP &amp; GFRP</u> <u><math>\geq 95\%</math> Tensile strength retention for CFRP</u>	5 <sup>m</sup>
Transverse Shear Strength	ASTM D7617	$> 22$ ksi	5 <sup>n</sup>
Horizontal Shear Strength <sup>p</sup>	ASTM D4475	$> 5.5$ ksi	5 <sup>n</sup>
Bond Strength to Concrete, Block Pull-Out	ACI 440.3R, Method B.3 or ASTM D7913	$> 1.1$ ksi <u>for Bars</u> <u><math>&gt; 0.9</math> ksi for Strands</u>	5 <sup>m</sup>

a – Guaranteed tensile load shall be equal to the average test result from all three lots minus three standard deviations.  
 n – Tests shall be conducted for all bar sizes produced.  
 m – Tests shall be conducted for the smallest, median, and largest bar size produced.  
 p – Only required for BFRP bars.

**932-3.3.1 Additional Requirements for Bent FRP Bars:** For all bars produced by bending straight solid FRP bars before the resin is fully cured, the minimum inside bend radius shall be at least three times the nominal diameters for bar sizes 2 through 8; and four times the nominal diameters for sizes 9 and 10.

The straight portion of a bent FRP reinforcing bar shall be extracted with sufficient length for tensile testing according to Table 932-8. When the bent shape does not allow for the tensile testing of one of its straight portions, test specimens produced at the same time during the same production LOT shall be used.

Table 932-8 Physical and Mechanical Property Requirements for Bent FRP Reinforcing Bars			
Property	Test Method	Requirement	Specimens per LOT
Fiber Mass Fraction – Bent Portion <sup>b</sup>	ASTM D2584 or ASTM D3171	≥70%	5 <sup>m</sup>
Short-Term Moisture Absorption – Bent Portion <sup>b</sup>	ASTM D570, Procedure 7.1; 24 hours immersion at 122°F	≤0.25%	5 <sup>m</sup>
Long-Term Moisture Absorption – Bent Portion <sup>b</sup>	ASTM D570, Procedure 7.4; immersion to full saturation at 122°F	≤1.0%	5 <sup>m</sup>
Glass Transition Temperature – Bent Portion <sup>b</sup>	ASTM E1356 (DSC; $T_m$ ) /ASTM D3418 (DSC; $T_{mg}$ )	≥212°F	3 <sup>m</sup>
Degree of Cure – Bent Portion <sup>b</sup>	ASTM E2160	≥95% of Total polymerization enthalpy	3 <sup>m</sup>
Measured Cross-Sectional Area – Straight Portion	ASTM D7205	Within the range listed in Table 932-6	5 <sup>m</sup>
Guaranteed Tensile Load <sup>a</sup> – Straight Portion		≥ Value listed in Table 932-6	
Tensile Modulus – Straight Portion		≥6,500 ksi for BFRP and GFRP ≥18,000 ksi for CRFRP (Type I) Bar > 22,400 ksi for CFRP (- Type II) Strand	

Table 932-8 Physical and Mechanical Property Requirements for Bent FRP Reinforcing Bars			
Property	Test Method	Requirement	Specimens per LOT
Alkali Resistance without Load – Straight Portion	ASTM D7705; 3 months test duration, followed by tensile strength per ASTM D7205	$\geq 80\%$ Tensile strength retention	5 <sup>m</sup>
Strength of 90° Bends	ACI 440.3, Method B.5 or ASTM D7914	> 60% Guaranteed tensile load listed in Table 932-6	5 <sup>m</sup>
Transverse Shear Strength – Straight Portion	ASTM D7617	>22 ksi	5 <sup>m</sup>
Horizontal Shear Strength <sup>p</sup>	ASTM D4475	>5.5 ksi	5 <sup>m</sup>
<p>a – Guaranteed tensile load shall be equal to the average test result from all three lots minus three standard deviations.</p> <p>b – Bent portion specimens shall be extracted from a central location within a 90° bend.</p> <p>m – Tests shall be conducted for the smallest, median, and largest bent bar size produced.</p> <p>p – Only required for BFRP bars.</p>			

**932-3.4 Material Acceptance:** Submit to the Engineer a certificate of analysis for each production LOT from the producer of the FRP reinforcing bars, confirming compliance with the requirements of this Section.

**932-3.4.1 Sampling:** The Engineer will select a minimum of six straight bars with minimum lengths of 7 feet each and a minimum of five bent bars or spiral bends/revolutions from each shipment, representing a random production LOT, per bar size of FRP reinforcing for testing in accordance with Table 932-9. Testing shall be conducted, at the Contractor's expense, by a Department approved independent laboratory. Each test shall be replicated a minimum of three times per sample. Submit the test results to the Engineer for review and approval prior to installation. Testing will not be required for bars to be used solely as reinforcement for sheet pile bulkheads, but LOT samples will still be selected and retained by the Engineer until final acceptance of the work.

Table 932-9 Testing Requirements for Project Material Acceptance of FRP Reinforcing Bars				
Property	Test Method	Requirement	Test Required for Straight Bar	Test Required for Bent Bar
Fiber Mass Fraction	ASTM D2584 or ASTM D3171	$\geq 70\%$	Yes	Yes – bent portion <sup>b</sup>
Short-Term Moisture Absorption	ASTM D570, Procedure 7.1; 24 hours immersion at 122°F	$\leq 0.25\%$	Yes	Yes – bent portion <sup>b</sup>
Glass Transition Temperature	ASTM D7028 (DMA) or ASTM E1356 (DSC; $T_m$ )/ ASTM D3418 (DSC; $T_{mg}$ )	$\geq 230^\circ\text{F}$  $\geq 212^\circ\text{F}$	Yes	Yes – bent portion <sup>b</sup>
Degree of Cure	ASTM E2160	$\geq 95\%$ of Total polymerization enthalpy	Yes	Yes – bent portion <sup>b</sup>
Measured Cross-sectional Area	ASTM D7205	Within the range listed in Table 932-6	Yes	Yes – straight portion
Guaranteed Tensile Load <sup>a</sup>		$\geq$ Value listed in Table 932-6	Yes	No
Tensile Modulus		$\geq 6,500$ ksi for BFRP and GFRP $\geq 18,000$ ksi for CFRP <u>(Type I) Bars</u> <u><math>\geq 22,400</math> ksi for CFRP (- Type II) Strands</u>	Yes	No

a – Guaranteed tensile load shall be equal to the average test result from all three lots minus three standard deviations.  
b – Bent portion specimens shall be extracted from a central location within a 90° bend.

#### 932-4 FRP Spirals for Concrete Piling.

FRP Spirals for reinforcing in concrete piling shall be CFRP conforming to the requirements of Section 933 or 932-3 for CFRP (-StrandType II).



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
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KEVIN J. THIBAUT, P.E.  
SECRETARY

July 14, 2021

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

Re: State Specifications Office  
Section: **933**  
Proposed Specification: **9330100 PRESTRESSING STRAND AND BAR.**

Dear Mr. Nguyen:

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

The changes are proposed by Steve Nolan to update tables and add special shipping and storage requirements in the new subarticle for Carbon-Fiber-Reinforced-Polymer.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**PRESTRESSING STRAND AND BAR**(REV ~~5-36-28~~-21)

ARTICLE 933-1 is deleted and the following substituted:

**933-1 Strands for Prestressing.**

**933-1.1 Carbon-Steel Strands for Prestressing:** The ~~carbon~~-steel strands for prestressing concrete members shall be Grade 270, low-relaxation seven wire strand ~~and shall conforming~~ to the requirements of ASTM A416.

**933-1.2 Stainless-Steel Strands for Prestressing:** The stainless-steel strands for prestressing concrete members shall be a high strength stainless-steel (HSSS, ~~Grade 240~~), ~~low-relaxation seven wire strand~~ conforming to the ~~chemical~~ requirements of ASTM ~~A276 A1114~~, ~~UNS S31803 or S32205 (Type 2205)~~. ~~The mechanical and dimensional requirements shall follow the requirements of ASTM A416 except as modified by this Section. The breaking strength shall conform to the requirements of Table 933-1. The minimum yield strength shall be 85% of the breaking strength listed in Table 933-1. The total elongation under load shall not be less than 1.4%. Stainless steel strand shall conform to a size tolerance of +0.026 in., -0.006 in. from the nominal diameter measured across the crowns of the wires.~~

<del>Nominal Diameter (in)</del>	<del>Nominal Cross Sectional Area (in<sup>2</sup>)</del>	<del>Minimum Breaking Strength (kips)</del>	<del>Nominal Ultimate Tensile Stress (ksi)</del>
<del>0.52</del>	<del>0.167</del>	<del>40.1</del>	<del>240</del>
<del>0.62</del>	<del>0.231</del>	<del>55.4</del>	<del>240</del>

**933-1.3 Carbon-Fiber-Reinforced Polymer (CFRP) Strands for Prestressing:** Obtain CFRP prestressing strands from producers currently on the Department's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105. CFRP strand shall meet the requirements of this Section.

<del>Type</del>	<del>Nominal Diameter (in)</del>	<del>Nominal Cross Sectional Area (in<sup>2</sup>)</del>	<del>Nominal Ultimate Load (P<sub>u</sub>) (kips)</del>	<del>Nominal Ultimate Tensile Stress (ksi)</del>
<del>Single Strand - 5.0mm Ø</del>	<del>0.20</del>	<del>0.025</del>	<del>9.1</del>	<del>364</del>
<del>7-strand - 7.9mm Ø</del>	<del>0.31</del>	<del>0.048</del>	<del>17.8</del>	<del>370</del>
<del>7-strand - 10.8mm Ø</del>	<del>0.43</del>	<del>0.090</del>	<del>33.1</del>	<del>367</del>
<del>Single Strand (Bar) - 9.5mm Ø</del>	<del>0.38</del>	<del>0.110</del>	<del>35.0</del>	<del>318</del>
<del>7-strand - 12.5mm Ø</del>	<del>0.49</del>	<del>0.117</del>	<del>43.3</del>	<del>370</del>
<del>Single Strand (Bar) - 12.7mm Ø</del>	<del>0.50</del>	<del>0.196</del>	<del>59.0</del>	<del>301</del>
<del>7-strand - 15.2mm Ø</del>	<del>0.60</del>	<del>0.179</del>	<del>66.2</del>	<del>369</del>

7-strand - 17.2mm Ø	0.68	0.234	86.6	370
<u>7-strand - 19.3mm Ø</u>	<u>0.76</u>	<u>0.289</u>	<u>106.9</u>	<u>370</u>

ARTICLE 933-1 is expanded by the following new subarticle:

**933-1.4 Shipping and Storage: Protect carbon-steel, stainless-steel, and CFRP strands for prestressing against mechanical damage and contamination during shipping and storage.**

SUBARTICLE 933-5.2 is deleted and the following substituted:

**933-5.2 Strands:**

**933-5.2.1 Steel Strands:** Acceptance of carbon-steel and stainless-steel prestressing strands shall be based on samples taken by the Department and the producer's certified mill analysis certifying that the test results meet the specification limits of ASTM, AASHTO, or FDOT as specifically designated. Prior to use, submit to the Engineer the producer's certified mill analysis for each heat or production LOT per shipment of strand.

Certified mill analyses for steel prestressing strand shall contain, for each heat number or production LOT, all test results required by ASTM A416 and ASTM A1114. Include the modulus of elasticity expressed in psi or the stress-strain curve with units identified.

The Engineer will select samples and certified mill analysis representing each shipment at a frequency of one sample per producer, per size of strand, per shipment.

**933-5.2.2 Carbon-Fiber-Reinforced Polymer (CFRP) Strands:** Producers shall submit to the State Materials Office (SMO), a test report of the physical and mechanical property requirements in Table 933-~~32~~. Qualification testing shall be conducted by an independent laboratory approved by the Department for performing the FRP test methods. Three production LOTS shall be randomly sampled at the production facility by a designee of the SMO. The minimum number of specimens per production LOT shall be as indicated in Table 933-~~32~~. The coefficient of variation (COV) for each test result shall be less than 6%. Outliers shall be subject to further investigation in accordance with ASTM E178. If the COV exceeds 6%, the number of test specimens per production LOT may be doubled a maximum of two times, to meet the COV requirement. Otherwise, the results shall be rejected. A production LOT is defined as a LOT of CFRP strand produced from start to finish with the same constituent materials used in the same proportions without changing any production parameter, such as cure temperature or line speed.



Table 933- <del>32</del> Physical and Mechanical Property Requirements for CFRP Prestressing Strands			
Property	Test Method	Requirement	Specimens per LOT
Fiber Mass Fraction	ASTM D2584 or ASTM D3171	$\geq 70\%$	10
Short-Term Moisture Absorption	ASTM D570, Procedure 7.1; 24 hours immersion at 122°F	$\leq 0.25\%$	10
Long-Term Moisture Absorption	ASTM D570, Procedure 7.4; immersion to full saturation at 122°F	$\leq 1.0\%$	10
Glass Transition Temperature ( $T_g$ )	ASTM D7028 (DMA) or ASTM E1356 (DSC; $T_m$ )/ASTM D3418 (DSC; $T_{mg}$ )	$\geq 230^\circ\text{F}$  $\geq 212^\circ\text{F}$	3
Total Enthalpy of Polymerization (Resin)	ASTM E2160	Identify the resin system used for each bar size and report the average value of three replicates for each system	-
Degree of Cure	ASTM E2160	$\geq 95\%$ of Total polymerization enthalpy	3
Measured Cross Sectional Area	ASTM D7205	Within -5% to +10% of nominal values listed in Table 933- <del>21</del>	10
Ultimate Tensile Strength (UTS)		$\geq$ Value listed in Table 933- <del>21</del>	
Tensile Modulus		$\geq 18,000$ ksi for Bar; $> 22,400$ ksi for 7-strand & 5mm $\varnothing$ .	
Alkali Resistance with Load	ASTM D7705, 3 months test duration at $140 \pm 5^\circ\text{F}$ . Apply sustained tensile stress to induce 3000 micro-strain, followed by tensile test per ASTM D7205	Tensile strength retention $\geq 70\%$ of UTS	5
Creep Rupture Strength	ASTM D7337, 3 months test duration at laboratory conditions. Apply sustained tensile load equivalent to 75% UTS, followed by tensile test per ASTM D7205	Equivalent sustained load $\geq 75\%$ UTS AND Tensile strength retention $\geq 90\%$ UTS	3

**933-5.2.2.1 Material Acceptance:** Submit to the Engineer a certificate of analysis for each production LOT from the producer of the CFRP strand, confirming compliance with the requirements of this Section.

**933-5.2.2.2 Sampling:** The Engineer will select a minimum total of 42 feet from each shipment, representing a random production LOT, per size of CFRP strand for testing in accordance with Table 933-43. The minimum discrete sample length shall be 7 feet. Testing shall be conducted, at the Contractor's expense, by a Department approved independent laboratory. Each test shall be replicated a minimum of three times per sample. Submit the test results to the Engineer for review and approval prior to installation.

Table 933-43 Testing requirements for Project Material Acceptance of CFRP Prestressing Strand		
Property	Test Method	Requirement
Fiber Mass Fraction	ASTM D2584 or ASTM D3171	$\geq 70\%$
Short-Term Moisture Absorption	ASTM D570, Procedure 7.1; 24 hours immersion at 122°F	$\leq 0.25\%$
Glass Transition Temperature	ASTM D7028 (DMA) or ASTM E1356 (DSC; $T_m$ )/ASTM D3418 (DSC; $T_{mg}$ )	$\geq 230^\circ\text{F}$ $\geq 212^\circ\text{F}$
Degree of Cure	ASTM E2160	$\geq 95\%$ of Total polymerization enthalpy
Actual Cross Sectional Area	ASTM D7205	Within -5% to +10% of nominal values listed in Table 933-21
Ultimate Tensile Strength		$\geq$ Value listed in Table 933-21
Tensile Modulus		$\geq 18,000$ ksi <u>for Bar; &gt; 22,400 ksi for 7-strand &amp; 5mm Ø</u>



*Florida Department of Transportation*

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KEVIN J. THIBAUT, P.E.  
SECRETARY

July 13, 2021

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

Re: State Specifications Office  
Section: **948**  
Proposed Specification: **9480205 OPTIONAL DRAINAGE PRODUCTS AND  
REPAIR SYSTEMS.**

Dear Mr. Nguyen:

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

The changes are proposed by Elizabeth Weber to add production, materials, and lab accreditation language to facilitate the implementation of steel reinforced polyethylene corrugated pipe into the Standard Specification.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**OPTIONAL DRAINAGE PRODUCTS AND REPAIR SYSTEMS  
(REV 5-18-21)**

ARTICLE 948-2 is expanded by the following new Subarticle:

**948-2.5 Steel Reinforced Polyethylene Corrugated Pipe:**

**948-2.5.1 General:** Class I (50-year design service life) steel reinforced polyethylene corrugated pipe used for side drain, storm and cross drain must meet the requirements of AASHTO MP 42 with plant certification from the National Transportation Product Evaluation Program (NTPEP), provided such certification for this category of pipe is available. Pipe resin must conform to ASTM D3350 with a minimum cell classification of 334452C or E and between 2% to 4% carbon black. Thermosetting polyurethane materials used for pipe joints must be polyester-based and meet the requirements of Table 948-2. Post-consumer and post-industrial recycled resins are not allowed. Perforations are not allowed. Mitered end sections are not to be constructed of steel reinforced polyethylene corrugated pipe.

Obtain pipe from a production facility that is listed on the Department's Production Facility Listing. Producers seeking inclusion to the listing shall meet the requirements of Section 105.

<u>Table 948-2</u>			
<u>Polyurethane Component Requirements</u>			
<u>Test Methods</u>	<u>Test Conditions</u>		<u>Requirement</u>
<u>ASTM D2240</u> <u>Durometer Hardness</u> <u>1-inch Thick Specimens</u>	<u>Initial</u>		<u>≥60</u>
	<u>After 6 Months Exposure to Each Condition*</u>		<u>No more than 10% reduction from measured initial value</u>
<u>ASTM D695</u> <u>Compressive Properties</u> <u>0.1 inch per minute Load Rate</u>	<u>Initial</u>		<u>≥200 psi</u>
	<u>After 6 Months Exposure to Each Condition*</u>		<u>No more than 10% reduction from measured initial value</u>
<u>ASTM D1623</u> <u>Yield Tensile Strength</u> <u>Type B Specimens</u> <u>0.1 inch per minute Load Rate</u>	<u>Initial</u>		<u>≥300 psi</u>
	<u>After 6 Months Exposure to Each Condition*</u>		<u>No more than 30% reduction from measured initial value</u>
<u>*Exposure Conditions:</u>			
<u>Solution pH</u>	<u>Resistivity (Ohm-cm), Minimum</u>	<u>Chloride Content (ppm), Maximum</u>	<u>Temperatures (°C)</u>
<u>5.5</u>	<u>1,000</u>	<u>300</u>	<u>60, 80, 90</u>
<u>7</u>	<u>1,000</u>	<u>300</u>	<u>60, 80, 90</u>
<u>12</u>	<u>1,000</u>	<u>300</u>	<u>60, 80, 90</u>

**948-2.5.2 Project Material Acceptance:** Prior to use, submit to the Engineer a material certification from the manufacturer confirming that the requirements of this Section are met. The certification shall conform to the requirements of Section 6.

**948-2.5.3 Laboratory Accreditation:** Manufacturers seeking evaluation of a product in accordance with Departmental procedures must submit test reports conducted by a laboratory qualified by the Geosynthetic Accreditation Institute-Laboratory Accreditation Program (GAI-LAP) or qualified by ISO 17025 accreditation agency using personnel with actual experience performing the test methods for steel reinforced polyethylene pipe. Submit the test reports to the State Materials Office.

SUBARTICLE 948-7.2 is deleted and the following substituted:

**948-7.2 Additional Requirements for Class II (100-Year Design Service Life) PP**

**Pipe:** Meet the requirements in Table 948-~~23~~ in addition to those in 948-7.1. Manufacturers may only use ground Class II PP for reworked plastic.

Table 948- <del>23</del> Stress Crack Resistance			
Pipe Location	Test Method	Test Conditions	Requirement
Pipe Liner	FM 5-572, Procedure A	10% Igepal solution at 50°C and 600 psi applied stress, 5 replicates	Average failure time of the pipe liner shall be ≥100 hours, no single value shall be less than 71 hours. <sup>(1)</sup>
Oxidation Resistance			
Pipe Location	Test Method	Test Conditions	Requirement
Pipe Liner and/or Crown <sup>(2)</sup>	OIT Test (ASTM D3895)	2 replicates (to determine initial OIT value) on the as manufactured (not incubated) pipe.	25.0 minutes, minimum
Pipe Liner and/or Crown <sup>(2)</sup>	Incubation test FM 5-574 and OIT test (ASTM D3895)	Three samples for incubation of 264 days at 85°C <sup>(3)</sup> . One OIT test per each sample	Average of 3.0 minutes <sup>(4)</sup> (no values shall be less than 2.0 minutes)
Pipe Liner and/or Crown <sup>(2)</sup>	MI test (ASTM D1238 at 230°C/2.16Kg)	2 replicates on the as manufactured (not incubated) pipe.	< 1.5 g/10 minutes
Pipe Liner and/or Crown <sup>(2)</sup>	Incubation test FM 5-574 and MI test (ASTM D1238 at 230°C/2.16Kg)	2 replicates on the three aged sampled after incubation of 264 days at 85°C <sup>(3)</sup>	MI Retained Value <sup>(4)(5)(6)</sup> shall be greater than 80% and less than 120%.

Note: FM = Florida Method of Test.

(1) If due to sample size this test cannot be completed on the liner then testing shall be conducted on a molded plaque sample.

Samples can be removed if test time exceeds 100 hours without failure.

(2) OIT and MI tests on the crown are required when resin used in the corrugation is different than that of the liner.

(3) The incubation temperature and duration can also be 192 days at 90°C or 140 days at 95°C.

(4) The tests for incubated and "as-manufactured" pipe samples shall be performed by the same lab, same operator, the same testing device, and in the same day.

(5) Within each replicate set of tests, the discrepancy range shall be within 9%. If an out-of-range discrepancy occurs, repeat the two MI tests on the same pipe sample. If insufficient material is available, a repeat of one test is acceptable.

(6) The MI retained value is determined using the average MI value of incubated sample divided by the average MI value of as-manufactured pipe sample.

ARTICLE 948-8 is deleted and the following substituted:

**948-8 Filter Fabric Sock for Use with Underdrain.**

For Type I underdrain specified in Standard Plans, Index 440-001, filter sock shall be an approved strong rough porous, polyester or other approved knitted fabric which completely covers and is secured to the perforated plastic tubing underdrain in such a way as to prevent infiltration of trench backfill material.

The knitted fabric sock shall be a continuous one-piece material that fits over the tubing like a sleeve. It shall be knitted of continuous 150 denier yarn and shall be free from any chemical treatment or coating that might significantly reduce porosity and permeability.

The knitted fabric sock shall comply with the following physical properties:

Table 948- <del>34</del> <u>4</u>		
Weight, applied (oz/sq. yd.)	3.5 min	ASTM D3887
Grab tensile strength (lbs.)	50 min.*	ASTM D5034
Equivalent opening size (EOS No.)	25 min.**	Corps of Engineers CW-02215-77
Burst strength (psi)	100 min.**	ASTM D3887
*Tested wet.		
**Manufacturer's certification to meet test requirement.		

The knitted fabric sock shall be applied to the tubing in the shop so as to maintain a uniform applied weight. The tubing with knitted fabric sock shall be delivered to the job site in such manner as to facilitate handling and incorporation into the work without damage. The knitted fabric sock shall be stored in UV resistant bags until just prior to installation. Torn or punctured knitted fabric sock shall not be used.



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KEVIN J. THIBAUT, P.E.  
SECRETARY

June 29, 2021

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

Re: State Specifications Office  
Section: **965**  
Proposed Specification: **9650000 General Provisions for Aluminum Items (Including Welding).**

Dear Mr. Nguyen:

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

The changes are proposed by Tim McCullough from the State Materials Office to meet all external publications including the Standard Plans and ASTM. The proposed changes will meet project needs and provide the ability for a quick review of project requirements.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## GENERAL PROVISIONS FOR ALUMINUM ITEMS (INCLUDING WELDING)

(REV ~~64-2322~~-21)

SECTION 965 is deleted and substituted by the following:

### **965-1 ~~Surface Appearance and Protection~~General.**

~~The exterior surfaces of aluminum castings, pipes, tubes, formed sheets, and structural shapes shall, when placed in the work, have a clean, uniform silvery appearance, free of dark streaks and discoloration.~~ This Section covers the material and fabrication requirements for aluminum components. All aluminum light poles, J-arms, and railings supplied under this Specification shall be from producers currently on the Department's Production Facility Listing. Producers seeking inclusion on the Department's Production Facility Listing must meet the requirements of Section 105.

~~Aluminum members (including specifically aluminum light poles and signs poles) which are of such size or shape that the surfaces might be marred during transit and prior to their being installed, shall be appropriately and adequately protected against such damage, by wrapping with paper or by other effective means.~~

### **965-2 ~~Certification and Mill Analysis~~Fabrication.**

~~For aluminum materials used for pipe, tube, sheet and other structural shapes for structures other than drainage, the fabricator must maintain a certified mill analysis of the alloys for three years following fabrication.~~ Provide fabricated components in accordance with AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, the Design Plans, and this section. Verify the strength of each Lot by tensile test. Alternate testing will not be accepted. Provide certifications as specified in 965-4, upon request. Protect against damage and marring during transit and delivery.

**965-2.1 Light Poles:** Provide aluminum lighting poles in accordance with this section and Table 965-1. Weld arms and poles in the T4 condition, using the filler metal ER4043, ER4047, ER5183, ER5356, or ER5556 in accordance with AWS D1.2 Aluminum Structural welding Code. Weld to castings in accordance with 965-2.3. Heat treat the arm and pole, until aged to the T6 condition. Transverse welds are only allowed at the base. Equip poles with a vibration damper, when specified in the contract documents.

Provide exterior surface with a clean, uniform silvery appearance, free of dark streaks and discoloration. Finish the pole and arm with a satin rubbed finish.

**965-2.2 Overhead Sign Components:** Provide aluminum toll gantry J-arms in accordance with this section and Table 965-1. Weld tube to plate connections in the T4 or T6 condition, using the filler metal ER4043, ER4047, ER5183, ER5356, or ER5556 in accordance with AWS D1.2 Aluminum Structural welding Code. Heat treat tube and plate in the T4 condition until aged to the T6 condition.

Provide exterior surface with a clean, uniform silvery appearance, free of dark streaks and discoloration.

**965-2.3 Castings:** Provide aluminum castings in accordance with this section and Table 965-1. Weld aluminum castings to itself or aluminum tube to castings using the filler metal



ER4043, in accordance with AWS D1.2 Aluminum Structural welding Code. Heat treat the castings, until aged to the T6 condition.

**965-2.4 Railing:** Provide aluminum railing in accordance with this section and Table 965-1. Weld aluminum railing using the filler metal ER4043, ER4047, ER5183, ER5356, or ER5556 in accordance with AWS D1.2 Aluminum Structural welding Code.

**965-2.5 Static Sign Assemblies:** Provide aluminum sheet, plate and structural shapes in accordance with this section and Table 965-1. Weld structural profiles to itself or aluminum components using ER4043, ER4047, ER5183, ER5356 or ER5556 in accordance with AWS D1.2 Aluminum Structural Welding Code. Heat treat the structural profiles, until aged to the T6 condition.

<u>Table 965-1: Material Requirements for Aluminum Components</u>				
<u>Product</u>	<u>ASTM</u>	<u>Alloy/Temper</u>	<u>Reportable Properties</u>	<u>Supplementary Requirements</u>
<u>Pole, Arm, Extrusions</u>	<u>B221</u>	<u>6061-T6</u>	<u>Alloy, Temper, Thickness</u>	<u>Report Tensile Strength</u>
		<u>6063-T6</u>		
<u>Bars, Plates, Stiffeners, Backing Ring, Shims, Shapes</u>	<u>B221</u>	<u>6063-T6</u>		
	<u>B209</u>	<u>6061-T6</u>		
<u>Castings</u>	<u>B26</u>	<u>356-T6</u>		
	<u>B108</u>			
<u>Railing</u>	<u>B221</u>	<u>6351-T5</u>		
	<u>B241</u>	<u>6061-T6</u>		
	<u>B210</u>			
	<u>B429</u>			
<u>J-Arm Tube</u>	<u>B429</u>	<u>6061-T6</u>		
	<u>B221</u>			
<u>J-Arm Plate</u>	<u>B209</u>	<u>6061-T6</u>		
<u>Sheet</u>	<u>B209</u>	<u>6061-T6</u>		
		<u>5154-H38</u>		
		<u>5052-H38</u>		
<u>Structural Shapes</u>	<u>B308</u>	<u>6061-T6</u>		

### 965-3 Welding Aluminum Sign Structures:

Welding and weld details shall be in accordance with Section 14 of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals; ANSI and AWS D1.2 "Structural Welding Code—Aluminum", including the requirements for qualifications of procedures and welders, as specified therein.

1. Alloys: The aluminum alloys to welded under these specifications may be any of the following alloys:

Wrought Nonheat treatable Alloys:

~~Alloy 3003~~  
~~Alloy Alclad 3004~~  
~~Alloy 5052~~  
~~Alloy 5083~~  
~~Alloy 5086~~  
~~Alloy 5456~~  
~~Wrought Heat treatable Alloys:~~  
~~Alloy 6061~~  
~~Alloy 6063~~  
~~Cast Heat treated Alloy~~  
~~Alloy SG-70A (ASTM Designation)~~

~~2. Filler Metals: The filler metals to be used with particular base metals shall be as shown in the table below except that other filler metals may be used if approved by the Engineer.~~

<del>Base Metal</del>	<del>Filler Metal</del>
<del>3003 to 3003</del>	<del>ER1100</del>
<del>Alclad 3004 to Alclad 3004</del>	<del>ER4043</del>
<del>5052 to 5052</del>	<del>ER5356*</del>
<del>5083 to 5083</del>	<del>ER5183</del>
<del>5086 to 5086</del>	<del>ER5356*</del>
<del>5456 to 5456</del>	<del>ER5556</del>
<del>6061 to 6061</del>	<del>ER5356*</del>
<del>6063 to 6063</del>	<del>ER5356*</del>
<del>SG-70A to 6061</del>	<del>ER4043</del>
<del>SG-70A to 6063</del>	<del>ER4043</del>

~~\*ER5183, ER5356, and ER5556 may be used interchangeably for these base metals.~~

#### ~~965-4 Welding Aluminum Structures Other Than Sign Structures.~~

~~The welding of aluminum structures, other than sign structures, such as aluminum bridge and railing structures and their aluminum components, shall be in accordance with ANSI and AWS D1.2 "Structures Welding Code Aluminum", including the requirements for qualifications of procedures and welders, as specified therein.~~

#### ~~965-5.3~~ **Paint for Poles, Pedestals, and Posts**

Paint systems used on aluminum poles, pedestals, and posts shall meet the color requirements as specified in the Contract Documents. All paint systems shall possess physical properties and handling characteristics that are compatible with the application requirements of Section 646. Materials shall be specifically intended for use over aluminum. Paint systems shall exhibit no loss of adhesion or total color difference ( $\Delta E^*_{ab}$ ) greater than 8.0 units for five years after final acceptance as specified in 5-11. An aluminum pole, pedestal, post, or sign panel that exhibits a cumulative surface area of delamination in excess of 50 square inches will constitute an adhesion failure. Delamination shall be defined as any area of exposed metal surface

subsequent to hand tool cleaning. A  $\Delta E^*_{ab}$  value exceeding 8.0 units per the International Commission on Illumination L\*a\*b\* 1976 (CIELAB) space and color difference formula, measured in accordance with ASTM D2244, will constitute a color retention failure.

The Department will measure and enter in the Department's database the CIELAB color chromaticity coordinates for the color of the top coat of sample coupons provided as required by 646-2.7 using a BYK-Gardner Handicolor colorimeter using D65 illuminant and 2-degree geometry settings. The Department-measured CIELAB chromaticity coordinates shall define the initial color and will be used for resolution of color retention failures and the resolution of color retention disputes.

#### **965-4 Certification**

Produce a certificate of compliance for all aluminum castings. Produce other certificates of compliance at the request of the Engineer. Certificates of compliance shall identify that the material has been sampled and tested in accordance with the applicable ASTM and shall include the reportable properties and supplementary requirements of the applicable sections listed above.



*Florida Department of Transportation*

RON DESANTIS  
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KEVIN J. THIBAUT, P.E.  
SECRETARY

August 9, 2021

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

Re: State Specifications Office  
Section: **965**  
Proposed Specification: **9650000 REVISED: General Provisions for Aluminum Items (Including Welding).**

Dear Mr. Nguyen:

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

The changes are proposed by Tim McCullough from the State Materials Office to meet all external publications including the Standard Plans and ASTM. The revised proposed specification can be misinterpreted by the Contractor and to avoid/mitigate on any future projects we have added the word Connection for J-Arm Connection plate. The proposed changes will meet project needs and provide the ability for a quick review of project requirements.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## GENERAL PROVISIONS FOR ALUMINUM ITEMS (INCLUDING WELDING)

(REV ~~84-922~~-21)

SECTION 965 is deleted and substituted by the following:

### **965-1 ~~Surface Appearance and Protection~~ General.**

~~The exterior surfaces of aluminum castings, pipes, tubes, formed sheets, and structural shapes shall, when placed in the work, have a clean, uniform silvery appearance, free of dark streaks and discoloration.~~ This Section covers the material and fabrication requirements for aluminum components. All aluminum light poles, J-arms, and railings supplied under this Specification shall be from producers currently on the Department's Production Facility Listing. Producers seeking inclusion on the Department's Production Facility Listing must meet the requirements of Section 105.

~~Aluminum members (including specifically aluminum light poles and signs poles) which are of such size or shape that the surfaces might be marred during transit and prior to their being installed, shall be appropriately and adequately protected against such damage, by wrapping with paper or by other effective means.~~

### **965-2 ~~Certification and Mill Analysis.~~ Fabrication.**

~~For aluminum materials used for pipe, tube, sheet and other structural shapes for structures other than drainage, the fabricator must maintain a certified mill analysis of the alloys for three years following fabrication.~~ Provide fabricated components in accordance with AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, the Design Plans, and this section. Verify the strength of each Lot by tensile test. Alternate testing will not be accepted. Provide certifications as specified in 965-4, upon request. Protect against damage and marring during transit and delivery.

**965-2.1 Light Poles:** Provide aluminum lighting poles in accordance with this section and Table 965-1. Weld arms and poles in the T4 condition, using the filler metal ER4043, ER4047, ER5183, ER5356, or ER5556 in accordance with AWS D1.2 Aluminum Structural welding Code. Weld to castings in accordance with 965-2.3. Heat treat the arm and pole, until aged to the T6 condition. Transverse welds are only allowed at the base. Equip poles with a vibration damper, when specified in the contract documents.

Provide exterior surface with a clean, uniform silvery appearance, free of dark streaks and discoloration. Finish the pole and arm with a satin rubbed finish.

**965-2.2 Overhead Sign Components:** Provide aluminum toll gantry J-arms in accordance with this section and Table 965-1. Weld tube to plate connections in the T4 or T6 condition, using the filler metal ER4043, ER4047, ER5183, ER5356, or ER5556 in accordance with AWS D1.2 Aluminum Structural welding Code. Heat treat tube and plate in the T4 condition until aged to the T6 condition.

Provide exterior surface with a clean, uniform silvery appearance, free of dark streaks and discoloration.

**965-2.3 Castings:** Provide aluminum castings in accordance with this section and Table 965-1. Weld aluminum castings to itself or aluminum tube to castings using the filler metal

ER4043, in accordance with AWS D1.2 Aluminum Structural welding Code. Heat treat the castings, until aged to the T6 condition.

**965-2.4 Railing:** Provide aluminum railing in accordance with this section and Table 965-1. Weld aluminum railing using the filler metal ER4043, ER4047, ER5183, ER5356, or ER5556 in accordance with AWS D1.2 Aluminum Structural welding Code.

**965-2.5 Static Sign Assemblies:** Provide aluminum sheet, plate and structural shapes in accordance with this section and Table 965-1. Weld structural profiles to itself or aluminum components using ER4043, ER4047, ER5183, ER5356 or ER5556 in accordance with AWS D1.2 Aluminum Structural Welding Code. Heat treat the structural profiles, until aged to the T6 condition.

<u>Table 965-1: Material Requirements for Aluminum Components</u>				
<u>Product</u>	<u>ASTM</u>	<u>Alloy/Temper</u>	<u>Reportable Properties</u>	<u>Supplementary Requirements</u>
<u>Pole, Arm, Extrusions</u>	<u>B221</u>	<u>6061-T6</u>	<u>Alloy, Temper, Thickness</u>	<u>Report Tensile Strength</u>
		<u>6063-T6</u>		
<u>Bars, Plates, Stiffeners, Backing Ring, Shims, Shapes</u>	<u>B221</u>	<u>6063-T6</u>		
	<u>B209</u>	<u>6061-T6</u>		
<u>Castings</u>	<u>B26</u>	<u>356-T6</u>		
	<u>B108</u>			
<u>Railing</u>	<u>B221</u>	<u>6351-T5</u>		
	<u>B241</u>	<u>6061-T6</u>		
	<u>B210</u>			
	<u>B429</u>			
<u>J-Arm Tube</u>	<u>B429</u>	<u>6061-T6</u>		
	<u>B221</u>			
<u>J-Arm Connection Plate</u>	<u>B209</u>	<u>6061-T6</u>		
<u>Sheet</u>	<u>B209</u>	<u>6061-T6</u>		
		<u>5154-H38</u>		
		<u>5052-H38</u>		
<u>Structural Shapes</u>	<u>B308</u>	<u>6061-T6</u>		

### 965-3 Welding Aluminum Sign Structures:

Welding and weld details shall be in accordance with Section 14 of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals; ANSI and AWS D1.2 “Structural Welding Code—Aluminum”, including the requirements for qualifications of procedures and welders, as specified therein.

1. Alloys: The aluminum alloys to welded under these specifications may be any of the following alloys:

~~Wrought Nonheat-treatable Alloys:~~~~Alloy 3003~~~~Alloy Alclad 3004~~~~Alloy 5052~~~~Alloy 5083~~~~Alloy 5086~~~~Alloy 5456~~~~Wrought Heat-treatable Alloys:~~~~Alloy 6061~~~~Alloy 6063~~~~Cast Heat-treated Alloy~~~~Alloy SG-70A (ASTM Designation)~~

~~2. Filler Metals: The filler metals to be used with particular base metals shall be as shown in the table below except that other filler metals may be used if approved by the Engineer.~~

Table 965-4

Base Metal	Filler Metal
3003 to 3003	ER1100
Alclad 3004 to Alclad 3004	ER4043
5052 to 5052	ER5356*
5083 to 5083	ER5183
5086 to 5086	ER5356*
5456 to 5456	ER5556
6061 to 6061	ER5356*
6063 to 6063	ER5356*
SG-70A to 6061	ER4043
SG-70A to 6063	ER4043

\*ER5183, ER5356, and ER5556 may be used interchangeably for these base metals.

**965-4 Welding Aluminum Structures Other Than Sign Structures.**

~~The welding of aluminum structures, other than sign structures, such as aluminum bridge and railing structures and their aluminum components, shall be in accordance with ANSI and AWS D1.2 "Structures Welding Code Aluminum", including the requirements for qualifications of procedures and welders, as specified therein.~~

**965-5.3 Paint for Poles, Pedestals, and Posts**

Paint systems used on aluminum poles, pedestals, and posts shall meet the color requirements as specified in the Contract Documents. All paint systems shall possess physical properties and handling characteristics that are compatible with the application requirements of Section 646. Materials shall be specifically intended for use over aluminum. Paint systems shall exhibit no loss of adhesion or total color difference ( $\Delta E^*_{ab}$ ) greater than 8.0 units for five years after final acceptance as specified in 5-11. An aluminum pole, pedestal, post, or sign panel that exhibits a cumulative surface area of delamination in excess of 50 square inches will constitute

an adhesion failure. Delamination shall be defined as any area of exposed metal surface subsequent to hand tool cleaning. A  $\Delta E^*_{ab}$  value exceeding 8.0 units per the International Commission on Illumination  $L^*a^*b^*$  1976 (CIELAB) space and color difference formula, measured in accordance with ASTM D2244, will constitute a color retention failure.

The Department will measure and enter in the Department's database the CIELAB color chromaticity coordinates for the color of the top coat of sample coupons provided as required by 646-2.7 using a BYK-Gardner Handicolor colorimeter using D65 illuminant and 2-degree geometry settings. The Department-measured CIELAB chromaticity coordinates shall define the initial color and will be used for resolution of color retention failures and the resolution of color retention disputes.

#### **965-4 Certification**

Produce a certificate of compliance for all aluminum castings. Produce other certificates of compliance at the request of the Engineer. Certificates of compliance shall identify that the material has been sampled and tested in accordance with the applicable ASTM and shall include the reportable properties and supplementary requirements of the applicable sections listed above.





*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

June 30, 2021

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

Re: State Specifications Office  
Section: **970**  
Proposed Specification: **9700000 MATERIALS FOR RAISED PAVEMENT  
MARKERS AND BITUMINOUS ADHESIVE.**

Dear Mr. Nguyen:

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

The changes are proposed by Kenneth Bergum to add requirements for epoxy adhesive for use with Raised Pavement Markers, add packaging and labeling requirements for adhesives, and include extra documentation requirements to raised pavement markers to the Standard Specification. This revision is associated with revised Specification 1020200 and revised Section 706.

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

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

Sincerely,

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**MATERIALS FOR RAISED PAVEMENT MARKERS AND BITUMINOUS ADHESIVE.  
(REV 5-11-21)**

SECTION 970 is deleted and the following substituted:

**SECTION 970  
MATERIALS FOR RAISED PAVEMENT  
MARKERS AND ~~BITUMINOUS~~ ADHESIVE**

**970-1 Raised Pavement Markers (RPMs).**

Manufacturers seeking evaluation of their product for the Approved Product List (APL) must submit an application in accordance with Section 6 and provide documentation showing the product is in conformance with this section.

RPMs shall be classified in accordance with the following chart:

Table 970-1 RPM Class				
Class	Description	Usage	Expected Normal Service	ASTM D4280 Surface Designation
B	Retroreflective	Temporary/Permanent	Long life	H, hard abrasion-resistant lens
D	Retroreflective	Temporary	One month	None
F	Internally Illuminated	Permanent	Long life	H, hard abrasion-resistant lens

**970-2 Performance Requirements.**

**970-2.1 Class B RPMs:** The RPMs shall meet the performance requirements specified in ASTM D4280, Section 6.2, for luminous intensity, flexural strength, compressive strength, resistance to cracking, and thermal cycling, as modified herein.

Submit product photo, product data sheet, and documentation from the National Transportation Product Evaluation Program (NTPEP) showing that the RPMs meet the requirements of this Section.

**970-2.1.1 Composition:** The RPM shall consist of materials conforming to ASTM D4280.

**970-2.1.2 Physical Requirements:** The physical size of the RPM shall conform to the requirements of ASTM D4280. Laboratory and field samples for RPMs and bituminous adhesives shall meet the requirements of ASTM D4280 and include the following requirements:

The minimum area of each retroreflective face shall be 2.5 square inches.  
The minimum base size shall be 12 square inches.

**970-2.1.3 Abrasion Resistant:** Meet the coefficient of luminous intensity requirements of ASTM D4280 after abrasion.

**970-2.1.4 In-Service Minimum Retroreflective Intensity:** Class B RPMs shall retain a minimum coefficient of luminous intensity for 18 months of not less than 30% of the values shown in Table 1 of ASTM D4280, and a minimum luminous intensity of 0.2 cd/fc at the end of two years.

**970-2.2 Class D RPMs:** Submit [documentation](#) [product photo](#), [product data sheet](#), and [certified test reports from an independent laboratory](#) showing that the RPMs meet the requirements of this Section.

**970-2.2.1 Body Requirements:** Provide RPMs made of nonferrous material. RPM dimensions are based on an x and y axis where the y dimension is parallel to the centerline and the x axis is 90° to the y axis.

The base must be approximately 4 inches along the x axis and approximately 1 inch along the y axis.

The vertical wall must be a minimum of 4 inches long with a minimum height of 2 inches and a maximum height of 3 inches with retroreflective sheeting affixed to the upper portion of the vertical wall. The retroreflective sheeting must be a minimum of 0.25 inch in width and extend the full length of the vertical wall.

**970-2.2.2 Color Requirements:** The color of the body and the retroreflective strips must be yellow.

**970-2.2.3 Flexibility and Deformation Resistance:** The vertical wall of the tabs must be flexible to bend under normal traffic and resistant to permanent deformation for a minimum of one month.

**970-2.2.4 Adhesion:** Provide tabs that adhere to the pavement such that no tab dislodges.

**970-2.2.5 Retroreflective Sheeting:** Provide retroreflective sheeting of Type IV or greater and meet the requirements of Section 994.

**970-2.2.6 Removability:** Ensure the entire RPM is removable without damaging the asphalt surface.

**970-2.3 Class F RPMs:** Submit [documentation](#) [product photo](#), [product data sheet](#), and [certified test reports from an independent laboratory](#) showing that the RPMs meet the requirements of this Section.

**970-2.3.1 Functional Requirements:** RPMs must be steadily-illuminated.

**970-2.3.2 Electrical Requirements:** Electrical power for the RPM must be provided by solar power.

RPMs must meet the performance requirements for at least 16 hours of continuous duty without sunlight. Charging time must be less than 3 hours during sunny conditions and less than 8 hours during cloudy conditions. Operation must be controlled by a photoreceptor located inside the RPM.

**970-2.3.3 Physical Requirements:** RPMs must have a maximum width of eight inches. The depth of embedment of the RPM housing into pavement must be 2.5 inches or less, and the housing must project 0.75 inches or less above the pavement surface.

RPMs must have a compressive strength of 20,000 pounds.

RPMs must have an IP 68 rating.

**970-2.3.4 Performance Requirements:** The light source for RPMs must be light-emitting diodes (LEDs).

The light produced by the RPM must only be visible from the direction of traffic that it is intended to guide. No light produced by the RPM should be visible when viewed from a height of 3.5 feet above the pavement at a distance of 20 feet from the opposite quadrant or side quadrants of the RPM's LED projection quadrant.

RPMs must be capable of producing the following luminance values when measured at the LED source:

Color	Luminance (Foot-candle)
White	5.00
Yellow	1.00
Red	1.50
Blue	0.10

The RPM lenses must meet the abrasion-resistant requirements of ASTM D4280. After abrading the RPM, the luminance produced by the RPM must be 50% or greater than the values in the above table.

**970-2.3.5 Warranty:** The manufacturer must provide a five-year, non-prorated warranty on all components for five years from the date of final acceptance in accordance with Section 706.

### **970-3 Packaging and Labeling.**

~~Shipment shall be made in containers which are acceptable to common carriers and packaged in a manner which ensures delivery in perfect condition. Each package shall be clearly marked with the APL number, name of the manufacturer, type, color, quantity enclosed and date of manufacture. Show the designation of the Class B marker in accordance with ASTM D4280.~~

### **970-43 Bituminous Adhesive for Class B and F Raised Pavement Markers.**

**970-43.1 General:** ~~Bituminous a~~Adhesive as recommended by the RPM manufacturer shall be used for bonding the RPM to the pavement. Manufacturers seeking evaluation of their product for the APL must submit an application in accordance with Section 6 and provide documentation showing the product is in conformance with this section.

**970-43.2 Specific Requirements for Bituminous Adhesives:** The bituminous adhesive shall meet the properties of adhesives per ASTM D4280 Section A1, including filler-free and filler alone properties.

**970-43.3 Performance Specific Requirements for Epoxy Adhesives:** The ~~performance of the epoxy~~ adhesive shall ~~be determined in accordance with the test methods listed in ASTM D4280.~~ conform to the following requirements of AASHTO M 237 for types I and II (Table 970-3).

<u>Table 970-3</u>					
		<u>Type I</u>		<u>Type II</u>	
<u>Property</u>	<u>Test Method</u>	<u>Min.</u>	<u>Max.</u>	<u>Min.</u>	<u>Max.</u>
<u>Viscosity:</u> <u>Component A (Resin) TD</u> <u>Spindle at 5 rev/min, poises</u>	<u>AASHTO</u> <u>T 237</u>	<u>3,500</u>	<u>5,000</u>	<u>1,000</u>	<u>3,000</u>
<u>Viscosity:</u> <u>Component B (Hardener) TD</u> <u>Spindle at 5 rev/min, poises</u>		<u>3,500</u>	<u>5,000</u>	<u>1,000</u>	<u>3,000</u>
<u>Shear Ratio (Each Component)</u>		<u>2.0</u>		<u>2.0</u>	
<u>Gel Time, Minutes</u>	<u>AASHTO</u> <u>T 237</u>	<u>6</u>	<u>10</u>	<u>6</u>	<u>10</u>
<u>Bond Strength to Concrete, max. time, minutes</u> <u>to reach 200 psi</u>	<u>AASHTO</u> <u>T 237</u>		<u>35</u>		<u>210</u>
<u>Density lbs/gal.</u> <u>Component A (Resin)</u>	<u>AASHTO</u> <u>T 237</u>	<u>11.7</u>	<u>12.2</u>	<u>10.6</u>	<u>10.9</u>
<u>Component B (Hardener)</u>		<u>11.7</u>	<u>12.2</u>	<u>11.3</u>	<u>11.6</u>
<u>Slant Shear Strength (Dry)</u> <u>24 hr, psi</u>	<u>AASHTO</u> <u>T 237</u>	<u>1,000</u>		<u>2,000</u>	
<u>Slant Shear Strength (Wet)</u> <u>24 hr, psi</u>		<u>800</u>		<u>1,500</u>	

**~~970-4 Bituminous Adhesive for Class B Raised Pavement Markers.~~**

~~970-4.1 General:~~ Bituminous adhesive as recommended by the RPM manufacturer shall be used for bonding the RPM to the pavement.

~~970-4.2 Specific Requirements for Bituminous Adhesives:~~ The bituminous adhesive shall meet the properties of adhesives per ASTM D4280 Section A1, including filler free and filler alone properties.

~~970-4.3 Performance Requirements:~~ The performance of the adhesive shall be determined in accordance with the test methods listed in ASTM D4280.

**970-34 Packaging and Labeling.**

**970-4.1 Raised Pavement Markers:** Shipment shall be made in containers which are acceptable to common carriers and packaged in a manner which ensures delivery in perfect condition. Each package shall be clearly marked with the APL number, name of the manufacturer, type, color, quantity enclosed and date of manufacture. Show the designation of the Class B marker in accordance with ASTM D4280.

**970-4.2 Adhesives:** Each package shall be clearly marked with the product name, name of the manufacturer, lot number, adhesive type, quantity enclosed, and date of manufacture.

**970-5 Product Acceptance on the Project.**

Acceptance will be made in accordance with the requirements of Sections 102 and 706.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 21, 2021

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

Re: State Specifications Office  
Section: **971**  
Proposed Specification: **9710104 Pavement Marking Materials.**

Dear Mr. Nguyen:

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

The changes are proposed by Kenneth Bergum from the State Materials Office to provide additional language to require National Transportation Product Evaluation Program (NTPEP) field test data for additional Pavement Marking Materials (PMM).

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**PAVEMENT MARKING MATERIALS****(REV 6-7-21)**

SUBARTICLE 971-1.4 is deleted and the following substituted:

**971-1.4 Approved Product List (APL):** All pavement marking materials shall be one of the products listed on the Department's Approved Product List (APL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6 and the infrared identification curve (2.5 to 15  $\mu\text{m}$ ) for the vehicle component. The Department will test ~~all~~ standard thermoplastic and profiled thermoplastic pavement marking materials in accordance with FM 5-541, Part B. For standard paint, durable paint, preformed thermoplastic, two reactive component material, high friction thermoplastic, and permanent tape, ~~the Department will accept~~ Manufacturers shall provide National Transportation Product Evaluation Program (NTPEP) field test data meeting FDOT Specification requirements ~~in lieu of evaluation testing as per FM 5-541, Part B.~~ A notation of the number of coats and the thickness of each coat at which the product passes testing may be placed on the APL. When listed, this will be the minimum criteria for application of the pavement marking material.





*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 13, 2021

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

Re: State Specifications Office  
Section: **973**

Proposed Specification: **9730502 Fiber Reinforced Polymer (FRP) Composite Structural Shapes.**

Dear Mr. Nguyen:

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

The changes are proposed by Elizabeth Weber from the State Materials Office to update the requirement for Impact Resistance of Thermoplastic Structural Shapes.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**FIBER REINFORCED POLYMER (FRP) COMPOSITE STRUCTURAL SHAPES  
(REV 5-19-21)**

SUBARTICLE 973-5.2 is deleted and the following substituted:

**973-5.2 Materials:** Use polyethylene made from recycled post consumer or post industrial thermoplastics. Mix the polyethylene with appropriate colorants, UV inhibitors, hindered amine light stabilizers, antioxidants, and chopped fiberglass reinforcement so that the resulting product meets the requirements specified in Table 973-4 for RTSS and Table 973-5 for TSS. Use a minimum of 15% (by weight) chopped fiberglass reinforcement for both TSS and RTSS. The thermoplastic matrix must not corrode, rot, warp, splinter or crack. Meet the requirements of 932-3 for FRP reinforcing bar materials.

For RTSS members, the use of separate materials for skin and core is at the discretion of each manufacturer; however, both materials must meet the requirements in Table 973-4. The material surrounding the rebar within 1 inch from the rebar surface shall not contain voids greater than 3/4 inch diameter and extend no further than 2 inches along the length of the member. The cross section of the product shall not contain voids exceeding 1-1/4 inches in diameter and the sum of all voids greater than 3/8 inches in diameter shall not exceed 5% of the cross sectional area.

Extrude final product as one continuous piece with no joints or splices to the dimensions and tolerances in accordance with Table 973-6.

Reject any sections containing cracks or splits.

Table 973-4 RTSS Matrix		
Property	Test Method	Requirement
Density	ASTM D792	48–63 pcf
Water Absorption	ASTMD570	2 hrs: <1.0% weight increase 24 hrs: <3.0% weight increase
Brittleness	ASTM D746	Brittleness temperature < minus 40°C
Impact Resistance	ASTM D256, Method A (Izod)	>0.55 ft-lbs/in
Hardness	ASTM D2240	44-75 (Shore D)
Ultraviolet	ASTM D4329 UVA	500 hours <10% change in Shore D Durometer Hardness
Abrasion	ASTM D 4060	Weight Loss: <0.02 oz Cycles = 10,000 Wheel = CS17 Load = 2.2 lb
Chemical Resistance	ASTM D543	Sea Water: <1.5% weight increase Gasoline: <9.5% weight increase No. 2 Diesel: <6.0% weight increase
Tensile Properties	ASTM D638	2,200 psi at break min.

Table 973-4 RTSS Matrix		
Compressive Modulus	ASTM D695	40 ksi min.
Static Coefficient of Friction	ASTM D1894	0.25, wet max.
Screw Withdrawal	ASTM D6117	400 lb (screw) min.

Table 973-5 TSS Matrix		
Property	Test Method	Requirement
Density	ASTM D792	50-65 pcf
Impact Resistance	ASTM D256 Method A (Izod)	> <del>0.55</del> <del>2.0</del> ft-lbs/in
Hardness	ASTM D2240	44-75 (Shore D)
Ultraviolet	ASTM D4329 (UVA)	500 hours <10% change in Shore D Durometer Hardness
Chemical Resistance	ASTM D756 or ASTM D543	Sea Water: <1.5% weight increase Gasoline: <7.5% weight increase No. 2 Diesel: <6.0% weight increase
Tensile Properties	ASTM D638	3,000 psi at break min.
Static Coefficient of Friction	ASTM D2394	0.25, wet or dry min.
Nail Withdrawal or Screw Withdrawal	ASTM D6117	250 lb (nail) min. 400 lb (screw) min.
Secant Modulus at 1% Strain	ASTM D6109	150,000 psi min.
Flexural Strength	ASTM D6109	2,500 psi min.
Compressive Strength	ASTM D6108	2,200 psi min.
Compressive Strength Perpendicular to grain	ASTM D6108	700 psi min.

Table 973-6 Tolerances	
Dimension	Tolerance
Length	0/+6 inch
Width – RTSS	±1/2 inch
Width – TSS	±1/4 inch
Height – RTSS	±1/2 inch
Width – TSS	±1/4 inch
Clear cover from outer surface to rebar elements (RTSS)	≥3/4 inch (wales) ±1/2 inch (other)
Straightness (while lying on a flat surface)	<1-1/2 inches per 10 feet



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 21, 2021

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

Re: State Specifications Office  
Section: **974**  
Proposed Specification: **9740000 SURFACE TREATMENTS.**

Dear Mr. Nguyen:

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

The changes are proposed by Karen Byram to include a new section in Division III for material requirements of surface treatments. Includes NTPEP testing for Detectable Warnings and performance lab testing to Patterned Pavement into the Standard Specifications.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**SURFACE TREATMENTS.****(REV 6-87-14-21)**

The following new Section is added after Section 973.

**SECTION 974**  
**SURFACE TREATMENTS**

**974-1 Description.**

This section specifies the material requirements for detectable warnings and patterned pavement.

**974-2 Detectable Warnings.**

Provide detectable warnings in accordance with the Americans with Disabilities Act Standards for Transportation Facilities, Section 705. Provide detectable warnings consisting of materials intended for exterior use subject to routine pedestrian traffic and occasional vehicular traffic. Provide detectable warnings with size and pattern comprised of truncated domes aligned in parallel rows. Detectable warnings with a diagonal pattern are not permitted. Detectable warnings consisting of truncated domes fabricated in the field are not permitted.

**974-2.1 Approved Product List Submittal Requirements:** Manufacturers seeking evaluation of products for inclusion on the APL shall submit an application in accordance with Section 6 and include the documentation identified in the Table 974-1. Documentation and reports must demonstrate that the product meets the requirements of this Section, Section 527, and the Standard Plans, Index 522-002.

<u>Table 974-1</u>	
<u>Documentation</u>	<u>Requirements</u>
<u>Product Photo</u>	<u>Displays the significant features of the product.</u>
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<u>Product Label</u>	<u>For each component of the product system.</u>
<u>Safety Data Sheet (SDS)</u>	<u>SDS meeting OSHA requirements for product and manufacturer recommended installation materials as applicable.</u>
<u>National Testing Product Evaluation Program (NTPEP) Test Report</u>	<u>Testing must be conducted using the project Work Plan for NTPEP Laboratory Testing of Detectable Warning Systems, using the cold exposure category.</u>
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<u>Product Sample</u>	<u>Submit upon request from the Department. If the product is a system, a sample of each component must be submitted.</u>

**974-2.2 Performance Requirements:** Provide detectable warnings that meet the performance requirements of Table 974-2.

<u>Table 974-2</u>												
<u>Property</u>	<u>Documentation</u>	<u>Test Value</u>										
<u>Visual and Microscopic Evaluation<sup>1</sup></u>	<u>Provide NTPEP Test Report</u>	<u>No lifting, debonding, cracking, flaking, and missing or partial domes.</u>										
<u>Domes and Spacing Dimensional Testing<sup>1</sup></u>	<u>Provide NTPEP Test Report</u>	<u>Meets the requirements with the Americans with Disabilities Act Standards for Transportation Facilities, Section 705.</u>										
<u>Slip Resistance<sup>1</sup></u>	<u>Provide NTPEP Test Report</u>	<u>Dry Coefficient of Friction – 0.8 min. Wet Coefficient of Friction – 0.65 min. (include recessed areas between truncated domes).</u>										
<u>Color Measurement<sup>1</sup></u>	<u>Provide NTPEP Test Report</u>	<u>Uniform color, for each color.</u>										
<u>Resistance to Impact from Falling Tup<sup>1</sup></u>	<u>Provide NTPEP Test Report</u>	<u>No cracking, flaking, missing or partial domes, 20 ft-lb energy.</u>										
<u>Adhesive, Coating, and Single Dome Bond Strength, uncured concrete panel<sup>3</sup></u>	<u>Provide NTPEP Test Report</u>	<u>150 psi min. with an elapsed panel cure time of less than 72 hours.</u>										
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**974-3 Patterned Pavement.**

Provide patterned pavement products that produce an adherent, weather resistant, skid resistant, and wear resistant surface that meets the requirements of this Section, and Section 523.

Patterned pavement installations requiring removal of pavement are not permitted.

**974-3.1 Approved Product List Submittal Requirements:** Manufacturers seeking evaluation of products for inclusion on the APL shall submit an application in accordance with Section 6 and include the documentation identified in Table 974-43. Documentation and reports must demonstrate that the product meets the requirements of this Section and Section 523.

<u>Table 974-43</u>	
<u>Documentation</u>	<u>Requirements</u>
<u>Product Photo</u>	<u>Displays the significant features of the product.</u>
<u>Technical Data Sheet</u>	<u>Uniquely identifies the product and includes product specifications, storage instructions, and recommended installation materials and equipment as applicable.</u> <u>Include the following information as applicable:</u> <u>1. Use on concrete and/or asphalt surfaces.</u> <u>2. Use as “Vehicular” and/or “Non-vehicular.”</u> <u>3. Patterns, textures, and templates.</u> <u>4. Resin, sealers, coatings, coloring, and friction materials.</u> <u>5. Friction material source.</u>
<u>Product Label</u>	<u>For each component of the product system.</u>
<u>Safety Data Sheet (SDS)</u>	<u>SDS meeting OSHA requirements for each material used in the product system.</u>
<u>Independent Laboratory Test Report</u>	<u>Skid Test and Integral Color testing as identified in Table 974-45.</u>
<u>Installation Instructions</u>	<u>Surface preparation and installation procedures for different substrates.</u>
<u>Product Sample</u>	<u>Submit upon request from the Department. A sample of each component must be submitted.</u>

**974-3.2 Performance Requirements:** Provide patterned pavement products that meet the performance requirements of Table 974-4.

<u>Table 974-45</u>		
<u>Property</u>	<u>Documentation</u>	<u>Test Method and Value</u>
<u>Skid Test<sup>1</sup></u>	<u>Independent Laboratory Report</u>	<u>ASTM E303 using the British Pendulum Tester, British Pendulum Number (BPN) of at least 40.</u>
<u>Integral Color<sup>1,2</sup></u>	<u>Independent Laboratory Report</u>	<u>Visual inspection, Color is integral and uniform.</u>
<u>Non-Hazardous Classification<sup>1,2</sup></u>	<u>Material Safety Data Sheet (SDS)</u>	<u>Non-Hazardous, per RCRA Subtitle C Table 1 of 40 CFR 261.24 “Toxicity Characteristic” and not exude fumes which are hazardous, toxic, or detrimental to persons or property.</u>
<u>Friction Resistance<sup>2</sup></u>	<u>Product Sample Panel for FDOT Laboratory Test</u>	<u>FM 5-622 - Part A, Initial Dynamic Friction Test (DFT40) value of 40 or greater.</u>
<sup>1</sup> For Non-vehicular use.		
<sup>2</sup> For Vehicular use.		

**974-3.3 Performance Requirements for Products in Vehicular Traffic Areas:** Manufacturers shall install the product on a site provided by the Department and test the

installation using an independent testing facility in accordance with FM 5-592. Provide patterned pavement products that meet the performance requirements of Table 974-5.

<u>Table 974-5</u>		
<u>Property</u>	<u>Documentation</u>	<u>Test Method and Value</u>
<u>Wear</u>	<u>Field Service Test Photos</u>	<u>Visual, Wearing shall not expose more than 15% of the underlying surface area as measured within the traveled way for 3 years.</u>
<u>Friction</u>	<u>Independent Testing Facility</u>	<u>FM 5-592, Test using one of the following:</u> <u>a. Locked Wheel Friction Tester - minimum FN40R value of 35 or greater at all testing intervals for 3 years, or</u> <u>b. Dynamic Friction Tester - minimum DFT40 value of 40 or greater at all testing intervals for 3 years.</u>





*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

August 2, 2021

Steve Deppmeier, P.E.  
Asset Management, Pavements and Materials Engineer  
Florida Division Office  
Federal Highway Administration  
3500 Financial Plaza, Suite 400  
Tallahassee, Florida 32312

Re: State Specifications Office  
Section: **974**  
Proposed Specification: **9740000 SURFACE APPLICATIONS. (REVISED)**

Dear Mr. Deppmeier:

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

The changes are proposed by Karen Byram to include a new section in Division III for material requirements of surface applications. Includes NTPEP testing for Detectable Warnings and performance lab testing to Patterned Pavement into the Standard Specifications.

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**974-1 Description.**

This section specifies the material requirements for detectable warnings and patterned pavement.

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Provide detectable warnings in accordance with the Americans with Disabilities Act Standards for Transportation Facilities, Section 705. Provide detectable warnings consisting of materials intended for exterior use subject to routine pedestrian traffic and occasional vehicular traffic. Provide detectable warnings with size and pattern comprised of truncated domes aligned in parallel rows. Detectable warnings with a diagonal pattern are not permitted. Detectable warnings consisting of truncated domes fabricated in the field are not permitted.

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<u>Visual and Microscopic Evaluation<sup>1</sup></u>	<u>Provide NTPEP Test Report</u>	<u>No lifting, debonding, cracking, flaking, and missing or partial domes.</u>	
<u>Domes and Spacing Dimensional Testing<sup>1</sup></u>	<u>Provide NTPEP Test Report</u>	<u>Meets the requirements with the Americans with Disabilities Act Standards for Transportation Facilities, Section 705.</u>	
<u>Slip Resistance<sup>1</sup></u>	<u>Provide NTPEP Test Report</u>	<u>Dry Coefficient of Friction – 0.8 min. Wet Coefficient of Friction – 0.65 min. (include recessed areas between truncated domes).</u>	
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Manufacturers shall install the product on a site provided by the Department and test the installation using an independent testing facility in accordance with FM 5-592. Provide patterned pavement products that meet the performance requirements of Table 974-5.

<u>Table 974-5</u>		
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<u>Wear</u>	<u>Field Service Test Photos</u>	<u>Visual, Wearing shall not expose more than 15% of the underlying surface area as measured within the traveled way for 3 years.</u>
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*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

June 29, 2021

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

Re: State Specifications Office  
Section: **991**  
Proposed Specification: **9910102 Channelizing Device Materials.**

Dear Mr. Nguyen:

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

The changes are proposed by Gevin McDaniel from the State Roadway Design Office to allow square bases on tubular markers.

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

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

Sincerely,

Signature on File

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**CHANNELIZING DEVICE MATERIALS**  
**(REV 5-10-21)**

SUBARTICLE 991-1.2 is deleted and the following substituted:

**991-1.2 Dimensions:** The post shall have a minimum diameter of 3 inches. The base of the tubular marker shall have a maximum diameter, width, or length ~~dimension in any direction~~ of 8 inches. The height of the tubular marker above the pavement surface shall be 36 inches.



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July 21, 2021

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

Re: State Specifications Office  
Section: **995**  
Proposed Specification: **9950207 Traffic Control Signal and Device Materials.**

Dear Mr. Nguyen:

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

The changes are proposed by Derek Vollmer from the Traffic Engineering and Operations Office is to move the materials section from Division II to Division III. Since the Wrong Way Vehicle Detection System must interface with the SunGuide Software, a supplemental requirements document will facilitate the application programming interface development. This proposed specification revision is associated with changes to Section 650 and 653.

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

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State Construction Engineer

## TRAFFIC CONTROL SIGNAL AND DEVICE MATERIALS (REV 5-14-21)

SUBARTICLE 995-2.7.2 is deleted and the following substituted:

**995-2.7.2 Communications:** Major components of the WWVDS (such as the sensor and any separate hardware used for contact closures) shall include a minimum of one serial or Ethernet communications interface and shall meet the following criteria:

1. The serial interface and connector conforms to TIA-232 standards and the serial ports support data rates up to 115200 bps; error detection utilizing parity bits (i.e., none, even, and odd); and stop bits (1 or 2).
2. Wired Ethernet interfaces provides, at a minimum, a 10/100 Base TX connection. Verify that all unshielded twisted pair/shielded twisted pair network cables and connectors comply with TIA-568.
3. Wireless communications are secure and that wireless devices are FCC certified. The FCC identification number is displayed on an external label and all WWVDS devices operate within their FCC frequency allocation.
4. Cellular communications devices are compatible with the cellular carrier used by the agency responsible for system operation and maintenance.
5. The system can be configured and monitored via one or more communications interface.
6. The WWVDS is compatible with the Department's SunGuide® software. The SunGuide software requirements are listed in supplemental requirement SR-995-2.7.2-01, Supplemental Wrong Way Vehicle Detection System SunGuide HTTP Protocol, as published on the Department's State Traffic Engineering and Operations Office website at the following URL: <https://www.fdot.gov/traffic/Traf-Sys/Product-Specifications.shtm>.
7. For WWVDS installed on ramps, the device shall:
  - a. Send an alert and a sequence of images for up to ten seconds to the SunGuide® software that covers a configurable time before and after the wrong-way vehicle detection.
  - b. Activate all highlighted signs associated with the WWVDS.

SUBARTICLE 995-2.9.1 is deleted and the following substituted:

### **995-2.9 Traffic Data Detection System Acceptance Requirements:**

995-2.9.1 Data Accuracy: Provide a vehicle detection system capable of meeting the minimum total roadway segment accuracy levels of 95% for volume, 90% for occupancy, and 90% for speed for all lanes, up to the maximum number of lanes that the device can monitor as specified by the manufacturer.

To verify conformance with the accuracy requirements in this Section and as a precondition for listing on the APL, sample data collected from the vehicle detection system will be compared against ground truth data collected during the same time by human observation or by another method approved by the TERL. Sample data shall be collected over several time periods under a variety of traffic conditions. Weight each data sample to represent the

predominant conditions over the course of a 24-hour period. Samples shall consist of 15- and 30-minute data sets collected at various times of the day. Representative data periods and their assigned weights are provided in Table 995-1.

SECTION 995 is expanded by the following new Articles:

**995-4 Vehicular Traffic Signal Assemblies.**

**995-4.1 General:** Vehicular traffic signal assemblies shall be listed on the Department's Approved Product List (APL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6.

Vehicular traffic signal assemblies must meet the requirements of Section 603 and the Institute of Transportation Engineers (ITE) Standard for Vehicle Traffic Control Signal Heads.

Fastening hardware such as bolts, screws, nuts, washers, latches, and studs must be SAE Type 316 or 304 stainless steel.

Horizontal signal assemblies must be constructed so the door hinges, when installed, are located on the bottom of the signal assembly. Vertical mounted five-section cluster assemblies must be constructed so that the door hinges, when installed, are located along the outside edges of the complete assembly and each section opens away from the horizontally adjacent section.

Vehicular traffic signal assemblies must be permanently marked with the manufacturer's name or trademark, part or model number and date of manufacture or serial number.

**995-4.2 Twelve Inch Signal Head Assemblies:** Construct the assembly of materials and alloys specified in the ITE Standard for Vehicle Traffic Control Signal Heads.

Construct signal housings to allow adjustment in multiple directions for proper signal alignment. If a serrated connection is used for positioning and alignment of the signal, the top and bottom opening of each signal head section must include a circular 72-tooth serrated connection (2 inch nominal I.D.) capable of providing positive positioning and alignment in 5 degree increments. When assembled and tightened, these connections must prevent rotation or misalignment of the signal head as well as misalignment between sections. The serrated area must start at the outside of the 2 inch hole and be at least 1/8 inch wide. The teeth must have a minimum depth of 3/64 inch between peaks and valleys, be free from burrs or other imperfections, and provide positive locking with the grooves of mating sections, framework, and brackets. The serration on the top circular connection of a signal section must have a valley at the 0 degree position and the serration on the bottom circular connection must have a peak at the 0 degree position, both aligned perpendicular to the front of the section. Connections must permit the assembly of a multi-section signal with the front of each section aligned within 1 degree.

Provide at least two latching points with latch pads and manual Type 316 or 304 stainless steel latching devices that are tamper resistant.

If backplates are mechanically attached, each signal section must have four backplate mounting attachment points on the back of the signal, on or no more than three inches from each section corner. Attachment points must be capable of accepting No. 10-16x3/8 inch or No. 10-24x3/8 inch Type 316 or 304 stainless steel screws for attaching backplates.

Tri-stud washers, when utilized to secure signal sections, must have a minimum thickness of 0.090 inches. For five-section cluster assemblies, tri-stud washers used to attach the

top signal section to the multi-signal bracket and the multi-signal bracket to the bottom four signal sections must have a minimum thickness of 3/8 inches. When fastened together, washer distortion is not allowed.

Design each signal section to prevent the accumulation of standing water within the assembly. All sections comprising a single multi-section assembly must be securely fastened together to form a rigid and weather-proof unit.

**995-4.2.1 Doors:** Construct each signal section with at least two hinges for mounting a door. Hinge pins must be captive. Doors must remain captive and secure at all times and be capable of either left or right swing. The door latch must hold the door tightly closed. The door must include slotted pads that allow the door to be opened and closed by engaging or disengaging the latching device. The outside face of the door must include four holes equally spaced around the circumference of the lens opening for the attachment of a visor. The lens opening in the door must have a diameter of 11 to 11-1/2 inches.

**995-4.2.2 Visors:** The rear of the visor must have four tabs, notches, or holes for securing the visor to the signal housing door. The visor mounting method must permit the visor to be rotated and secured at 90 degrees for horizontal signal head installations. All visors must have a minimum length of 9-1/2 inches, and a minimum downward tilt of 3.5 degrees measured from the center of the lens. Tunnel visors must encircle and shield the lens from 300 degrees, plus or minus 10 degrees. Louvers may only be used in combination with full circle visors. Light must not escape between the visor and the door.

**995-4.2.3 Gaskets:** Gaskets must be constructed of weather-resistant material and be glued or sealed where they meet to provide one continuous length of gasket capable of providing a weatherproof seal for the signal assembly. Provide seals between the housing and door, between the lens and the door, and between any other mating surfaces where dust and moisture could enter. Gasket material must meet NEMA 250 and be constructed of temperature stabilized material that prevents any residue from collecting on the internal surfaces of the signal head.

**995-4.2.4 Terminal Blocks:** Provide at least one five-connection terminal block in all three or more section signal head assemblies and at least three five-connection terminal blocks in all five section signal head assemblies. Terminal block connections in the signal assembly must not require any tools other than a screwdriver.

Mount terminal blocks to the signal housing with Type 316 or 304 passivated stainless steel hardware. Use only non-corrosive wire attachment screws approved by the Department.

**995-4.2.5 Color and Finish:** The housing, doors, visors and backplates must be powder coated dull black (Federal Standard 595-37038) with a reflectance value not exceeding 25 percent as measured by ASTM E1347. For plastic heads, the black color must be incorporated into the plastic material before molding.

The finish on interior and exterior surfaces of aluminum signal head assemblies, visors, doors, and housing, must be painted in accordance with Military Standard MIL-PRF-24712A or American Architectural Manufacturers Association-2603-02 and must meet the requirements of ASTM D3359, ASTM D3363, and ASTM D522. Surface erosion, flaking, or oxidation must not occur within the normal life expectancy under typical installation conditions.

**995-4.2.6 Plastic Signal Housings and Visors:** Construct signal housing assembly, door, and visors of UV stabilized plastic with a minimum thickness of 0.1 inches, plus or minus, 0.01 inches, with the following physical properties:

1. Specific Gravity: 1.17 minimum, as per ASTM D792
2. Vicat Softening Temperature: 305-325 F (152-163 C), as per ASTM D1525
3. Brittleness Temperature: Below -200 F (-129 C), as per ASTM D746
4. Flammability: Self-extinguishing, as per ASTM D635
5. Tensile Strength, yield: 8500 PSI (58 MPa) minimum, as per ASTM D638
6. Elongation at yield: 5.5-8.5 %, as per ASTM D638
7. Shear, strength, yield: 5500 PSI (38 Mpa) minimum, as per ASTM D732
8. Izod impact strength, [notched, 1/8 inch]: 15 ft-lb/in (800 j/m) minimum, as per ASTM D256
9. Fatigue strength at 2.5 mm cycles: 950 PSI (6.5 MPa) minimum, as per ASTM D671

**995-4.2.7 Backplates:** Backplates may be constructed of either aluminum or plastic. Minimum thickness for aluminum backplates is 0.060 inch and the minimum thickness for plastic backplates is 0.120 inch. The required width of the top, bottom, and sides of backplates must measure between five to six inches. Color of backplates must be black in accordance with 995-4.2.5. Backplate thickness measurement must not include the retroreflective sheeting thickness.

If backplates are mechanically attached, provide a minimum of four corner mounting attachment points per signal section (for example, a three-section signal assembly would have 12 mounting points). Attachment points must not interfere with the operation of traffic signal section doors. Backplate outside corners must be rounded and all edges must be deburred.

If louvers are provided, louver orientation must be vertical on sides and horizontal on top and bottom of the backplate and must be at least 1/2 inch from the inner and outer edge of the backplate panel. Universal backplates must fit all traffic signals listed on the APL.

Mount the backplate securely to the signal assembly with Type 316 or 304 passivated stainless steel installation hardware. Backplates, if mechanically attached, must be marked in accordance with 995-4.1, on the long sides of the backplate.

Backplates must include retroreflective borders using Type IV yellow retroreflective sheeting listed on the APL. Place a 2 inch border on the entire outer perimeter of the backplate panel, no closer than 1/2 inch from any louvers.

All materials must be designed for exterior use and be UV stable.

**995-4.2.7.1 Flexible Backplates:** Flexible backplates must allow the entire length of longer portions of the backplate to flex 90 degrees, or until the backplate width is reduced to 2.5 inches or less, when influenced by high wind conditions, and return to zero degrees after the wind conditions subside. Flexible backplates must maintain visibility of the retroreflective border to approaching traffic, with up to 40 mph winds.

**995-4.2.8 Light-Emitting Diode Optical Unit:** The LED optical unit must conform to the requirements of ITE's Performance Specification, Vehicle Traffic Control Signal



Heads - Light Emitting Diode (LED) Circular Signal Supplement, dated June 27, 2005 or Vehicle Traffic Control Signal Heads - Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement, dated July 1, 2007, with the following exceptions.

**995-4.2.8.1 Physical and Mechanical Requirements:** Retrofit LED signal modules must be compatible with all traffic signal housings listed on the APL. The rear of the LED signal module must be marked in accordance with 995-4.1.

**995-4.2.8.2 LED Signal Module Lens:** The lens must be tinted with an appropriate color (red, amber, or green) to reduce sun phantom affect and enhance on/off contrast. The tinting must be uniform across the face of the lens and be free from streaks, wrinkles, chips, bubbles, or other imperfections. If a polymer lens is used, a surface coating must be incorporated to provide abrasion resistance.

**995-4.2.8.3 Minimum Maintained Luminous Intensity Values:** Red and green modules must meet the requirements of ITE's Performance Specification, Vehicle Traffic Control Signal Heads - Light Emitting Diode (LED) Circular Signal Supplement, dated June 27, 2005, with the exception that yellow modules must be 1.7 times brighter than the ITE specification. Arrow modules must meet the requirements of ITE's Performance Specification, Vehicle Traffic Control Signal Heads - Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement, dated July 1, 2007.

**995-4.2.9 Electrical:** Electrical conductors for LED signal modules must be a minimum of 36 inches in length. Each lead from the LED module must be terminated with insulated slide-on terminals. The conductors must be color coded to identify the color of the module as follows:

1. White must identify the neutral lead.
2. Red circular signals must be identified with a red lead, yellow circular signals with a yellow lead, and green circular signals with a green lead.
3. Red arrows must be identified with a red and black tracer lead, yellow arrows with a yellow and black tracer lead, and green arrows with a green and black tracer lead.

## **995-5 Pedestrian Signal Assemblies.**

**995-5.1 General:** Pedestrian signal assemblies shall be listed on the Department's Approved Product List (APL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6.

Pedestrian signal assemblies must meet the requirements of Section 603, the latest edition of the Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD), and the Institute of Transportation Engineers (ITE) standard for Pedestrian Traffic Control Signal Indications.

**995-5.2 Housing and Visor:** The housing must be weatherproof, sectional and may consist of as many sections as optical units. The housing must prevent light from escaping from one unit to another. The top and bottom opening of the housing must include a circular 72-tooth serrated connection (2 inch nominal I.D.) capable of providing positive positioning and alignment in 5 degree increments. When assembled and tightened, these connections must prevent rotation or misalignment. The serrated area must start at the outside of the 2 inch hole and be at least 1/8 inch wide. The teeth must have a minimum depth of 3/64 inch between peaks and valleys, free from burrs or other imperfections, and provide positive locking with the grooves of mating sections, framework, and brackets. The serration on the top circular connection of a signal section must have a valley at the 0 degree position and the serration on the bottom circular connection must have a peak at the 0 degree position, both aligned perpendicular

to the front of the section. Housings must include latch pads and manual stainless steel latching devices that are captive, or non-removable. Housings must have at least two latching points.

Reinforce all mounting points and adjacent housing material. The door enclosing the lens must be hinged and held securely to the housing. Provide a gasket meeting the requirements of ASTM D1056, Grade 2B2 between the housing and door and between the lens and door. If the fitting between the housing and door is weather-tight, the gasket may be omitted.

Provide a visor or egg-crate louver that eliminates sun phantom for each signal face. Visor must be three-sided and extend a minimum of 7 inches at the top from the face of the lens. The visor must be constructed of noncorrosive No. 18 gauge sheet metal, not less than 0.05 inch thick, or 0.1 inch thick polycarbonate.

All metal housings and visors must be powder-coat painted black in accordance with Military Standard MIL-PRF-24712A or AAMA-2603-02 with a reflectance value not exceeding 25 percent as measured by ASTM E97. For polycarbonate heads, the black color must be incorporated into the material before the molding process.

The housing must be constructed of a non-corrosive material. Cast metal parts must have a minimum tensile strength of 1 ksi (117 MPa) and sheet metal parts a minimum tensile strength of 27 ksi (186 MPa).

**995-5.2.1 Die Castings:** Meet the requirements in ASTM B85 for the physical characteristics and chemical content for alloys S12A, S12B, SC84A, SC84B, SG100A and SG100B.

**995-5.2.2 Sand Castings:** Meet the requirements in ASTM B26 for the physical characteristics and chemical content for alloys S5A and CS72A.

**995-5.2.3 Permanent Mold Castings:** Meet the requirements in ASTM B108 for the physical characteristics and chemical content for alloys S5A and CS72A.

**995-5.2.4 Polycarbonate:** Polycarbonate housing assemblies, doors and visors must be molded from ultraviolet stabilized polycarbonate plastic with a minimum thickness of 0.1 inches, plus or minus 0.01 inch, and provide the following physical properties:

<u>Table 995-2</u>		
<u>Test</u>	<u>Minimum Requirement</u>	<u>Method</u>
<u>Specific Gravity</u>	<u>1.17</u>	<u>ASTM D 792</u>
<u>Vicat Softening Temp.</u>	<u>305-325°F (152 – 163°C)</u>	<u>ASTM D 1525</u>
<u>Brittleness Temp.</u>	<u>Below -200°F (-129°C)</u>	<u>ASTM D 746</u>
<u>Flammability</u>	<u>Self-extinguishing</u>	<u>ASTM D 635</u>
<u>Tensile Strength</u>	<u>Yield, 8500 psi (58 MPa)</u>	<u>ASTM D 638</u>
<u>Elongation at yield</u>	<u>5.5 - 8.5%</u>	<u>ASTM D 638</u>
<u>Shear Strength</u>	<u>Yield, 5500 psi (38 MPa)</u>	<u>ASTM D 732</u>
<u>Izod impact strength</u>	<u>15ft-lb/in (800 J/m)</u>	<u>ASTM D 256</u>
<u>Fatigue strength</u>	<u>950 psi (6.5MPa) at 2.5 mm cycles</u>	<u>ASTM D 671</u>

**995-5.3 Light Emitting Diode (LED) Pedestrian Signal Optical Unit (State Standard):** Provide a countdown pedestrian signal module meeting the requirements of the latest ITE LED Pedestrian Signal Specifications.

**995-5.4 Electrical:** Wiring and terminals must meet the size, insulation, length and color-coding of the current ITE Pedestrian Traffic Control Signal Indicators LED specification. Wires must not have bare wiring exposed where wires are secured.

The pedestrian signal must include a terminal block containing a minimum of three circuits, each with two noncorrosive screw-type terminals. Each terminal must accommodate three No. 18 AWG conductors and be labeled for ease of identification. The terminal block must not be obstructed and be visible when the housing is open.

**995-5.5 Hardware:** All brackets used to mount pedestrian signals must be an aluminum alloy cast fitting, pipe or equivalent material approved by the Department. Aluminum and aluminum alloy bars, rods, wires, profiles, and tubes must meet ASTM B221. Aluminum-alloy sand casting must meet ASTM B26. All mounting hardware must be painted black with a reflectance value not exceeding 25 percent as measured by ASTM E97.

Ensure that all assembly hardware, including nuts, bolts, external screws and locking washers less than 5/8 inch in diameter, are Type 304 or 316 passivated stainless steel. Stainless Steel bolts, screws and studs must meet ASTM F593. Nuts must meet ASTM F594. All assembly hardware greater than or equal to 5/8 inch in diameter must be galvanized. Bolts, studs, and threaded rod must meet ASTM A307. Structural bolts must meet ASTM F3125, Grade A325.



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KEVIN J. THIBAUT, P.E.  
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August 16, 2021

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

Re: State Specifications Office  
Section: **995**  
Proposed Specification: **REVISED 9950207 Traffic Control Signal and Device Materials.**

Dear Mr. Nguyen:

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

The changes are proposed by Derek Vollmer from the Traffic Engineering and Operations Office is to move the materials section from Division II to Division III. Since the Wrong Way Vehicle Detection System must interface with the SunGuide Software, a supplemental requirements document will facilitate the application programming interface development. This proposed specification revision is associated with changes to Section 650 and 653.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

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Attachment

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## TRAFFIC CONTROL SIGNAL AND DEVICE MATERIALS (REV 5-14-21)

SUBARTICLE 995-2.7.2 is deleted and the following substituted:

**995-2.7.2 Communications:** Major components of the WWVDS (such as the sensor and any separate hardware used for contact closures) shall include a minimum of one serial or Ethernet communications interface and shall meet the following criteria:

1. The serial interface and connector conforms to TIA-232 standards and the serial ports support data rates up to 115200 bps; error detection utilizing parity bits (i.e., none, even, and odd); and stop bits (1 or 2).
2. Wired Ethernet interfaces provides, at a minimum, a 10/100 Base TX connection. Verify that all unshielded twisted pair/shielded twisted pair network cables and connectors comply with TIA-568.
3. Wireless communications are secure and that wireless devices are FCC certified. The FCC identification number is displayed on an external label and all WWVDS devices operate within their FCC frequency allocation.
4. Cellular communications devices are compatible with the cellular carrier used by the agency responsible for system operation and maintenance.
5. The system can be configured and monitored via one or more communications interface.
6. The WWVDS is compatible with the Department's SunGuide® software. The SunGuide software requirements are listed in supplemental requirement SR-995-2.7.2-01, Supplemental Wrong Way Vehicle Detection System SunGuide HTTP Protocol, as published on the Department's State Traffic Engineering and Operations Office website at the following URL: <https://www.fdot.gov/traffic/Traf-Sys/Product-Specifications.shtm>.
7. For WWVDS installed on ramps, the device shall:
  - a. ~~Send an alert and a sequence of images for up to ten seconds to the SunGuide® software when the wrong-way vehicle is detected.that covers a configurable time before and after the wrong-way vehicle detection.~~
  - b. Send a sequence of images for up to ten seconds to the SunGuide software that covers a configurable time before and after the wrong-way vehicle detection.
  - c. Activate all highlighted signs associated with the WWVDS.

SUBARTICLE 995-2.9.1 is deleted and the following substituted:

### **995-2.9 Traffic Data Detection System Acceptance Requirements:**

995-2.9.1 Data Accuracy: Provide aThe vehicle detection system shall be capable of meeting the minimum total roadway segment accuracy levels of 95% for volume, 90% for occupancy, and 90% for speed for all lanes, up to the maximum number of lanes that the device can monitor as specified by the manufacturer.

To verify conformance with the accuracy requirements in this Section and as a precondition for listing on the APL, sample data collected from the vehicle detection system

will be compared against ground truth data collected during the same time by human observation or by another method approved by the TERL. Sample data shall be collected over several time periods under a variety of traffic conditions. Weight each data sample to represent the predominant conditions over the course of a 24-hour period. Samples shall consist of 15- and 30-minute data sets collected at various times of the day. Representative data periods and their assigned weights are provided in Table 995-1.

SECTION 995 is expanded by the following new Articles:

#### **995-4 Vehicular Traffic Signal Assemblies.**

**995-4.1 General:** Vehicular traffic signal assemblies shall be listed on the Department's Approved Product List (APL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6.

Vehicular traffic signal assemblies must meet the requirements of Section 603 and the Institute of Transportation Engineers (ITE) Standard for Vehicle Traffic Control Signal Heads.

Fastening hardware such as bolts, screws, nuts, washers, latches, and studs must be SAE Type 316 or 304 stainless steel.

Horizontal signal assemblies must be constructed so the door hinges, when installed, are located on the bottom of the signal assembly. Vertical mounted five-section cluster assemblies must be constructed so that the door hinges, when installed, are located along the outside edges of the complete assembly and each section opens away from the horizontally adjacent section.

Vehicular traffic signal assemblies must be permanently marked with the manufacturer's name or trademark, part or model number and date of manufacture or serial number.

**995-4.2 Twelve Inch Signal Head Assemblies:** Construct the assembly of materials and alloys specified in the ITE Standard for Vehicle Traffic Control Signal Heads.

Construct signal housings to allow adjustment in multiple directions for proper signal alignment. If a serrated connection is used for positioning and alignment of the signal, the top and bottom opening of each signal head section must include a circular 72-tooth serrated connection (2 inch nominal I.D.) capable of providing positive positioning and alignment in 5 degree increments. When assembled and tightened, these connections must prevent rotation or misalignment of the signal head as well as misalignment between sections. The serrated area must start at the outside of the 2 inch hole and be at least 1/8 inch wide. The teeth must have a minimum depth of 3/64 inch between peaks and valleys, be free from burrs or other imperfections, and provide positive locking with the grooves of mating sections, framework, and brackets. The serration on the top circular connection of a signal section must have a valley at the 0 degree position and the serration on the bottom circular connection must have a peak at the 0 degree position, both aligned perpendicular to the front of the section. Connections must permit the assembly of a multi-section signal with the front of each section aligned within 1 degree.

Provide at least two latching points with latch pads and manual Type 316 or 304 stainless steel latching devices that are tamper resistant.

If backplates are mechanically attached, each signal section must have four backplate mounting attachment points on the back of the signal, on or no more than three inches



from each section corner. Attachment points must be capable of accepting No. 10-16x3/8 inch or No. 10-24x3/8 inch Type 316 or 304 stainless steel screws for attaching backplates.

Tri-stud washers, when utilized to secure signal sections, must have a minimum thickness of 0.090 inches. For five-section cluster assemblies, tri-stud washers used to attach the top signal section to the multi-signal bracket and the multi-signal bracket to the bottom four signal sections must have a minimum thickness of 3/8 inches. When fastened together, washer distortion is not allowed.

Design each signal section to prevent the accumulation of standing water within the assembly. All sections comprising a single multi-section assembly must be securely fastened together to form a rigid and weather-proof unit.

**995-4.2.1 Doors:** Construct each signal section with at least two hinges for mounting a door. Hinge pins must be captive. Doors must remain captive and secure at all times and be capable of either left or right swing. The door latch must hold the door tightly closed. The door must include slotted pads that allow the door to be opened and closed by engaging or disengaging the latching device. The outside face of the door must include four holes equally spaced around the circumference of the lens opening for the attachment of a visor. The lens opening in the door must have a diameter of 11 to 11-1/2 inches.

**995-4.2.2 Visors:** The rear of the visor must have four tabs, notches, or holes for securing the visor to the signal housing door. The visor mounting method must permit the visor to be rotated and secured at 90 degrees for horizontal signal head installations. All visors must have a minimum length of 9-1/2 inches, and a minimum downward tilt of 3.5 degrees measured from the center of the lens. Tunnel visors must encircle and shield the lens from 300 degrees, plus or minus 10 degrees. Louvers may only be used in combination with full circle visors. Light must not escape between the visor and the door.

**995-4.2.3 Gaskets:** Gaskets must be constructed of weather-resistant material and be glued or sealed where they meet to provide one continuous length of gasket capable of providing a weatherproof seal for the signal assembly. Provide seals between the housing and door, between the lens and the door, and between any other mating surfaces where dust and moisture could enter. Gasket material must meet NEMA 250 and be constructed of temperature stabilized material that prevents any residue from collecting on the internal surfaces of the signal head.

**995-4.2.4 Terminal Blocks:** Provide at least one five-connection terminal block in all three or more section signal head assemblies and at least three five-connection terminal blocks in all five section signal head assemblies. Terminal block connections in the signal assembly must not require any tools other than a screwdriver.

Mount terminal blocks to the signal housing with Type 316 or 304 passivated stainless steel hardware. Use only non-corrosive wire attachment screws approved by the Department.

**995-4.2.5 Color and Finish:** The housing, doors, visors and backplates must be powder coated dull black (Federal Standard 595-37038) with a reflectance value not exceeding 25 percent as measured by ASTM E1347. For plastic heads, the black color must be incorporated into the plastic material before molding.

The finish on interior and exterior surfaces of aluminum signal head assemblies, visors, doors, and housing, must be painted in accordance with Military Standard MIL-PRF-24712A or American Architectural Manufacturers Association-2603-02 and must meet the requirements of ASTM D3359, ASTM D3363, and ASTM D522. Surface erosion,

flaking, or oxidation must not occur within the normal life expectancy under typical installation conditions.

**995-4.2.6 Plastic Signal Housings and Visors:** Construct signal housing assembly, door, and visors of UV stabilized plastic with a minimum thickness of 0.1 inches, plus or minus, 0.01 inches, with the following physical properties:

1. Specific Gravity: 1.17 minimum, as per ASTM D792
2. Vicat Softening Temperature: 305-325 F (152-163 C), as per ASTM D1525
3. Brittleness Temperature: Below -200 F (-129 C), as per ASTM D746
4. Flammability: Self-extinguishing, as per ASTM D635
5. Tensile Strength, yield: 8500 PSI (58 MPa) minimum, as per ASTM D638
6. Elongation at yield: 5.5-8.5 %, as per ASTM D638
7. Shear, strength, yield: 5500 PSI (38 Mpa) minimum, as per ASTM D732
8. Izod impact strength, [notched, 1/8 inch]: 15 ft-lb/in (800 j/m) minimum, as per ASTM D256
9. Fatigue strength at 2.5 mm cycles: 950 PSI (6.5 MPa) minimum, as per ASTM D671

**995-4.2.7 Backplates:** Backplates may be constructed of either aluminum or plastic. Minimum thickness for aluminum backplates is 0.060 inch and the minimum thickness for plastic backplates is 0.120 inch. The required width of the top, bottom, and sides of backplates must measure between five to six inches. Color of backplates must be black in accordance with 995-4.2.5. Backplate thickness measurement must not include the retroreflective sheeting thickness.

If backplates are mechanically attached, provide a minimum of four corner mounting attachment points per signal section (for example, a three-section signal assembly would have 12 mounting points). Attachment points must not interfere with the operation of traffic signal section doors. Backplate outside corners must be rounded and all edges must be deburred.

If louvers are provided, louver orientation must be vertical on sides and horizontal on top and bottom of the backplate and must be at least 1/2 inch from the inner and outer edge of the backplate panel. Universal backplates must fit all traffic signals listed on the APL.

Mount the backplate securely to the signal assembly with Type 316 or 304 passivated stainless steel installation hardware. Backplates, if mechanically attached, must be marked in accordance with 995-4.1, on the long sides of the backplate.

Backplates must include retroreflective borders using Type IV yellow retroreflective sheeting listed on the APL. Place a 2 inch border on the entire outer perimeter of the backplate panel, no closer than 1/2 inch from any louvers.

All materials must be designed for exterior use and be UV stable.

**995-4.2.7.1 Flexible Backplates:** Flexible backplates must allow the entire length of longer portions of the backplate to flex 90 degrees, or until the backplate width is reduced to 2.5 inches or less, when influenced by high wind conditions, and return to zero degrees after the wind conditions subside. Flexible backplates must maintain visibility of the retroreflective border to approaching traffic, with up to 40 mph winds.



**995-4.2.8 Light-Emitting Diode Optical Unit:** The LED optical unit must conform to the requirements of ITE's Performance Specification, Vehicle Traffic Control Signal Heads - Light Emitting Diode (LED) Circular Signal Supplement, dated June 27, 2005 or Vehicle Traffic Control Signal Heads - Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement, dated July 1, 2007, with the following exceptions.

**995-4.2.8.1 Physical and Mechanical Requirements:** Retrofit LED signal modules must be compatible with all traffic signal housings listed on the APL. The rear of the LED signal module must be marked in accordance with 995-4.1.

**995-4.2.8.2 LED Signal Module Lens:** The lens must be tinted with an appropriate color (red, amber, or green) to reduce sun phantom affect and enhance on/off contrast. The tinting must be uniform across the face of the lens and be free from streaks, wrinkles, chips, bubbles, or other imperfections. If a polymer lens is used, a surface coating must be incorporated to provide abrasion resistance.

**995-4.2.8.3 Minimum Maintained Luminous Intensity Values:** Red and green modules must meet the requirements of ITE's Performance Specification, Vehicle Traffic Control Signal Heads - Light Emitting Diode (LED) Circular Signal Supplement, dated June 27, 2005, with the exception that yellow modules must be 1.7 times brighter than the ITE specification. Arrow modules must meet the requirements of ITE's Performance Specification, Vehicle Traffic Control Signal Heads - Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement, dated July 1, 2007.

**995-4.2.9 Electrical:** Electrical conductors for LED signal modules must be a minimum of 36 inches in length. Each lead from the LED module must be terminated with insulated slide-on terminals. The conductors must be color coded to identify the color of the module as follows:

1. White must identify the neutral lead.
2. Red circular signals must be identified with a red lead, yellow circular signals with a yellow lead, and green circular signals with a green lead.
3. Red arrows must be identified with a red and black tracer lead, yellow arrows with a yellow and black tracer lead, and green arrows with a green and black tracer lead.

## **995-5 Pedestrian Signal Assemblies.**

**995-5.1 General:** Pedestrian signal assemblies shall be listed on the Department's Approved Product List (APL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6.

Pedestrian signal assemblies must meet the requirements of Section 603, the latest edition of the Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD), and the Institute of Transportation Engineers (ITE) standard for Pedestrian Traffic Control Signal Indications.

**995-5.2 Housing and Visor:** The housing must be weatherproof, sectional and may consist of as many sections as optical units. The housing must prevent light from escaping from one unit to another. The top and bottom opening of the housing must include a circular 72-tooth serrated connection (2 inch nominal I.D.) capable of providing positive positioning and alignment in 5 degree increments. When assembled and tightened, these connections must prevent rotation or misalignment. The serrated area must start at the outside of the 2 inch hole and be at least 1/8 inch wide. The teeth must have a minimum depth of 3/64 inch between peaks and valleys, free from burrs or other imperfections, and provide positive locking with the grooves of mating sections, framework, and brackets. The serration on the top circular

connection of a signal section must have a valley at the 0 degree position and the serration on the bottom circular connection must have a peak at the 0 degree position, both aligned perpendicular to the front of the section. Housings must include latch pads and manual stainless steel latching devices that are captive, or non-removable. Housings must have at least two latching points.

Reinforce all mounting points and adjacent housing material. The door enclosing the lens must be hinged and held securely to the housing. Provide a gasket meeting the requirements of ASTM D1056, Grade 2B2 between the housing and door and between the lens and door. If the fitting between the housing and door is weather-tight, the gasket may be omitted.

Provide a visor or egg-crate louver that eliminates sun phantom for each signal face. Visor must be three-sided and extend a minimum of 7 inches at the top from the face of the lens. The visor must be constructed of noncorrosive No. 18 gauge sheet metal, not less than 0.05 inch thick, or 0.1 inch thick polycarbonate.

All metal housings and visors must be powder-coat painted black in accordance with Military Standard MIL-PRF-24712A or AAMA-2603-02 with a reflectance value not exceeding 25 percent as measured by ASTM E97. For polycarbonate heads, the black color must be incorporated into the material before the molding process.

The housing must be constructed of a non-corrosive material. Cast metal parts must have a minimum tensile strength of 1 ksi (117 MPa) and sheet metal parts a minimum tensile strength of 27 ksi (186 MPa).

**995-5.2.1 Die Castings:** Meet the requirements in ASTM B85 for the physical characteristics and chemical content for alloys S12A, S12B, SC84A, SC84B, SG100A and SG100B.

**995-5.2.2 Sand Castings:** Meet the requirements in ASTM B26 for the physical characteristics and chemical content for alloys S5A and CS72A.

**995-5.2.3 Permanent Mold Castings:** Meet the requirements in ASTM B108 for the physical characteristics and chemical content for alloys S5A and CS72A.

**995-5.2.4 Polycarbonate:** Polycarbonate housing assemblies, doors and visors must be molded from ultraviolet stabilized polycarbonate plastic with a minimum thickness of 0.1 inches, plus or minus 0.01 inch, and provide the following physical properties:

<u>Table 995-2</u>		
<u>Test</u>	<u>Minimum Requirement</u>	<u>Method</u>
<u>Specific Gravity</u>	<u>1.17</u>	<u>ASTM D 792</u>
<u>Vicat Softening Temp.</u>	<u>305-325°F (152 – 163°C)</u>	<u>ASTM D 1525</u>
<u>Brittleness Temp.</u>	<u>Below -200°F (-129°C)</u>	<u>ASTM D 746</u>
<u>Flammability</u>	<u>Self-extinguishing</u>	<u>ASTM D 635</u>
<u>Tensile Strength</u>	<u>Yield, 8500 psi (58 MPa)</u>	<u>ASTM D 638</u>
<u>Elongation at yield</u>	<u>5.5 - 8.5%</u>	<u>ASTM D 638</u>
<u>Shear Strength</u>	<u>Yield, 5500 psi (38 MPa)</u>	<u>ASTM D 732</u>
<u>Izod impact strength</u>	<u>15ft-lb/in (800 J/m)</u>	<u>ASTM D 256</u>
<u>Fatigue strength</u>	<u>950 psi (6.5MPa) at 2.5 mm cycles</u>	<u>ASTM D 671</u>

**995-5.3 Light Emitting Diode (LED) Pedestrian Signal Optical Unit (State Standard):** Provide a countdown pedestrian signal module meeting the requirements of the latest ITE LED Pedestrian Signal Specifications.

**995-5.4 Electrical:** Wiring and terminals must meet the size, insulation, length and color-coding of the current ITE Pedestrian Traffic Control Signal Indicators LED specification. Wires must not have bare wiring exposed where wires are secured.

The pedestrian signal must include a terminal block containing a minimum of three circuits, each with two noncorrosive screw-type terminals. Each terminal must accommodate three No. 18 AWG conductors and be labeled for ease of identification. The terminal block must not be obstructed and be visible when the housing is open.

**995-5.5 Hardware:** All brackets used to mount pedestrian signals must be an aluminum alloy cast fitting, pipe or equivalent material approved by the Department. Aluminum and aluminum alloy bars, rods, wires, profiles, and tubes must meet ASTM B221. Aluminum-alloy sand casting must meet ASTM B26. All mounting hardware must be painted black with a reflectance value not exceeding 25 percent as measured by ASTM E97.

Ensure that all assembly hardware, including nuts, bolts, external screws and locking washers less than 5/8 inch in diameter, are Type 304 or 316 passivated stainless steel. Stainless Steel bolts, screws and studs must meet ASTM F593. Nuts must meet ASTM F594. All assembly hardware greater than or equal to 5/8 inch in diameter must be galvanized. Bolts, studs, and threaded rod must meet ASTM A307. Structural bolts must meet ASTM F3125, Grade A325.



*Florida Department of Transportation*

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SECRETARY

August 3, 2021

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

Re: State Specifications Office  
Section: **997**  
Proposed Specification: **9970000 Traffic Monitoring Site Materials.**

Dear Mr. Nguyen:

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

The changes are proposed by Eric Griffin from the Transportation Data and Analytics to implement a new Section in Division III for Traffic Monitoring Site Materials. The proposed specification is associated with Section 695.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**TRAFFIC MONITORING SITE MATERIALS  
(REV 6-23-21)**

The following new Section is added after Section 996.

**SECTION 997**  
**TRAFFIC MONITORING SITE MATERIALS**

**997-1 Description.**

This Section governs the requirements for all traffic monitoring site (TMS) material as shown in the Plans and Standard Plans.

Provide products compatible with all other TMS APL equipment. Any electronics unit or software submitted for approval must be compatible with or convert the data into a format compatible with the Department’s polling and processing software. Any substitute software modules submitted must be tested and approved.

Provide products constructed of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal. All fasteners exposed to the elements shall be Type 304 or 316 passivated stainless steel.

**997-1.1 Approved Product List Submittal Requirements:** Manufacturers seeking evaluation of their product for inclusion on the APL shall submit an application in accordance with Section 6 including documentation identified in Table 997-1 and this section. Documentation must demonstrate that the product meets the requirements of this Section.

<u>Table 997-1</u>	
<u>Documentation</u>	<u>Requirements</u>
<u>Technical Data Sheets</u>	<u>Provide information as required in this Section.</u>
<u>Product Label</u>	<u>Provide equipment permanently marked with manufacturer name or trademark, part number, and date of manufacture or serial number.</u>
<u>Product Sample</u>	<u>When requested, submit a product sample.</u>
<u>Installation Instructions</u>	<u>Required.</u>
<u>Product Photo</u>	<u>Display significant features of the products.</u>

**997-2 Vehicle Sensors (Non-Weight).**

**997-2.1 General:** Non-weight vehicle sensors include microwave vehicle detection system (MVDS), axle sensors, and non-motorized sensors.

**997-2.2 Axle Sensor and Non-Motorized Sensor:** In-Roadway axle sensors shall meet the physical characteristics in Table 997-2.

<u>Table 997-2</u> <u>Physical Characteristics, Axle Sensor</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>

<u>Sensor Element Dimensions</u>	<u>Technical Data Sheet</u>	<u>Approximately 6 ft. to 10 ft. in length, 3/16 in. to 3/8 in. in diameter (varies by manufacturer)</u>
<u>Sensor Element Material</u>	<u>Technical Data Sheet</u>	<u>Pressure sensing piezoelectric</u>
<u>Pavement Operating Temperature Range</u>	<u>Technical Data Sheet</u>	<u>Minimum 0°F to +150°F</u>
<u>Output Signal</u>	<u>Technical Data Sheet</u>	<u>Minimum +200mV or produce a charge signal for passenger car/pickup truck axle @ 70°F with less than 10% negative signal for non-WIM axle sensors</u>
<u>Environmental Requirements</u>	<u>Technical Data Sheet</u>	<u>NEMA TS-2-2016, Section 3.</u>

In-Sidewalk and Shared Use Path non-motorized sensors shall meet the physical characteristics in Table 997-3.

<u>Table 997-3</u> <u>Physical Characteristics, Non-Motorized Sensor</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Sensor Element Dimensions</u>	<u>Technical Data Sheet</u>	<u>Approximately 3 ft. in length, 3/16 in. to 3/8 in. in diameter (varies by manufacturer)</u>
<u>Sensor Element Material</u>	<u>Technical Data Sheet</u>	<u>Pressure sensing piezoelectric</u>
<u>Pavement Operating Temperature Range</u>	<u>Technical Data Sheet</u>	<u>Minimum 0°F to +150°F</u>
<u>Output Signal Range</u>	<u>Technical Data Sheet</u>	<u>Minimum +34 mV (front axle) and +65mV (rear axle), 220 lb. Passenger bicycle, at 7.3 MPH</u>
<u>Environmental Requirements</u>	<u>Technical Data Sheet</u>	<u>NEMA TS-2-2016, Section 3.</u>

### **997-3 Weight Sensors (In-Roadway).**

**997-3.1 General:** Weight sensors include bending plates, Class I piezoelectric sensors, and quartz piezoelectric sensors.

**997-3.2 Bending Plate:** Provide bending Plate Weigh-In-Motion systems that utilize plates with strain gauges bonded to the underside. The weigh pads shall meet the physical characteristics in Table 997-4.

<u>Table 997-4</u> <u>Physical Characteristics, Bending Plate, Weigh Pad</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Sensor Size</u>	<u>Technical Data Sheet</u>	<u>20 in. wide x 70 in. or 50 in. long</u>

<u>Operating Temperature Range</u>	<u>Technical Data Sheet</u>	<u>-50°F to 176°F</u>
<u>Scale Capacity</u>	<u>Technical Data Sheet</u>	<u>45000 pounds per axle and overload protected to 80000 pounds per axle</u>
<u>Environmental Requirements</u>	<u>Technical Data Sheet</u>	<u>NEMA TS-2-2016, Section 3.</u>

**997-3.3 Piezoelectric Axle Sensor (Class I):** Class I sensors collect Weigh-In-Motion data. The vehicle sensor shall meet the physical characteristics in Table 997-5.

<u>Table 997-5</u> <u>Physical Characteristics, Piezoelectric Axle Sensor, Class I</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Sensor Size</u>	<u>Technical Data Sheet</u>	<u>6 ft. to 8 ft.</u> <u>Flat Element 0.26 in. wide x 0.063 in. thick</u>
<u>Operating Temperature Range</u>	<u>Technical Data Sheet</u>	<u>-40°F to 160°F</u>
<u>Temperature sensitivity</u>	<u>Technical Data Sheet</u>	<u>0.2%/°F</u>
<u>Output Uniformity</u>	<u>Technical Data Sheet</u>	<u>5% to 7%</u>
<u>Output Signal</u>	<u>Technical Data Sheet</u>	<u>250 mV for 400-pound wheel load at 70 F° and 55 mph</u> <u>[250 mV for 181 kg wheel load at 21 C° and 88 kph] Minimum</u>
<u>Insulation Resistance</u>	<u>Technical Data Sheet</u>	<u>≥ 500 MΩ</u>
<u>Passive Signal Cable</u>	<u>Technical Data Sheet</u>	<u>RG 58 C/U with High Density Polyethylene Outer Jacket 0.187” [4.75 mm] OD</u>
<u>Center Core</u>	<u>Technical Data Sheet</u>	<u>16-gauge, flat braided, silver plated copper wire</u>
<u>Piezoelectric Material</u>	<u>Technical Data Sheet</u>	<u>Spiral Wrapped PVDF piezoelectric film</u>
<u>Cable Capacitance</u>	<u>Technical Data Sheet</u>	<u>27 pF/ft [89 pF/m]</u>
<u>Piezoelectric Coefficient</u>	<u>Technical Data Sheet</u>	<u>34 pC/N – nominal</u>
<u>Life</u>	<u>Technical Data Sheet</u>	<u>40 Million ESAL’s [Minimum]</u>
<u>Environmental Requirements</u>	<u>Technical Data Sheet</u>	<u>NEMA TS-2-2016, Section 3.</u>

**997-3.4 Quartz Piezoelectric Sensor:** The quartz piezoelectric sensors collect Weigh-In-Motion data. The quartz sensor shall meet the physical characteristics in Table 997-6.

<u>Table 997-6</u> <u>Physical Characteristics, Quartz Piezoelectric Sensor</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Measuring Range wheel load (At a referenced tire contact area)</u>	<u>Technical Data Sheet</u>	<u>0 to 34000 pounds (8 in. by 12.6 in.)</u>
<u>Overload (twin wheel)</u>	<u>Technical Data Sheet</u>	<u>55000 pounds</u>



<u>Sensitivity – Nominal</u>	<u>Technical Data Sheet</u>	<u>7.6 ± 12% pC/lbf</u>
<u>Sensitivity shift over sensor length</u>	<u>Technical Data Sheet</u>	<u>&lt;± 3%</u>
<u>Threshold</u>	<u>Technical Data Sheet</u>	<u>&lt;0.1 lbf</u>
<u>Linearity</u>	<u>Technical Data Sheet</u>	<u>&lt;± 2% Full Scale Output</u>
<u>Hysteresis</u>	<u>Technical Data Sheet</u>	<u>≤ 2% Full Scale Output</u>
<u>Natural Frequency</u>	<u>Technical Data Sheet</u>	<u>&gt; 5 kHz</u>
<u>Operating Temperature range</u>	<u>Technical Data Sheet</u>	<u>-40°F to 176°F</u>
<u>Temperature coefficient of sensitivity</u>	<u>Technical Data Sheet</u>	<u>-0.04%/°F</u>
<u>Operating Speed</u>	<u>Technical Data Sheet</u>	<u>5 MPH to 100 MPH</u>
<u>Insulation resistance</u>	<u>Technical Data Sheet</u>	<u>&gt; 100 giga ohms</u>
<u>Capacitance with 130 ft. cable</u>	<u>Technical Data Sheet</u>	<u>8 to 12 nano farad</u>
<u>Environmental Requirements</u>	<u>Technical Data Sheet</u>	<u>NEMA TS-2-2016, Section 3.</u>

#### **997-4 Solar Power Unit.**

**997-4.1 General:** Provide solar power unit consisting of the following components: solar panel(s) and mounting hardware; 12 V storage battery; and voltage regulator with wiring and associated mounting hardware.

**997-4.2 Solar Panel Configured for Nominal 12 V<sub>DC</sub>:** Solar panels cannot have internal voltage regulators and must be capable of multiple arrays and series or parallel wiring configurations. Meet the physical characteristics in Table 997-7:

<u>Table 997-7</u> <u>Physical Characteristics, Solar Panel</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Peak power range</u>	<u>Technical Data Sheet</u>	<u>80 to 130 watts.</u>
<u>Voltage</u>	<u>Technical Data Sheet</u>	<u>Maximum power greater than 16.5 V at 77°F</u>
<u>Current</u>	<u>Technical Data Sheet</u>	<u>Maximum power greater than 2.85 A at 77°F.</u>
<u>Photovoltaic modules construction</u>	<u>Technical Data Sheet</u>	<u>Mono or poly-crystalline cells.</u>
<u>AppFrame construction</u>	<u>Technical Data Sheet</u>	<u>Anodized aluminum.</u>
<u>Mounting hardware construction</u>	<u>Technical Data Sheet</u>	<u>Anodized, galvanized or stainless-steel.</u>

**997-4.3 Battery 12 V:** Meet the physical characteristics in Table 997-8:

<u>Table 997-8</u> <u>Physical Characteristics, Battery 12 V</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
		<u>Rechargeable for photovoltaic application.</u>
		<u>Valve regulated lead-calcium gelled electrolyte or absorbed</u>



		<u>glass mat.</u>
<u>Case Construction</u>	<u>Technical Data Sheet</u>	<u>ABS Plastic or Polypropylene.</u>
<u>Current discharge rate</u>	<u>Technical Data Sheet</u>	<u>Minimum of 100 hours at 0.9 amperes.</u>
<u>Dimensions</u>	<u>Technical Data Sheet</u>	<u>Approximately 12 inches by 7 inches by 9 inches.</u>

**997-4.4 Voltage Regulator Configured for Nominal 12 V<sub>DC</sub>:** Meet the physical characteristics in Table 997-9:

<u>Table 997-9</u> <u>Physical Characteristics, Voltage Regulator</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Voltage for battery charging.</u>	<u>Technical Data Sheet</u>	<u>Minimum of 13.5 V<sub>DC</sub>.</u>
		<u>Begin charging when battery voltage is 13.3 V or less.</u>
		<u>Discontinue charging when battery voltage is 14.5 V.</u>
<u>Quiescent current</u>	<u>Technical Data Sheet</u>	<u>Maximum 15 mA.</u>
<u>Operating Temperature range</u>	<u>Technical Data Sheet</u>	<u>0 to 122°F.</u>
<u>Dimensions</u>	<u>Technical Data Sheet</u>	<u>Approximately 2 inches by 5 inches by 1 inch.</u>

**997-5 Site Modem:** Meet the physical characteristics in Table 997-10:

<u>Table 997-10</u> <u>Physical Characteristics, Site Modem</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Configuration</u>	<u>Technical Data Sheet</u>	<u>1.The device shall be field configurable to be powered from 12 V<sub>DC</sub>.</u> <u>2.The device shall have the ability and be configured to utilize a network service that shall be at a minimum 4G LTE with fallback to 3G EV-DO.</u>

<p><b><u>Protocols:</u></b> The device shall have the ability to utilize, at a minimum, the following protocols:</p>	<p><u>Technical Data Sheet</u></p>	<ol style="list-style-type: none"> <li>1. <u>Network: TCP/IP, UDP/IP, Domain Name System (DNS)</u></li> <li>2. <u>Routing: Network Address Translation (NAT), Host Port Routing, DHCP, Point-to-Point Protocol over Ethernet (PPPoE), VLAN, Virtual Router Redundancy Protocol (VRRP), Reliable Static Route.</u></li> <li>3. <u>Application: Short Message Service (SMS), Telnet/SSH, Reverse Telnet, Simple Mail Transfer Protocol (SMTP), SNMP, SNTp, Reliable Static Route</u></li> <li>4. <u>Serial: TCP/UDP Packet Assembly Disassembly (PAD) Mode, Modbus (ASCII, RTU, Variable), Point-to-Point Protocol (PPP)</u></li> </ol>
<p><b><u>Event Reporting:</u></b> The device shall have the capability to record and report, at a minimum, the following events in plain text:</p>	<p><u>Technical Data Sheet</u></p>	<ol style="list-style-type: none"> <li>1. <u>Network parameters</u></li> <li>2. <u>Data usage</u></li> <li>3. <u>Power</u></li> <li>4. <u>Device temperature</u></li> <li>5. <u>Digital input</u></li> <li>6. <u>Global Positioning</u></li> <li>7. <u>System/Automatic</u></li> <li>8. <u>Vehicle Locator (GPS/AVL)</u></li> <li>9. <u>Timer</u></li> </ol>
<p><b><u>Security:</u></b> The device shall have the following security provisions:</p>	<p><u>Technical Data Sheet</u></p>	<ol style="list-style-type: none"> <li>1. <u>Ability to establish VPN tunnels.</u></li> <li>2. <u>IPsec, Secure Sockets Layer (SSL), and Generic Routing Encapsulation (GRE) VPN client</u></li> <li>3. <u>Port forwarding and Demilitarized Zone (DMZ)</u></li> <li>4. <u>Port filtering</u></li> <li>5. <u>Trusted IP</u></li> <li>6. <u>MAC address filtering</u></li> </ol>
<p><u>Operating Temperature range</u></p>	<p><u>Technical Data Sheet</u></p>	<p><u>Minimum 0 to 158°F.</u></p>

<p><u>Antenna: Use an antenna that meets the following requirements:</u></p>	<p><u>Technical Data Sheet</u></p>	<p><u>1. Dual diversity</u> <u>2. Minimum NEMA rating of NEMA 3</u> <u>3. Frequencies: F<sub>1</sub> = 824 to 896 MHz, F<sub>2</sub> = 1850 to 1990 MHz, F<sub>3</sub> = 1850 to 1955 MHz, F<sub>4</sub> = 1710 to 1770 MHz, F<sub>5</sub> = 2110 to 2170 MHz</u> <u>4. Voltage Standing Wave Ratio (VSWR) of 1.5:1 or less at resonant point</u> <u>5. 50 <math>\Omega</math> nominal impedance</u> <u>6. Gain of 3.0 dB to 5.15 dB</u> <u>7. Omni-directional radiation pattern</u> <u>8. Vertical polarization</u> <u>9. Glass-filled polypropylene radome</u> <u>10. Adhesive mounting or Bolt mount</u> <u>11. SMA male plug connectors 10 ft. (minimum) coaxial length</u></p>
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*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

August 24, 2021

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

Re: State Specifications Office  
Section: **997**  
Proposed Specification: **REVISED 9970000 Traffic Monitoring Site Materials.**

Dear Mr. Nguyen:

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

The changes are proposed by Eric Griffin from the Transportation Data and Analytics to implement a new Section in Division III for Traffic Monitoring Site Materials. The proposed specification is associated with Section 695.

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

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/ra

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**TRAFFIC MONITORING SITE MATERIALS**  
**(REV 86-23-21)**

The following new Section is added after Section 996.

**SECTION 997**  
**TRAFFIC MONITORING SITE MATERIALS**

**997-1 Description.**

This Section governs the requirements for all traffic monitoring site (TMS) material as shown in the Plans and Standard Plans.

Provide products compatible with all other TMS APL equipment. Any electronics unit or software submitted for approval must be compatible with or convert the data into a format compatible with the Department's polling and processing software. Any substitute software modules submitted must be tested and approved by the Department.

Provide products constructed of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal. All fasteners exposed to the elements shall be Type 304 or 316 passivated stainless steel.

**997-1.1 Approved Product List Submittal Requirements:** Manufacturers seeking evaluation of their product for inclusion on the APL shall submit an application in accordance with Section 6 including documentation identified in Table 997-1 and this section. Documentation must demonstrate that the product meets the requirements of this Section.

<u>Table 997-1</u>	
<u>Documentation</u>	<u>Requirements</u>
<u>Technical Data Sheets</u>	<u>Provide information as required in this Section.</u>
<u>Product Label</u>	<u>Provide equipment permanently marked with manufacturer name or trademark, part number, and date of manufacture or serial number.</u>
<u>Product Sample</u>	<u>When requested, submit a product sample.</u>
<u>Installation Instructions</u>	<u>Required.</u>
<u>Product Photo</u>	<u>Display significant features of the products.</u>

**997-2 Vehicle Sensors (Non-Weight).**

**997-2.1 General:** Non-weight vehicle sensors include axle sensors and non-motorized sensors.

**997-2.2 Axle Sensor and Non-Motorized Sensor:** In-Roadway axle sensors shall meet the physical characteristics in Table 997-2.

<u>Table 997-2</u> <u>Physical Characteristics, Axle Sensor</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Sensor Element Dimensions</u>	<u>Technical Data Sheet</u>	<u>Approximately 6 ft. to 10 ft. in length, 3/16 in. to 3/8 in. in diameter (varies by manufacturer)</u>
<u>Sensor Element Material</u>	<u>Technical Data Sheet</u>	<u>Pressure sensing piezoelectric</u>
<u>Pavement Operating Temperature Range</u>	<u>Technical Data Sheet</u>	<u>Minimum 0°F to +150°F</u>
<u>Output Signal</u>	<u>Technical Data Sheet</u>	<u>Minimum +200mV or produce a charge signal for passenger car/pickup truck axle @ 70°F with less than 10% negative signal for non-WIM axle sensors</u>
<u>Environmental Requirements</u>	<u>Technical Data Sheet</u>	<u>NEMA TS-2-2016, Section 3.</u>

In-Sidewalk and Shared Use Path non-motorized sensors shall meet the physical characteristics in Table 997-3.

<u>Table 997-3</u> <u>Physical Characteristics, Non-Motorized Sensor</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Sensor Element Dimensions</u>	<u>Technical Data Sheet</u>	<u>Approximately 3 ft. in length, 3/16 in. to 3/8 in. in diameter (varies by manufacturer)</u>
<u>Sensor Element Material</u>	<u>Technical Data Sheet</u>	<u>Pressure sensing piezoelectric</u>
<u>Pavement Operating Temperature Range</u>	<u>Technical Data Sheet</u>	<u>Minimum 0°F to +150°F</u>
<u>Output Signal Range</u>	<u>Technical Data Sheet</u>	<u>Minimum +34 mV (front axle) and +65mV (rear axle), 220 lb. Passenger bicycle, at 7.3 MPH</u>
<u>Environmental Requirements</u>	<u>Technical Data Sheet</u>	<u>NEMA TS-2-2016, Section 3.</u>

### **997-3 Weight Sensors (In-Roadway).**

**997-3.1 General:** Weight sensors include bending plates, Class I piezoelectric sensors, and quartz piezoelectric sensors.

**997-3.2 Bending Plate:** Provide bending Plate Weigh-In-Motion systems that utilize plates with strain gauges bonded to the underside. The weigh pads shall meet the physical characteristics in Table 997-4.

<u>Table 997-4</u> <u>Physical Characteristics, Bending Plate, Weigh Pad</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Sensor Size</u>	<u>Technical Data Sheet</u>	<u>20 in. wide x 70 in. or 50 in. long</u>
<u>Operating Temperature Range</u>	<u>Technical Data Sheet</u>	<u>-50°F to 176°F</u>
<u>Scale Capacity</u>	<u>Technical Data Sheet</u>	<u>45000 pounds per axle and overload protected to 80000 pounds per axle</u>
<u>Environmental Requirements</u>	<u>Technical Data Sheet</u>	<u>NEMA TS-2-2016, Section 3.</u>

**997-3.3 Piezoelectric Axle Sensor (Class I):** Class I sensors collect Weigh-In-Motion data. The vehicle sensor shall meet the physical characteristics in Table 997-5.

<u>Table 997-5</u> <u>Physical Characteristics, Piezoelectric Axle Sensor, Class I</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Sensor Size</u>	<u>Technical Data Sheet</u>	<u>6 ft. to 8 ft.</u> <u>Flat Element 0.26 in. wide x 0.063 in. thick</u>
<u>Operating Temperature Range</u>	<u>Technical Data Sheet</u>	<u>-40°F to 160°F</u>
<u>Temperature sensitivity</u>	<u>Technical Data Sheet</u>	<u>0.2%/°F</u>
<u>Output Uniformity</u>	<u>Technical Data Sheet</u>	<u>5% to 7%</u>
<u>Output Signal</u>	<u>Technical Data Sheet</u>	<u>250 mV for 400-pound wheel load at 70 F° and 55 mph</u> <u>[250 mV for 181 kg wheel load at 21 C° and 88 kph] Minimum</u>
<u>Insulation Resistance</u>	<u>Technical Data Sheet</u>	<u>&gt; 500 MΩ</u>
<u>Passive Signal Cable</u>	<u>Technical Data Sheet</u>	<u>RG 58 C/U with High Density Polyethylene Outer Jacket 0.187” [4.75 mm] OD</u>
<u>Center Core</u>	<u>Technical Data Sheet</u>	<u>16-gauge, flat braided, silver plated copper wire</u>
<u>Piezoelectric Material</u>	<u>Technical Data Sheet</u>	<u>Spiral Wrapped PVDF piezoelectric film</u>
<u>Cable Capacitance</u>	<u>Technical Data Sheet</u>	<u>27 pF/ft [89 pF/m]</u>
<u>Piezoelectric Coefficient</u>	<u>Technical Data Sheet</u>	<u>34 pC/N – nominal</u>
<u>Life</u>	<u>Technical Data Sheet</u>	<u>40 Million ESAL’s[Minimum]</u>
<u>Environmental Requirements</u>	<u>Technical Data Sheet</u>	<u>NEMA TS-2-2016, Section 3.</u>

**997-3.4 Quartz Piezoelectric Sensor:** The quartz piezoelectric sensors collect Weigh-In-Motion data. The quartz sensor shall meet the physical characteristics in Table 997-6.

<u>Table 997-6</u> <u>Physical Characteristics, Quartz Piezoelectric Sensor</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Measuring Range wheel load (At a referenced tire contact area)</u>	<u>Technical Data Sheet</u>	<u>0 to 34000 pounds (8 in. by 12.6 in.)</u>
<u>Overload (twin wheel)</u>	<u>Technical Data Sheet</u>	<u>55000 pounds</u>
<u>Sensitivity – Nominal</u>	<u>Technical Data Sheet</u>	<u>7.6 ± 12% pC/lbf</u>
<u>Sensitivity shift over sensor length</u>	<u>Technical Data Sheet</u>	<u>&lt;± 3%</u>
<u>Threshold</u>	<u>Technical Data Sheet</u>	<u>&lt;0.1 lbf</u>
<u>Linearity</u>	<u>Technical Data Sheet</u>	<u>&lt;± 2% Full Scale Output</u>
<u>Hysteresis</u>	<u>Technical Data Sheet</u>	<u>≤ 2% Full Scale Output</u>
<u>Natural Frequency</u>	<u>Technical Data Sheet</u>	<u>&gt; 5 kHz</u>
<u>Operating Temperature range</u>	<u>Technical Data Sheet</u>	<u>-40°F to 176°F</u>
<u>Temperature coefficient of sensitivity</u>	<u>Technical Data Sheet</u>	<u>-0.04%/°F</u>
<u>Operating Speed</u>	<u>Technical Data Sheet</u>	<u>5 MPH to 100 MPH</u>
<u>Insulation resistance</u>	<u>Technical Data Sheet</u>	<u>&gt; 100 giga ohms</u>
<u>Capacitance with 130 ft. cable</u>	<u>Technical Data Sheet</u>	<u>8 to 12 nano farad</u>
<u>Environmental Requirements</u>	<u>Technical Data Sheet</u>	<u>NEMA TS-2-2016, Section 3.</u>

**997-4 Solar Power Unit.**

**997-4.1 General:** Provide solar power unit consisting of the following components: solar panel(s) and mounting hardware; 12 V storage battery; and voltage regulator with wiring and associated mounting hardware.

**997-4.2 Solar Panel Configured for Nominal 12 V<sub>DC</sub>:** Solar panels cannot have internal voltage regulators and must be capable of multiple arrays and series or parallel wiring configurations. Meet the physical characteristics in Table 997-7:

<u>Table 997-7</u> <u>Physical Characteristics, Solar Panel</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Peak power range</u>	<u>Technical Data Sheet</u>	<u>80 to 130 watts.</u>
<u>Voltage</u>	<u>Technical Data Sheet</u>	<u>Maximum power greater than 16.5 V at 77°F</u>
<u>Current</u>	<u>Technical Data Sheet</u>	<u>Maximum power greater than 2.85 A at 77°F.</u>
<u>Photovoltaic modules construction</u>	<u>Technical Data Sheet</u>	<u>Mono or poly-crystalline cells.</u>
<u>AppFrame construction</u>	<u>Technical Data Sheet</u>	<u>Anodized aluminum.</u>
<u>Mounting hardware construction</u>	<u>Technical Data Sheet</u>	<u>Anodized, galvanized or stainless-steel.</u>

**997-4.3 Battery 12 V:** Meet the physical characteristics in Table 997-8:



<u>Table 997-8</u> <u>Physical Characteristics, Battery 12 V</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
		<u>Rechargeable for photovoltaic application.</u>
		<u>Valve regulated lead-calcium gelled electrolyte or absorbed glass mat.</u>
<u>Case Construction</u>	<u>Technical Data Sheet</u>	<u>ABS Plastic or Polypropylene.</u>
<u>Current discharge rate</u>	<u>Technical Data Sheet</u>	<u>Minimum of 100 hours at 0.9 amperes.</u>
<u>Dimensions</u>	<u>Technical Data Sheet</u>	<u>Approximately 12 inches by 7 inches by 9 inches.</u>

**997-4.4 Voltage Regulator Configured for Nominal 12 V<sub>DC</sub>**: Meet the physical characteristics in Table 997-9:

<u>Table 997-9</u> <u>Physical Characteristics, Voltage Regulator</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Voltage for battery charging.</u>	<u>Technical Data Sheet</u>	<u>Minimum of 13.5 V<sub>DC</sub>.</u>
		<u>Begin charging when battery voltage is 13.3 V or less.</u>
		<u>Discontinue charging when battery voltage is 14.5 V.</u>
<u>Quiescent current</u>	<u>Technical Data Sheet</u>	<u>Maximum 15 mA.</u>
<u>Operating Temperature range</u>	<u>Technical Data Sheet</u>	<u>0 to 122°F.</u>
<u>Dimensions</u>	<u>Technical Data Sheet</u>	<u>Approximately 2 inches by 5 inches by 1 inch.</u>

**997-5 Site Modem**: Meet the physical characteristics in Table 997-10:

<u>Table 997-10</u> <u>Physical Characteristics, Site Modem</u>		
<u>Property</u>	<u>Documentation</u>	<u>Requirements</u>
<u>Configuration</u>	<u>Technical Data Sheet</u>	<ol style="list-style-type: none"> <li><u>1.The device shall be field configurable to be powered from 12 V<sub>DC</sub>.</u></li> <li><u>2.The device shall have the ability and be configured to utilize a network service that shall be at a minimum 4G LTE with fallback to 3G EV-DO.</u></li> </ol>
<b><u>Protocols:</u></b> <u>The device shall have the ability to utilize, at a minimum, the following protocols:</u>	<u>Technical Data Sheet</u>	<ol style="list-style-type: none"> <li><u>1. Network: TCP/IP, UDP/IP, Domain Name System (DNS)</u></li> <li><u>2. Routing: Network Address Translation (NAT), Host Port Routing, DHCP, Point-to-Point Protocol over Ethernet (PPPoE), VLAN, Virtual Router Redundancy Protocol (VRRP), Reliable Static Route.</u></li> <li><u>3. Application: Short Message Service (SMS), Telnet/SSH, Reverse Telnet, Simple Mail Transfer Protocol (SMTP), SNMP, SNTp, Reliable Static Route</u></li> <li><u>4. Serial: TCP/UDP Packet Assembly Disassembly (PAD) Mode, Modbus (ASCII, RTU, Variable), Point-to-Point Protocol (PPP)</u></li> </ol>
<b><u>Event Reporting:</u></b> <u>The device shall have the capability to record and report, at a minimum, the following events in plain text:</u>	<u>Technical Data Sheet</u>	<ol style="list-style-type: none"> <li><u>1. Network parameters</u></li> <li><u>2. Data usage</u></li> <li><u>3. Power</u></li> <li><u>4. Device temperature</u></li> <li><u>5. Digital input</u></li> <li><u>6. Global Positioning</u></li> <li><u>7. System/Automatic</u></li> <li><u>8. Vehicle Locator (GPS/AVL)</u></li> <li><u>9. Timer</u></li> </ol>
<b><u>Security:</u></b> <u>The device shall have the following security provisions:</u>	<u>Technical Data Sheet</u>	<ol style="list-style-type: none"> <li><u>1. Ability to establish VPN tunnels.</u></li> <li><u>2. IPsec, Secure Sockets Layer (SSL), and Generic Routing Encapsulation (GRE) VPN client</u></li> <li><u>3. Port forwarding and Demilitarized Zone (DMZ)</u></li> <li><u>4. Port filtering</u></li> <li><u>5. Trusted IP</u></li> <li><u>6. MAC address filtering</u></li> </ol>
<u>Operating Temperature range</u>	<u>Technical Data Sheet</u>	<u>Minimum 0 to 158°F.</u>

<p><u>Antenna: Use an antenna that meets the following requirements:</u></p>	<p><u>Technical Data Sheet</u></p>	<p><u>1. Dual diversity</u> <u>2. Minimum NEMA rating of NEMA 3</u> <u>3. Frequencies: <math>F_1 = 824</math> to <math>896</math> MHz, <math>F_2 = 1850</math> to <math>1990</math> MHz, <math>F_3 = 1850</math> to <math>1955</math> MHz, <math>F_4 = 1710</math> to <math>1770</math> MHz, <math>F_5 = 2110</math> to <math>2170</math> MHz</u> <u>4. Voltage Standing Wave Ratio (VSWR) of 1.5:1 or less at resonant point</u> <u>5. <math>50 \Omega</math> nominal impedance</u> <u>6. Gain of 3.0 dB to 5.15 dB</u> <u>7. Omni-directional radiation pattern</u> <u>8. Vertical polarization</u> <u>9. Glass-filled polypropylene radome</u> <u>10. Adhesive mounting or Bolt mount</u> <u>11. SMA male plug connectors 10 ft. (minimum) coaxial length</u></p>
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*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 22, 2021

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: **SP0020400-60day Proposal Requirements and Conditions – Examination of Plans, Specifications, Special Provisions, and Site of Work (60 Day Ad).**

Dear Mr. Nguyen:

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

The changes are proposed by Larry Ritchie from the Construction Office to clarify existing language to bring Bid Q&A questions and responses into a construction contract. Changes were also proposed by Scott Arnold from the State Construction Office to clarify the Contractor's responsibility to examine and interpret any pavement coring data provided by the Department.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**PROPOSAL REQUIREMENTS AND CONDITIONS - EXAMINATION OF PLANS, SPECIFICATIONS, SPECIAL PROVISIONS, AND SITE OF WORK (60 DAY AD). (REV 6-16-21)**

ARTICLE 2-4 is deleted and the following substituted:

**2-4 Examination of Plans, Specifications, Special Provisions, 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://fdotwp1.dot.state.fl.us/BidQuestionsAndAnswers/Proposal.aspx/SearchProposal>

Questions posted to this site before 5:00 P.M. (EST) on the tenth calendar day prior to the bid opening, will be responded to by the Department. For questions posted after this 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 \_\_\_\_\_.

Responses provided by the Department via the website during this period will be considered as being incorporated into this Special Provision. 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 and pavement cores, as shown in the Plans Contract Documents, 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 and pavement core 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*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 22, 2021

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: **SP0020400 Proposal Requirements and Conditions – Examination of Plans, Specifications, Special Provisions, and Site of Work.**

Dear Mr. Nguyen:

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

The changes are proposed by Larry Ritchie from the Construction Office to clarify existing language to bring Bid Q&A questions and responses into a construction contract. Changes were also proposed by Scott Arnold from the State Construction Office to clarify the Contractor's responsibility to examine and interpret any pavement coring data provided by the Department.

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**PROPOSAL REQUIREMENTS AND CONDITIONS - EXAMINATION OF PLANS, SPECIFICATIONS, SPECIAL PROVISIONS, AND SITE OF WORK.**

**(REV 6-16-21)**

ARTICLE 2-4 is deleted and the following substituted:

**2-4 Examination of Plans, Specifications, Special Provisions, 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://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 times, 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 [REDACTED] at [REDACTED].

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The Department does not guarantee the details pertaining to borings and pavement cores, as shown in the Plans Contract Documents, 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 and pavement core data, where available, and make their own interpretation of the subsoil investigations and other preliminary data, and 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*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

June 29, 2021

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

Re: State Specifications Office  
Section: **005**  
Proposed Specification: **SP0050100PB Control of the Work (Push Button).**

Dear Mr. Nguyen:

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

The changes are proposed by Ashley Anderson from the State Construction Office to correspond with the Maintenance Push Button Specification change for July 2021.

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

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

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer



**CONTROL OF THE WORK (PUSH BUTTON).  
(REV 4-1-21)**

ARTICLE 5-1 is expanded by the following:

**5-1.7 Work Documents/Liquidated Damages:** For this Contract in which specific sites are not identified at the time of letting, the Engineer will issue a Work Document. Work Documents will identify the location, description, amount of work to be accomplished, and the number of calendar days to complete the work. Notify the Engineer prior to beginning work defined by each individual Work Document.

The initial Work Document may be issued with the Notice to Proceed. The Contractor will be allowed 14 calendar days from receipt of the initial Work Document to respond and begin work. The 14 calendar days begin on the date the document is received in person, by email or fax ~~or by certified mail~~. The Contractor will be expected to respond and begin work within five working days of receipt of any subsequent Work Document. If a start date later than 5 working days is identified in a Work Document, the Contractor will be expected to begin work by the start date identified in the Work Document.

Charging of Contract time will begin on the actual day that work begins at the site, but no later than:

1. the 14<sup>th</sup> calendar day from receipt of the initial Work Document; or
2. the 5<sup>th</sup> working day from receipt of any subsequent Work Document; or
3. the “start date” identified in a Work Document (as described above) that is applicable to the specific Work Document issued.

If the Contractor does not ~~begin work by the end of the day provided by the Work Document, or if the assignment of work on the Work Document is not~~ complete the work within the number of calendar days specified on the Work Document, then the Department may assess the Contractor, not as a penalty but as liquidated damages, a per day assessment of 1% of the total Work Document amount or the amount shown in Subarticle 8-10.2 (Amount of Liquidated Damages), whichever is less.

The Engineer will issue Work Documents for locations that represent a minimum of one day's work. All work locations will be described with sufficient particularity that will allow the Contractor to proceed immediately to the location with minimum delay. The Department will make every reasonable effort to plan work locations and develop work documents in systematic and concentrated regions so as to minimize the Contractor's travel requirements. A Pre-Work Conference may be scheduled prior to the commencement of work in accordance with the Work Document.

Upon completion of the assigned work of the Work Document, notify the Engineer. Certify that the work quantities and quality were accomplished in accordance with these specifications by signing and returning the Work Document to the Department. All work completed will be reviewed to verify quantity and quality prior to approval of the Work Document.

Should inclement weather limit or stop the work, notify the Engineer of such limitation or work stoppage.

Schedule work in a manner that prevents delays, stoppages and rework.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 6, 2021

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

Re: State Specifications Office  
Section: **008**  
Proposed Specification: **SP0080302A Prosecution and Progress – Prosecution of Work – General (Submission of Working Schedule).**

Dear Mr. Nguyen:

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

The changes are proposed by Olivia Townsend from the State Construction Office to clarify requirements for Critical Path Method (CPM) Contract Schedule submission and remove requirements for budgeted total cost.

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

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

Sincerely,

Signature on File

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**PROSECUTION AND PROGRESS - PROSECUTION OF WORK - GENERAL  
(SUBMISSION OF WORKING SCHEDULE).****(REV 5-20-21)**

SUBARTICLE 8-3.2 is deleted and the following substituted:

**8-3.2 General:** For this Contract, submit the following schedules and reports.

**8-3.2.1 Contract Schedule:** Submit to the Engineer for acceptance a Critical Path Method (CPM) Contract Schedule for the project within 30 calendar days after execution of the Contract or at the preconstruction conference, whichever is earlier.

The Contract Schedule shall include detailed schedule diagrams and schedule data as described below that shows how the Contractor intends to complete the work within the Contract Time. Any ~~Contract defined holidays, suspension days, or~~ weather days that affect the Critical Path will be added as they occur. When the project includes a Maintenance of Traffic plan, the work breakdown structure (WBS) or project activity codes for the Contract Schedule shall be consistent with the Contract Maintenance of Traffic plan, showing activities for each discrete Contract activity to be accomplished within each Maintenance of Traffic phase. When the project does not include a Maintenance of Traffic plan, the WBS or project activity codes shall be consistent with the phasing shown in the Contract Documents. Include activities for deliverables and reviews in the schedule. Sufficient liaison shall be conducted and information provided to indicate coordination with utility owners having facilities within the project limits. The schedule must incorporate the utility work schedules included in the Contract Documents, unless changed by mutual agreement of the utility company, the Contractor and the Department. Show the interdependence (logic) of the utility work schedule activities with other schedule activities in the Contract Schedule for acceptance by the Department, unless otherwise approved by the Engineer.

Failure to include any element of work or any activity relating to utility work will not relieve the Contractor from completing all work within the Contract Time at no additional time or cost to the Department, notwithstanding the acceptance of the schedule by the Department.

The Contract Schedule may indicate a completion date in advance of the expiration of Contract Time. However, the Department will not be liable in any way for the Contractor's failure to complete the project prior to expiration of Contract Time. Any additional costs, including extended overhead incurred between the Contractor's scheduled completion date and the expiration of Contract Time, shall be the responsibility of the Contractor. The Contractor shall not be entitled to claim or recover any such costs from the Department.

Acceptance by the Engineer of the Contract Schedule or any updates shall not be construed as approval of any particular construction methods or sequence of construction or to relieve the Contractor of its responsibility to provide sufficient materials, equipment and labor to guarantee the completion of the contract in accordance with the Contract Documents.

**8-3.2.2 Schedule Submissions:** Develop the schedule in Precedence Diagram Method (PDM) format.

Each schedule submission and monthly update shall include a minimum of the following ~~seven~~six items:

Use only when CPM is authorized  
by District Construction Engineer.

1. Submit the files electronically in the current Department version of Oracle Primavera P6 format by exporting the full schedule to an .xer file format.

2. A Gantt chart grouped by WBS, then phase, sorted by early start then total float. The chart shall include the following columns:

- a. Activity ID
- b. Activity Name
- c. Calendar
- d. Activity Type
- e. Original Duration
- f. Remaining Duration
- g. Duration % Complete
- h. Early Start
- i. Early Finish
- j. Late Start
- k. Late Finish
- l. Total Float

~~m. Budgeted Total Cost~~

The chart shall also include activity bars using the Oracle Primavera P6 default color coding for the bars. The chart shall be submitted as a Portable Document Format (.pdf) file and formatted on 11 inch by 17 inch landscape oriented sheets, with the activity table and bars.

3. A Gantt chart with the same columns and bars listed in 8-3.2.2(2), but filtered for the longest path, not grouped but sorted by early start, then early finish. The chart shall be submitted as a.pdf file and formatted on 11 inch by 17 inch landscape oriented sheets, with the activity table and bars.

4. The Schedule log for the calculated schedule, submitted as a.pdf file and formatted on 8-1/2 inch by 11 inch portrait oriented sheets.

5. A schedule narrative report with the following information:

- a. Current project schedule status and identify potential delays
- b. A description of the progress made since the previous schedule submission
- c. Objectives for the upcoming 30 calendar days
- d. Indicate if the project is on schedule, ahead of schedule or behind schedule.
  1. If ahead or behind schedule, indicate the specific number of calendar days.
  2. If behind schedule, include a detailed recovery plan that will put the schedule back on track or identify the alleged delay event for which a preliminary request for an extension of Contract Time has been submitted, which if granted by the Department, will account for the amount of time the project is behind schedule, or provide a fully supported request for a Contract Time extension, which if granted by the Department, will account for the amount of time the project is behind schedule.
- e. Description of the current critical path and indicate if the critical path has changed in the last 30 calendar days.

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by District Construction Engineer.

f. Discussion of current successes or problems that have affected either the critical path's length or have caused a shift in the critical path within the last 30 calendar days.

g. Identify specific activities, progress, or events that may reasonably be anticipated to impact the critical path within the next 30 calendar days, either to affect its length or to shift it to an alternate path.

h. List all changes to schedule logic, calendars, calendar assignments, activity types, activity names, changes to constraints, added activities or duration changes (original and remaining) that have been made to the schedule since the previous submission.

For each change, describe the basis for the change and specifically identify the affected activities by activity ID.

i. Identify any and all activities, either in progress or scheduled to occur within the following 30 days that require Department participation, review, approval, etc.

6. A detailed logic report that provides a list of activities in the schedule sorted by activity ID, no grouping and submitted as a .pdf file and formatted on 8-1/2 inch by 11 inch portrait oriented sheets. For each activity listed, the report shall include the activity's predecessors and successors, including the relationship type and lag.

~~7. A chart showing the budgeted total cost versus time shall be submitted as a pdf file and formatted on 8 1/2 inch by 11 inch landscape oriented sheets. The chart shall include the following two curves:~~

- ~~a. budgeted total cost versus time based on the early dates.~~  
~~b. budgeted total cost versus time based on the late dates.~~

For each submission of the Contract Schedule and monthly update, the Engineer will have 21 days to accept the Contract Schedule or monthly update or to schedule a meeting, if needed, within that time, with the Contractor to resolve any problems that prevent acceptance of the schedule. Attend the meeting scheduled by the Engineer, and submit a corrected schedule to the Engineer within seven days after the meeting. The process will be continued until a Contract Schedule or monthly update is accepted or accepted as noted by the Engineer.

Upon the Engineer's acceptance of the Contract Schedule, submit monthly updates of the Contract Schedule, including all months prior to the start of construction, reflecting progress through the monthly estimate cut-off date within 8 calendar days after the monthly estimate cut-off date.

The Engineer may withhold monthly payments due for failure of the Contractor to submit an acceptable schedule or monthly updates within the time frame described herein.

**8-3.2.3 Schedule Content:** All schedule submissions shall comply with the following content guidelines as appropriate to the specific submission:

The schedules shall include the sequence, order, and interdependence of major construction milestones and activities. Include procurement of project specific materials and equipment that require submittals and are not readily available, long-lead time items, and key milestones identified by the Contract.

Show the sequence, order, and interdependence of activities in which the work is to be accomplished. Include allowance for Department review, acceptance and return of

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by District Construction Engineer.

submittals, samples and shop drawings where Department acceptance is specifically required (in accordance with 5-1.4.6 of the standard specifications). In addition to construction activities, schedule activities shall include the submittals, procurement, and Department or Utility activities:

1. Submittal activities shall include submittal preparation, Department review, and acceptance of submittals. If the Department's action on any submittal is "Not Accepted" or "Revise and Resubmit", a new series of submittal preparation activities shall be inserted into the schedule. Predecessor for the new submittal preparation activity will be the original acceptance activity and the successor of the new acceptance activity will be the fabrication/delivery activity for the equipment or material.

2. Procurement activities shall include all project specific materials and equipment that require submittals and are not readily available, ~~receipt of materials with estimated procurement costs of major items for which payment of stockpiled materials will be requested in advance of installation~~, fabrication of special material and equipment, and their installation and testing.

3. Show activities of the Department or Utilities that affect progress and contract-required dates for completion of all or parts of the work.

Detailed schedule data: shall conform to the following:

1. All activities shall be assigned to a specific project calendar within the software. Specific project calendars will be defined within the software to include planned work days and planned non-work days. These project calendars will include both Contractor and Contract defined holidays and suspension days as non-workdays. The use of global calendars is not permitted. Project calendars shall not inherit holidays from global calendars. Work shifts identified for each project calendar shall be consistent with the Contractor's planned workdays. Actual start and finish date times shall be consistent with the work shift hours on the calendar assigned to the activities.

2. ~~Each schedule activity shall be cost loaded. Activity cost loading shall be consistent with the bid breakdown.~~ A cost account drawdown schedule depicting amount earned by month through project completion. The sum total of the ~~activity cost loading accounts~~ shall be equal to the current contract value.

3. At a minimum, each schedule activity shall contain codes by:  
a. Responsibility: for items of work that are not in control of the Contractor including, but not be limited to, Department, Utility, ~~Contractor/subcontractor, supplier/vendor, consultant,~~ etc.

b. Phasing: identify the appropriate Maintenance of Traffic phase or subphase.

The required coding can be accomplished by WBS codes or project activity codes.

4. Key milestones as identified by Contract. At a minimum, the start and finish of each Maintenance of Traffic phase or subphase shall be represented by a milestone activity. Milestone activities shall be start or finish milestone type activities, as appropriate.

5. All non-procurement activities must be less than or equal to 20 workdays unless approved by the Engineer. Sufficient explanation for activities over 20 days shall be provided for the Engineers review and approval.



6. All activities must include adequate detailed activity descriptions to describe the work that is included. In each activity, ~~through the activity name, user defined field, or cost account, give quantity and unit of measure~~ provide sufficient detail so that the amount of work the activity involves is clearly communicated.

7. Only two open-ended activities (the first and the last) are allowed.

8. Constraints shall only be used for “project start,” and “project completion.” Constraints shall not override logic. The project start constraint shall be the Contract execution date. The project completion date shall be the Contract completion date plus any Contract defined holidays and suspension days included on the longest path. The use of any other imposed constraints is not allowed without specific approval by the Engineer. Any other desired constraints must be submitted to the Engineer with the rationale for the use of each desired additional constraint. If allowed by the Engineer, the rationale should be recorded in the activity's notebook field. Mandatory constraints (start and finish) violate network logic and shall not be used.

9. Out of sequence progress shall be corrected on each monthly update by modifying the schedule logic so that the logic accurately depicts the actual sequence of the work. The Retained Logic setting shall be used when calculating the schedule.

10. All changes to activities shall be recorded with a note in the activity notebook field. The notebook entry shall include, as a minimum, the date and reason for the change, as well as reference to a document wherein the Engineer acknowledges and accepts the change.

11. The use of resource leveling, either manual or automatic, is prohibited.

12. Activities shall not be deleted from the schedule. If an activity is not required, then upon approval from the Engineer, the Contractor shall provide actual start and finish dates equal to the date of the Engineer's approval, shall add the word “Removed” to the activity name and shall make a notebook entry explaining the reason for removing the activity from the planned work.

13. Activities ~~with appropriate cost loading~~ shall be added to the schedule upon ~~approval of notifying~~ the Engineer when it is determined that a Contract work element was omitted from the previous accepted Contract schedule or update or if work is added to the Contract, or to reflect a time extension in accordance with 8-7.3.2.

14. Activity names shall only be changed to reflect changes to the scope of the work element represented by the activity, not as a way to remove and replace activities. Changes to activity names shall be approved by the Engineer.

15. Unless otherwise approved by the Engineer, activity types shall be defined as milestones, level-of-effort, WBS summary or task dependent. Resource dependent type shall not be used. All activities shall have percent complete type set to duration and duration type set to either fixed duration and unit/time or fixed duration and units.

**8-3.2.4 Weekly Meetings:** Attend weekly meetings scheduled by the Engineer to discuss Contract progress, near term scheduled activities, including utility relocations, problems and their proposed solutions. Submit a Three-Week Planning Schedule at each weekly meeting, showing the Contract schedule activities completed in the previous week and planned for the next two weeks. Develop the Three-Week Planning Schedule in Gantt chart format from the updated Contract schedule, identifying completed, current and planned activities. Designate all

activities that are controlling work items as determined by the currently accepted Contract Schedule

**8-3.2.5 Float:** Float is defined as the amount of time the finish of an activity can be delayed. Two kinds of float are possible: Total float is how much an activity can be delayed without affecting the finish date of the project or an intermediate deadline (constraint); it is the difference between the late finish date and the early finish date. Free float is how much an activity can be delayed without affecting its earliest successor.

Float is not for the exclusive use or benefit of either the Department or the Contractor.

Use of float suppression techniques, such as preferential sequencing (arranging critical path through activities more susceptible to Department caused delay), special lead/lag logic restraints, zero total or free float constraints, extended activity times, positive relationship lags, or imposing constraint dates other than as required by the contract, shall be cause for rejection of the project schedule or its updates. The use of finish-to-start lags greater than zero days, start-to-start lags that exceed the duration of the predecessors, or finish-to-finish lags that exceed the duration of the successor, shall not be used without the expressed approval of the Engineer. The use of Resource Leveling, or similar software features, for the purpose of artificially adjusting activity durations to consume float and influence the critical path is expressly prohibited.

Negative float shall not be a basis for requesting time extensions. Any extension of time shall be addressed in accordance with 8-3.2. 7. Scheduled completion dates that extend beyond the Contract completion date, evidenced by negative float, may be used in computations for assessment of payment withholdings. The use of this computation is not to be construed as a means of acceleration.

**8-3.2.6 Critical Path:** The critical path shall be defined as the longest path and is represented by the longest logical path through the remaining activities, resulting in the earliest calculated completion date. There may be more than one longest path in the schedule. However, the use of float suppression techniques as described in 8-3.2.5 shall not be used to force the schedule to have more than one longest path.

**8-3.2.7 Time Extensions:** The Contractor is responsible for submitting a request for Contract Time extension in accordance with 8-7.3.2. An extension of time shall be considered only to the extent that an event impacts the completion date of the schedule such that the impacted completion date is later than the Contract completion date as adjusted previously. The Pre-event Schedule is defined as the latest accepted update of the Contract schedule, statused (actual start dates added, actual finish dates added, remaining durations adjusted) to the end of the day before the start of the event. The Post-event Schedule is defined as the accepted update of the Contract Schedule just after the end of the event and destatused (actual start dates removed, actual finish dates removed, remaining durations adjusted) to the end of the last day of the event.

As a minimum, time extension requests shall contain:

1. A descriptive summary of the event
2. A written analysis supported by a:
  - a. Pre-event Schedule
  - b. Post-event Schedule
3. Schedule submittal items 1, 2, 3 and 4 required in 8-3.2.2 shall be provided for the Pre-event and Post-event schedules



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by District Construction Engineer.

Time extensions shall not be considered for proposals that do not include full documentation described above. Once a time extension has been approved by the Engineer, the Contract completion date shall be changed accordingly.

**8-3.2.7 Performance of Work:** By submitting a schedule, the Contractor is making a positive assertion that the project has been and will be constructed in the order indicated in the schedule. Prosecute the work in accordance with the latest accepted Contract Schedule or update. Any costs associated with meeting milestones and completing the project within the authorized Contract Time will be borne solely by the Contractor.

**8-3.2.8 As-Built Schedule:** ~~As a condition for final payment of the project,~~  
~~s~~Submit ~~the an~~ as-built schedule along with the Qualified Acceptance Letter if the Contactor elects the use of the Qualified Acceptance Letter as described in 9-8.1~~within 10 days of Final Acceptance.~~ The as-built schedule shall describe the actual order and start and stop times for all activities by the Contractor.



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
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KEVIN J. THIBAUT, P.E.  
SECRETARY

July 27, 2021

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

Re: State Specifications Office  
Section: **009**  
Proposed Specification: **SP0090103LS Measurement and Payment (Lump Sum).**

Dear Mr. Nguyen:

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

The changes are proposed by Taylor Carlquist to revise the specification language to only reference diesel as a fuel adjustment.

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

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

Sincerely,

Signature on File

Daniel Strickland, P.E.  
State Specifications Engineer

DS/vc

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**MEASUREMENT AND PAYMENT (LUMP SUM).**  
**(REV 7-1-21)**

SUBARTICLE 9-1.3 is deleted and the following substituted:

**9-1.3 Determination of Pay Reduction:** In measurement of areas of ~~work~~Work, where pay reductions are to be assessed, the Engineer will use the lengths and/or widths in the calculations based upon station to station dimensions in the Contract Documents, the station to station dimensions actually constructed within the limits designated by the Engineer; or the final dimensions measured along the final surface of the completed ~~work~~Work within the neat lines shown in the Contract Documents or designated by the Engineer. The Engineer will use the method or combination of methods of measurement which will reflect with reasonable accuracy, the actual surface area of the finished ~~work~~Work as the Engineer determines.

Failure on the part of the Contractor to construct any item of ~~work~~Work to plan or authorized dimensions within the Specification tolerances will result in: reconstruction to acceptable tolerances at no additional cost to the Department; acceptance at no pay; or, acceptance at reduced pay, all at the discretion of the Engineer.

When acceptance at no pay occurs for any material not listed in 9-2, the Engineer will apply a reduction in payment for the material in question based on the weighted average unit price in the Six Month Moving Statewide Averages report. The dates will be the six months prior to the letting date for this Contract.

ARTICLE 9-2 is deleted and the following substituted:

**9-2 Scope of Payments.**

**9-2.1 Items Included in Payment:** Accept the compensation as provided in the Contract Documents as full payment for furnishing all materials and for performing all ~~work~~Work contemplated and embraced under the Contract; also for all loss or damage arising out of the nature of the ~~work~~Work or from the action of the elements, or from any unforeseen difficulties or obstructions which may arise or be encountered in the prosecution of the ~~work~~Work until its final acceptance; also for all other costs incurred under the provisions of Division I.

The Contract Lump Sum Price will include overhead, profits, and direct and indirect costs required to complete the project except as described below.

**9-2.1.1 Fuels:** On Contracts with an original Contract Time in excess of 120 calendar days, the Department will make price adjustments on each applicable progress estimate to reflect increases or decreases in the price of ~~gasoline and~~ diesel from those in effect during the month in which bids were received. The Contractor will not be given the option of accepting or rejecting these adjustments. Price adjustments for ~~these fuels~~ will be made only when the current fuel price (CFP) varies by more than 5% from the price prevailing in the month when bids were received (BFP), and then only on the portion that exceeds 5%.

The Contractor will certify the number of gallons of fuel (~~gasoline and/or~~ diesel) used on this Contract during the period represented by each Contractor's Certified Monthly Estimate.

Price adjustments will be based on the monthly bulk average price for ~~gas~~ ~~and~~ diesel as derived by the Department. These average indexes shall be determined by

averaging bulk fuel prices on the first day of each month as quoted by major oil companies that are reasonably expected to furnish fuel for projects in the State of Florida. Average price indices for ~~gasoline and~~ diesel will be available on the State Construction Office website before the 15<sup>th</sup> of each month at the following URL:

<https://www.fdot.gov/construction/fuel-Bit/Fuel-Bit.shtm>.

Payment on progress estimates will be adjusted to reflect adjustments in the prices for fuel in accordance with the following:

When fuel prices have decreased between month of bid and month of this progress estimate:

$A_i = F_i (P_i - 0.95 P_b)$  during a period of decreasing prices.

$A_i$  = Total dollar amount - positive or negative - of the cost adjustment for ~~each kind of~~ fuel used by the Contractor during the month "i."

$F_i$  = Total gallons calculated as being used during the month.

$P_i$  = Average price for fuel prevailing during month "i."

$P_b$  = Average price for fuel prevailing during the month "b" when bids were received on this Contract.

When fuel prices have increased between month of bid and month of this progress estimate:

$A_i = F_i (P_i - 1.05 P_b)$  during a period of increasing prices.

$A_i$  = Total dollar amount - positive or negative - of the cost adjustment for ~~each kind of~~ fuel used by the Contractor during the month "i."

$F_i$  = Total gallons calculated as being used during the month.

$P_i$  = Average price for fuel prevailing during month "i."

$P_b$  = Average price for fuel prevailing during the month "b" when bids were received on this Contract.

Gallons will be derived only from the established Standard Fuel Factor list posted on the State Construction Office website at the following URL:

<https://www.fdot.gov/construction/fuel-Bit/Fuel-Bit.shtm>.

The Department will provide a computer application that will calculate and print the gallons of ~~gasoline and/or~~ diesel for the items that these factors represent. The Contractor will attach this worksheet and record these gallons on the Contractor's Certified Monthly Estimate as required in 9-11.3.

Payment will be based on the quantities shown on the Contractor's Certified Monthly Estimate on all items for which established standard fuel factors are posted on the State Construction Office website at the following URL:

<https://www.fdot.gov/construction/fuel-Bit/Fuel-Bit.shtm>.

Payment will be made on the current progress estimate to reflect the index difference at the time ~~work~~Work was performed. The total price adjustment for the Contract is limited to the pay quantity as specified in 9-2.2.2.

Adjustments will be paid or charged to the Prime Contractor only. Any Contractor receiving an adjustment under this provision shall distribute the proper proportional part of such adjustment to subcontractors who perform applicable ~~work~~Work.

**9-2.1.2 Bituminous Material:** Prepare a Contractor's Certification of Quantities, using the Department's current approved form for Superpave Asphalt Base, Driveway Asphalt Base, Asphalt Treated Permeable Base, Superpave Asphaltic Concrete, Miscellaneous Asphalt Pavement, Asphalt Concrete Friction Course, and Asphalt Membrane Interlayer items. On

Contracts having an original Contract Time of more than 365 calendar days, or more than 5,000 tons of asphalt concrete, the Department will adjust the bid unit price for bituminous material, excluding cutback and emulsified asphalt to reflect increases or decreases in the Asphalt Price Index (API) of bituminous material from that in effect during the month in which bids were received. The Contractor will not be given the option of accepting or rejecting this adjustment. Bituminous adjustments will be made only when the current API (CAPI) varies by more than 5% of the API prevailing in the month when bids were received (BAPI), and then only on the portion that exceeds 5%.

The Department will determine the API for each month by averaging quotations in effect on the first day of the month at all terminals that could reasonably be expected to furnish bituminous material to projects in the State of Florida.

The API will be available on the State Construction Office website before the 15<sup>th</sup> day of each month at the following URL:  
<https://www.fdot.gov/construction/fuel-Bit/Fuel-Bit.shtm>.

The Department will provide a computer application that will calculate and print the number of gallons of bituminous material for the items that these factors represent. The Contractor will attach this worksheet and record these gallons on the Contractor's Certified Monthly Estimate as required in 9-11.3.

Payment on progress estimates will be adjusted to reflect adjustments in the prices for bituminous materials in accordance with the following:

$$\text{\$ Adjustment} = (\text{ID})(\text{gallons})$$

Where ID = Index Difference = [CAPI - 0.95(BAPI)] when the API has decreased between the month of bid and month of this progress estimate.

Where ID = Index Difference = [CAPI - 1.05(BAPI)] when the API has increased between the month of bid and month of this progress estimate.

For all asphalt concrete, the number of gallons will be determined assuming a mix design with 6.25% liquid asphalt weighing 8.58 pounds per gallon.

Payment will be made on the current progress estimate to reflect the index difference at the time workWork was performed. The total price adjustment for the Contract is limited to the pay quantity as specified in 9-2.2.2.

Adjustments will be paid or charged to the Prime Contractor only. Any Contractor receiving an adjustment under this provision shall distribute the proper proportional part of such adjustment to subcontractors who perform applicable workWork.

**9-2.2 General Basis of Adjusted Pay:**

**9-2.2.1 Deficiencies:** When a deficiency occurs that results in the acceptance of a material at a reduced payment level as defined in these Specifications, the Engineer will apply a reduction in payment for the material in question based on the unit prices shown in Table 9-1.

**Table 9-1**

Item Description	Unit	Unit Prices

**9-2.2.2 Asphalt Pay Adjustments:** Asphalt pay quantity adjustments apply to asphalt items listed in Sections 234, 334, 337 and 339.

For each item, the pay quantity will be based on the quantity placed on the project, limited to 105% of the adjusted quantity for the item. The adjusted quantity will be determined by dividing the sum of the quantities from the plan summary boxes (including any Engineer approved quantity revisions) by the design  $G_{mm}$  stated in 334-1.4 (design  $G_{sb}$  stated in 337-8.2 for FC-5), and multiplying by the tonnage-weighted average  $G_{mm}$  (tonnage-weighted average  $G_{sb}$  for FC-5) of the mixes used.

For each item, additions in pay will be made if the actual quantity placed exceeds the adjusted quantity. Additions in pay will be calculated by subtracting the adjusted quantity placed from the actual quantity placed, multiplied by the unit prices as determined by 9-2.3.1. The additional pay quantity shall not exceed 5% of the adjusted quantity.

For each item, reductions in pay will be made if the quantity placed is less than the adjusted quantity. Reduction in pay will be calculated by subtracting the adjusted quantity from the quantity placed, then multiplying by the unit prices as shown in Table 9-1.

**9-2.2.3 Asphalt Overbuild:** Where overbuild is called for in the Plans for the correction of cross-slope, the Engineer will make an adjustment in payment should the quantity of material placed be less than the adjusted quantity as calculated in 9-2.2.2. In addition, should the material placed exceed the adjusted quantity with no negative effect to the correction of cross-slope, an upward adjustment will be made representing the additional material placed. Adjustments in pay will be determined by subtracting the adjusted quantity from the quantity placed, then multiplying by the unit prices as shown in Table 9-2.

**Table 9-2**

Item Description	Unit	Unit Prices

An average spread rate, per calculations as specified in 9-2.2, will be used to determine verification of the required amount of asphalt for the project.

**9-2.2.4 Foundations:** Adjustment in the lump sum payment will be made for actual quantities installed of piling and drilled shafts, as additions or deletions for the total project quantity determined from the pile/drilled shaft elevations shown in the Contract Documents.

The Engineer will base all adjustments in payment on the unit prices as shown in Table 9-3.

**Table 9-3**

Item Description	Unit	Unit Prices

Payment listed above for Piling and Drilled Shafts includes all work required to install the foundation element to the required capacity/depth.

**9-2.2.5 Quality:** Where an adjustment of payment for quality is called for in the Contract Documents, the Engineer will make such adjustments for the corresponding quantity of

material based on the unit prices shown in Table 9-4, or the adjustment defined in Section 346, Developmental Specification Section 330, and Developmental Specification Section 350.

Table 9-4

Item Description	Unit	Unit Prices

**9-2.2.6 Adjustment to the Lump Sum Payment for Deleted Items of Work:**

When items of workWork are shown in the Contract Documents to be constructed or installed and due to actual field conditions; it is determined by the Engineer that the items are not needed, a negative adjustment to the Contract will be made. The negative adjustment will be based on the actual cost of the items being deleted less all costs incurred prior to the date the Engineer determined the items are not needed and the Contractor will retain ownership. The negative adjustment will be processed in accordance with 4-3.2.

ARTICLE 9-3 is deleted.

SUBARTICLE 9-5.5.2 is deleted and the following substituted:

**9-5.5.2 Partial Payment Amounts:** The following partial payment restrictions

apply:

1. Partial payments less than \$5,000 for any one month will not be processed.
2. Partial payment will not be made for aggregate and base course material received after paving or base construction operations begin except when a construction sequence designated by the Department requires suspension of paving and base construction after the initial paving operations, partial payments will be reinstated until the paving and base construction resumes.

SECTION 9 is expanded by the following new Article:

**9-11 Submittals.**

**9-11.1 Submittal Instructions:** The Contractor will prepare a monthly estimate for each project in the Contract. Submit the Contractor’s monthly estimate to the Engineer. The Engineer will not pay for any item of workWork until the Contractor’s monthly estimate is approved.

**9-11.2 Schedule of Values:** Within 21 calendar days after contract award or at the preconstruction conference, whichever is earlier, prepare and submit a schedule of values to the Engineer for approval prior to invoicing. Assign the schedule of values to the scheduled workWork activities in the project schedule with the total being the lump sum contract amount.

The schedule of values will be the basis for determining monthly payments. Quantities will be compared with the project schedule to determine the percentage earned. The

percentage shall be that portion of the ~~work~~Work completed as compared to the total ~~work~~Work contracted.

**9-11.3 Contractor's Certified Monthly Estimate:** The Contractor must make a request for payment by submitting a monthly estimate, no later than 12 O'clock noon, Monday, after the estimate cut-off date or as directed by the Engineer, based on the amount of ~~work~~Work done or completed. The Contractor's Certified Monthly Estimate must consist of the following:

1. Contract Number, Financial Project Identification Number, Estimate Number, Monthly Estimate Date and the period that the monthly estimate represents.

2. The basis for arriving at the amount of the monthly estimate including approximate quantities of ~~work~~Work completed, less payments previously made and less an amount previously retained or withheld.

3. Contract Summary showing the percentage of dollar value of completed ~~work~~Work based on the present Contract amount and the percentage of days used based on the present Contract Days.

~~4. Certify the number of gallons of gasoline used during the monthly estimate period.~~

~~45.~~ Certify the number of gallons of diesel used during the monthly estimate period.

~~56.~~ Certify the number of gallons of bituminous material used during the monthly estimate period.

~~67.~~ Certify weight of steel for indexed items.

**9-11.4 Payment to the Contractor:** Upon receipt of the Contractor's monthly estimate and approval by the Engineer, payment will be made, less an amount retained or withheld per provisions included in the Contract. The monthly payments will be approximate only and will be subject to reduction for overpayments or increase for underpayments on preceding payments to the Contractor and to correction in the subsequent estimates and the final estimate and payment process.





*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 13, 2021

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

Re: State Specifications Office  
Section: **334**  
Proposed Specification: **SP3340203 SUPERPAVE ASPHALT CONCRETE (NEW SP)**.

Dear Mr. Nguyen:

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

The change is proposed by Scott Arnold to replace the Standard Specification subarticle and include the URL for the State Materials Office web site.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

Use with any project where pavement coring reports are provided by the Department

**SUPERPAVE ASPHALT CONCRETE.**

**(REV 5-4-21)**

SUBARTICLE 334-2.3.4 is deleted and the following substituted:

**334-2.3.4 Pavement Coring Report:** ~~When the Contract includes milling of the existing asphalt pavement, the Pavement Coring Report may be available on the Department's website.~~ This Contract includes removal and/or milling of the existing asphalt pavement. The Pavement Coring Report is available on the Department's website at the following URL: <https://www.fdot.gov/materials/pavement/coringdata/default.shtm>



*Florida Department of Transportation*

RON DESANTIS  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT, P.E.  
SECRETARY

July 14, 2021

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

Re: State Specifications Office  
Section: **580**  
Proposed Specification: **5800000FA LANDSCAPING.**

Dear Mr. Nguyen:

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

The changes are proposed by Melissa Hollis to include Landscape Soil with "all materials" included for payment under Landscape, LS in the Special Provision.

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

If you have any questions relating to this specification change, please call me at 850-414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.  
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

**LANDSCAPING.**(REV ~~10-30-19~~5-11-21) (FA 1-7-20) (7-21)

The following new Section is added after Section 571.

**SECTION 580  
LANDSCAPING**

**580-1 Description.**

Install landscaping as indicated in the Contract Documents.

**580-2 Materials.****580-2.1 Plants:**

**580-2.1.1 Sizes:** Small plants includes all ground covers, shrubs less than 7 gallon, trees less than 7 gallon, clustering type palms less than 6 foot overall height, cycads less than 7 gallon, and incidental landscaping.

Large plants include shrubs 7 gallon or greater, trees 7 gallon or greater, all single trunk palms, and clustering type palms 6 foot overall height and greater.

**580-2.1.2 Grade Standards and Conformity with Type and Species:** Provide plant materials that comply with all required inspection, grading standards, and plant regulations in accordance with the latest edition of the Florida Department of Agriculture's "Grades and Standards for Nursery Plants."

Unless otherwise specified, the minimum grade for plant material is Florida No. 1. Plant materials must be the specified size and grade at the time of delivery to the site.

Use only plants that are true to type and species, free of fungal infection and disease, and ensure that the plants not specifically covered by Florida Department of Agriculture's "Grades and Standards for Nursery Plants" conform in type and species with the standards and designations in general acceptance by Florida nurseries. Submit a list of nurseries where plants are tagged, including contact information and location. The Engineer may visit the nursery sites to inspect representative samples and lock tag the example plant material.

A minimum of two plants of each species on each shipment must be shipped with tags stating the botanical nomenclature and common name of the plant. Should discrepancies between botanical nomenclature and common name arise, the botanical name will take precedence.

**580-2.2 Inspection and Transporting:** Move nursery stock in accordance with all Federal, State, and Local Rule Regulations. For each shipment of nursery stock, provide the nursery's General Nursery Stock Inspection Certificate as required in Chapter 5B-2, F.A.C.

**580-2.3 Water:** Meet the requirements of Section 983.

**580-2.4 Mulch:** Provide and install mulch in accordance with the Contract Documents.

**580-2.5 Soil Enhancement:**

~~580-2.5.1~~ Enhance soil in accordance with the Contract Documents.

**580-2.6 Landscape Soil:** Replace existing soil with Landscape Soil meeting the requirements of Section 987, at the locations shown in the Contract Documents.

All Federal Aid Jobs with Landscaping. Use when requested by the DDE.

### **580-3 Worksite Landscape Supervisor.**

Provide a Worksite Landscape Supervisor to directly oversee all landscape installation. The Worksite Landscape Supervisor must be a Certified Landscape Technician or Certified Landscape Contractor in accordance with the Florida Nursery Growers and Landscape Association (FNGLA) or a State of Florida Registered Landscape Architect. Provide verification at the preconstruction meeting.

### **580-4 Installation.**

**580-4.1 Installation Plan:** At the preconstruction meeting, provide an installation plan for review and comment. Describe the methods, activities, materials, and schedule to achieve installation as described in this Section. Include a schedule for monthly inspections and reports described in 580-4.9. Include a Schedule of Values for each item on the Tabulation of Quantities/Plant List. Begin installation after Installation Plan is accepted by Engineer.

**580-4.2 Delivery:** All materials must be available for inspection before installation.

**580-4.3 Layout:** The locations of plants as shown in the Contract Documents are approximate. At no cost to the Department, adjust final locations when directed by the Engineer to accommodate unforeseen field conditions or to comply with safety setbacks and requirements. Mark proposed mowing limits, planting beds and individual locations of trees and palms as shown in the Contract Documents for the Engineer's review, prior to excavation or planting.

Make no changes to the layout, or any variations of materials from the Contract Documents without the Engineer's approval.

**580-4.4 Soil Drainage:** Planting holes and beds must drain sufficiently. Notify the Engineer of drainage or percolation problems before plant installation.

**580-4.5 Installation:** Meet the requirements of the Contract Documents.

**580-4.6 Maintenance:** Maintain plant material to the equivalent visible structural, quality and health characteristics per the Contract Documents.

**580-4.7 Site Repair and Restoration:** Repair and restore existing areas disturbed by installation or maintenance activities. Where new turf is required to restore and repair disturbed areas, meet the requirements of Section 570.

**580-4.8 Disposal of Surplus Materials and Debris:** Remove from the jobsite any surplus material unless otherwise directed by the Engineer. Surplus is defined as material not needed after installation of landscaping per Contract Documents. Upon commencement of landscaping installation, remove daily all debris from the landscape locations described in the Contract Documents.

**580-4.9 Reporting:** Provide a written monthly report to the Engineer detailing the condition of the installed landscape, to include at a minimum, the project information, installation date, inspection dates, general condition of the plantings, and the watering and fertilization schedule.

### **580-5 Method of Measurement.**

The quantities to be paid for will be the items shown in the Contract Documents, completed and accepted.

### **580-6 Basis of Payment.**

Price and payment will be full compensation for all work and materials specified in this Section.