INVITATION FOR BID
IFB #12-3020CD

US 301 @ HABEN BOULEVARD, PALMETTO, FL IMPROVEMENTS FOR SIGNALIZATION PLANS (FIN #429873-1-58-01)

Manatee County, a political subdivision of the State of Florida, (hereinafter the "County") will receive sealed bids from individuals, corporations, partnerships, and other legal entities organized under the laws of the State of Florida or authorized to conduct business in the State of Florida.

NON-MANDATORY INFORMATION CONFERENCE
In order to insure that all prospective bidders have sufficient information and understanding of the County's needs, an information conference will be held:

Tuesday, December 11, 2012 at 10:00 AM

at the Manatee County Administrative Center, Purchasing Division, 1112 Manatee Avenue West, Suite 803, Bradenton, Florida 34205.

DEADLINE FOR CLARIFICATION REQUESTS: December 18, 2012 at 3:00 PM
(Reference Bid Article A.06)

TIME AND DATE DUE: December 27, 2012 at 3:00 PM
Manatee County Purchasing, 1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205

Important Note: Lobbying is prohibited (reference Bid Article A.08)

FOR INFORMATION CONTACT:
CHRIS DALEY, CPPB- CONTRACT SPECIALIST
Phone (941) 749-3048 - Fax (941) 749-3034
chris.daley@mymanatee.org

AUTHORIZED FOR RELEASE:

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SECTION 00010
INFORMATION TO BIDDERS

A.01 OPENING LOCATION

These bids will be **publicly opened** at **Manatee County Purchasing Division, 1112 Manatee Avenue West, Suite 803, Bradenton, Florida 34205** in the presence of County officials at the time and date stated, or soon thereafter. All bidders or their representatives are invited to be present.

Any bids received after the stated time and date will not be considered. It shall be the sole responsibility of the bidder to have their bid delivered to the Manatee County Purchasing Division for receipt on or before the stated time and date. If a bid is sent by U.S. Mail, the bidder shall be responsible for its timely delivery to the Purchasing Division. Bids delayed by mail shall not be considered, shall not be opened at the public opening, and arrangements shall be made for their return at the respondent's request and expense.

A.02 SEALED & MARKED

One original and two copies of your **signed bid** shall be submitted in one **sealed** package, clearly marked on the outside **"Sealed Bid #12-3020CD, US 301 @ Haben Boulevard, Palmetto, FL Improvements for Signalization Plans"** with your company name.

Address package to: Manatee County Purchasing Division
1112 Manatee Avenue West, Suite 803
Bradenton, Florida 34205

A.03 SECURING OF DOCUMENTS

Complete individual copies of the bidding documents for the project and/or products can be obtained, free of charge, at the Manatee County Public Works Department located at: 1022 26th Avenue East, Bradenton, FL 34208: **941-708-7450, Extension 7327 or 7334** between the hours of 8:00 AM to 4:00 PM, Monday through Friday, exception of holidays. Complete set of the bidding document must be used in preparing bids. The County assumes no responsibility for errors and misinterpretations resulting from the use of incomplete sets of bidding document.

A.04 BID DOCUMENTS

Bids on http://www.mymanatee.org, Bid documents and the Notices of Source Selection related to those Bids are available for download in a portable document format (.PDF) file on the Manatee County web page on the Purchasing tab under "Bids." You may view and print these files using Adobe Acrobat software. You may download a free copy of this software (Adobe) from the Owner's web page if you do not have it.

A.04 BID DOCUMENTS (Continued)

Manatee County collaborates with the Manatee Chamber of Commerce on distributing solicitations using the RFP Tool web page on the Chambers website: http://www.Manateechamber.com to post Bid documents in a portable document format (.PDF) file. This step is in addition to the posting on Manatee County Government web pages.

Manatee County may also use an internet service provider to distribute Bids. A link to that service, http://www.DemandStar.com, is provided on this website under the Tab "DemandStar". Participation in the DemandStar system is not a requirement for doing business with Manatee County.

Note: The County posts the Notice of Source Selection seven (7) calendar days prior to the effective date of the award.

IT IS THE RESPONSIBILITY OF EACH VENDOR, PRIOR TO SUBMITTING THEIR BID, TO CONTACT THE MANATEE COUNTY PURCHASING DIVISON (see contact information on page one of this document) TO DETERMINE IF ADDENDA WERE ISSUED AND TO MAKE SUCH ADDENDA A PART OF THEIR BID .

A.05 MODIFICATION OF BID SPECIFICATIONS

If a bidder wishes to recommend changes to the bid specifications, the bidder shall furnish in writing, data and information necessary to aid the Owner in evaluating the request to modify the specifications. The Owner is not obligated to make any changes to the bid specifications. Unless an addendum is issued, the bid specifications shall remain unaltered. **Bidders must fully comply with the bid specifications, terms, and conditions.**

A.06 DEADLINE FOR CLARIFICATION REQUESTS

December 18, 2012 at 3:00 PM shall be the deadline to submit all inquiries, suggestions, or requests concerning interpretation, clarification or additional information pertaining to the Invitation for Bids to the Manatee County Purchasing Office.

This deadline has been established to maintain fair treatment for all potential bidders, while maintaining the expedited nature of the Economic Stimulus that the contracting of this work may achieve.

A.07 CLARIFICATION & ADDENDA

Each bidder shall examine all Invitation For Bid documents and shall judge all matters relating to the adequacy and accuracy of such documents. Any inquiries, suggestions or requests concerning interpretation, clarification or additional information pertaining to the Invitation for Bids shall be made through the Manatee County Purchasing Office. The County shall not be responsible for oral interpretations given by any County employee, representative, or others. The issuance of a written addendum is the only official method whereby interpretation, clarification or additional information can be given.

A.07 CLARIFICATION & ADDENDA (Continued)

If any addenda are issued to this Invitation for Bid, the County will broadcast the addenda on the Demand Star distribution system to "Planholders" on this web service, and post the documents on the Purchasing Division's web page at http://www.mymanatee.org which can be accessed by clicking on the "Purchasing" button and then clicking on the "Bids" button. It shall be the responsibility of each bidder, prior to submitting their bid, to contact Manatee County Purchasing Division (see contact on page 1) to determine if addenda were issued and to make such addenda a part of their bid.

A.08 LOBBYING

After the issuance of any Invitation For Bid, prospective bidders, or any agent, representative or person acting at the request of such bidder shall not contact, communicate with or discuss any matter relating in any way to the Invitation For Bid with any officer, agent or employee of Manatee County other than the Purchasing Official or as directed in the Invitation For Bid. This prohibition begins with the issuance of any Invitation For Bid, and ends upon execution of the final Contract or when the invitation has been canceled. Violators of this prohibition shall be subject to sanctions as provided in the Manatee County Purchasing Code.

The County reserves the right to amend or to add to the names listed as persons to contact. All amendments or additions to the names listed as persons to contact shall be issued by the Purchasing Division, in writing.

A.09 UNBALANCED BIDDING PROHIBITED

Manatee County recognizes that large and/or complex projects will often result in a variety of methods, sources and prices. However, where in the opinion of the County such variation does not appear to be justified, given bid specifications and industry and market conditions, the bid will be presumed to be unbalanced. Examples of unbalanced bids will include:

1. Bids showing omissions, alterations of form, additions not specified or required conditional or unauthorized alternate bids.

2. Bids quoting prices that substantially deviate, either higher or lower, from those included in the bids of competitive bidders for the same line item unit costs.

3. Bids where the unit costs offered are in excess of or below reasonable cost analysis values.

In the event the County determines that a bid is presumed unbalanced, it will request the opportunity to, and reserves the right to, review all source quotes, bids, price lists, letters of intent, etc., which the bidder obtained and upon which the bidder relied upon to develop the bid. The County reserves the right to reject as non-responsive any presumptive unbalanced bids where the bidder is unable to demonstrate the validity and/or necessity of the unbalanced unit costs.

A.10 FRONT END LOADING OF BID PRICING PROHIBITED

Prices offered for performance and/or acquisition activities that occur early in the project schedule such as mobilization, clearing and grubbing; or maintenance of traffic that are substantially higher than pricing of competitive bidders within the same portion of the project schedule, will be presumed to be front end loaded. Front end loaded bids could reasonably appear to be an attempt to obtain unjustified early payments creating a risk of insufficient incentive for the Contractor to complete the work or otherwise creating an appearance of an under-capitalized bidder.

In the event the County determines that a bid is presumed to be front end loaded, it will request the opportunity to, and reserves the right to, review all source quotes, bids, price lists, letters of intent, etc., which the bidder obtained and upon which the bidder relied upon to develop the pricing or acquisition timing for these bid items. The County reserves the right to reject as non-responsive any presumptive front end loaded bids where the bidder is unable to demonstrate the validity and/or necessity of the front end loaded costs.

A.11 WITHDRAWAL OF OFFERS

Vendors may withdraw offers as follows: a) Mistakes discovered before the opening of a solicitation may be withdrawn by written notice from the bidder submitting the offer. This request must be received in the office designated for receipt of offers in the solicitation document prior to the time set for delivery and opening of the offers. A copy of the request shall be retained and the unopened offer returned to that vendor. b) After the responses to a solicitation are opened or a selection has been determined, but before a Contract is signed, a vendor alleging a material mistake of fact may be permitted to withdraw their offer if the mistake is clearly evident on the solicitation document or the bidder submits evidence which clearly and convincingly demonstrates that a mistake was made. Request to withdraw an offer must be in writing and approved by the Purchasing Official.

A.12 IRREVOCABLE OFFER

Any bid may be withdrawn up until the date and time set for opening of the bid. Any bid not so withdrawn shall, upon opening, constitute an irrevocable offer for a period of ninety (90) days to sell to Manatee County the goods or services set forth in the attached specifications until one or more of the bids have been duly accepted by the County.

A.13 BID EXPENSES

All expenses for making bids to the County are to be borne by the bidder.

A.14 RESERVED RIGHTS

The County reserves the right to accept or reject any and/or all bids, to waive irregularities and technicalities and to request resubmission. Also, the County reserves the right to accept all or any part of the bid and to increase or decrease quantities to meet additional or reduced requirements of the County. Any sole response received by the first submission date may or may not be rejected by the County depending on available competition and current needs of the County. For all items combined, the bid of the lowest responsive, responsible bidder will be accepted, unless all bids are rejected. The lowest responsible bidder shall mean that bidder who makes the lowest bid to sell goods and/or services of a quality which meets or exceeds the quality of goods and/or services set forth in the attached specifications or otherwise required by the County, and who is fit and capable to perform the bid as made.

To be responsive, a bidder shall submit a bid which conforms in all material respects to the requirements set forth in the Invitation For Bid. To be a responsible bidder, the bidder shall have the capability in all respects to perform fully the Contract requirements, and the tenacity, perseverance, experience, integrity, reliability, capacity, facilities, equipment, and credit which will assure good faith performance. Also, the County reserves the right to make such investigation as it deems necessary to determine the ability of any bidder to furnish the service requested. Information the County deems necessary to make this determination shall be provided by the bidder. Such information may include, but shall not be limited to current financial statements, verification of availability of equipment and personnel, and past performance records.

A.15 APPLICABLE LAWS

Bidder must be authorized to transact business in the State of Florida. All applicable laws and regulations of the State of Florida and ordinances and regulations of Manatee County will apply to any resulting agreement. Any involvement with any Manatee County procurement shall be in accordance with Manatee County Purchasing Code of Laws as amended. Any actual or prospective bidder who is aggrieved in connection with the solicitation or award of a Contract may protest to the Board of County Commissioners of Manatee County as required in Manatee County Code of Laws.

A.16 COLLUSION

By offering a submission to this Invitation For Bid, the bidder certifies that he has not divulged, discussed or compared their bid with other bidder, and has not colluded with any other bidder or parties to this bid whatsoever. Also, bidder certifies, and in the case of a joint bid each party thereto certifies as to their own organization, that in connection with this bid:

a. any prices and/or cost data submitted have been arrived at independently, without consultation, communication, or agreement for the purpose of restricting competition, as to any matter relating to such prices and/or cost data, with any other bidder or with any competitor;

A.16 COLLUSION (Continued)

b. any prices and/or cost data quoted for this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder, prior to the scheduled opening, directly or indirectly to any other bidder or to any competitor;

c. no attempt has been made or will be made by the bidder to induce any other person or firm to submit or not to submit a bid for the purpose of restricting competition;

d. the only person or persons interested in this bid, principal or principals is/are named therein and that no person other than therein mentioned has any interest in this bid or in the Contract to be entered into; and

e. no person or agency has been employed or retained to solicit or secure this Contract upon an agreement or understanding or a commission, percentage, brokerage, or contingent fee excepting bona fide employees or established commercial agencies maintained by bidder for purpose of doing business.

A.17 CODE OF ETHICS

With respect to this bid, if any bidder violates or is a party to a violation of the Code of Ethics of Manatee County per Manatee County Purchasing Code Ordinance 08-43, Article 3, Ethics in Public Contracting, and/or the State of Florida per Florida Statutes, Chapter 112, Part III, Code of Ethics for Public Officers and Employees, such bidder may be disqualified from performing the work described in this bid or from furnishing the goods or services for which the bid is submitted and shall be further disqualified from submitting any future bids for work or for goods or services for Manatee County. The Owner anticipates that all statements made and materials submitted in a bid will be truthful. If a bidder is determined to be untruthful in its bid or any related presentation, such bidder may be disqualified from further consideration regarding this Invitation For Bid.

A.18 BID FORMS

Bids must be submitted on attached County forms, although additional pages may be attached. - **Bidders must fully complete all pages of the Bid Forms. Bid Forms must be executed by an authorized signatory who has the legal authority to make the offer and bind the company. Bidders must fully comply with all bid specifications, terms and conditions**. Failure to comply shall result in Contract default, whereupon, the defaulting vendor shall be required to pay for any and all re-procurement costs, damages, and attorney fees as incurred by the County.

A.19 LEGAL NAME

Bids shall clearly indicate the legal name, address and telephone number of the bidder. Bids shall be signed above the typed or printed name and title of the signer. The signer must have the authority to bind the bidder to the submitted bid.

A.20 PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES

A person or affiliate who has been placed on the State's convicted vendor list following a conviction for a public entity crime, as that term is defined in Florida Statute § 287.133, may not submit a bid, proposal, or reply on a Contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a Contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals or replies on leases of real property to a public entity; may not be awarded or perform work as a Contractor, supplier, subcontractor, or consultant under a Contract with any public entity; and may not transact business with any public entity in excess of the threshold amount provided in Florida Statute § 287.017 for CATEGORY TWO for a period of thirty-six (36) months following the date of being placed on the convicted list.

In addition, the Manatee County Code prohibits the award of any Contract to any person or entity who/which has, within the past 5 years, been convicted of, or admitted to in court or sworn to under oath, a public entity crime or of any environmental law that, in the reasonable opinion of the purchasing official, establishes reasonable grounds to believe the person or business entity will not conduct business in a responsible matter. To insure compliance with the foregoing, the Code requires all persons or entities desiring to Contract with the County to execute and file with the purchasing official an affidavit, executed under the pain and penalties of perjury, confirming that person, entity and any person(s) affiliated with the entity, does not have such a record and is therefore eligible to seek and be awarded business with the County. In the case of a business entity other than a partnership or a corporation, such affidavit shall be executed by an authorized agent of the entity. In the case of a partnership, such affidavit shall be executed by the general partner(s). A Public Contracting and Environmental Crimes Certification are attached for this purpose.

A.21 DISCOUNTS

Any and all discounts must be incorporated in the prices contained in the bid and not shown separately. The prices as shown on the bid form shall be the price used in determining award.

A.22 TAXES

Manatee County is exempt from Federal Excise and State Sales Taxes. (F.E.T. Exempt Cert. No. 59-78-0089K; FL Sales Tax Exempt Cert. No. 85-8012622206C-6); therefore, the vendor is prohibited from delineating a separate line item in his bid for any sales or service taxes. Nothing herein shall affect the vendor's normal tax liability.

A.23 DESCRIPTIVE INFORMATION

Unless otherwise specifically provided in the specifications, all equipment, materials and articles incorporated in the work covered by this Contract shall be new and of the most suitable grade for the purpose intended. Unless otherwise specifically provided in the specifications, reference to any equipment, material, article or patented process, by trade name, brand name, make or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition.

A.24 AMERICANS WITH DISABILITIES ACT

The Board of County Commissioners of Manatee County, Florida, does not discriminate upon the basis of any individual's disability status. This non-discrimination policy involves every aspect of the County's functions including one's access to, participation, employment, or treatment in its programs or activities. Anyone requiring reasonable accommodation for an **Information Conference** or **Bid Opening** should contact the person named on the first page of this bid document at least twenty-four (24) hours in advance of either activity.

A.25 EQUAL EMPLOYMENT OPPORTUNITY CLAUSE

In accordance with the provisions of Title VI of the Civil Rights Act of 1964 and Title 15, Part 8 of the Code of Federal Regulations, Manatee County hereby notifies all prospective offerors that they will affirmatively ensure minority business enterprises will be afforded full opportunity to participate in response to this advertisement and will not be discriminated against on the grounds of race, color or national origin in consideration for an award of contract.

A.26 MBE/WBE

The State of Florida, **Office of Supplier Diversity** provides the certification process and the database for identifying certified MBE/WBE firms. This service may be directly accessed at: http://www.osd.dms.state.fl.us/iframe.htm

If you have any questions regarding this State service, please contact their office at (850) 487-0915.

A.27 MATHEMATICAL ERRORS

In the event of multiplication/extension error(s), the unit price shall prevail. In the event of addition error(s) the extension totals will prevail. All bids shall be reviewed mathematically and corrected, if necessary, using these standards, prior to additional evaluation.

A.28 DISCLOSURE

Upon receipt, all inquiries and responses to inquiries related to this Invitation For Bid becomes "Public Records", and shall be subject to public disclosure consistent with Chapter 119, Florida Statues.

Bids become subject to disclosure 30 days after the Opening or if a notice of intended award decision is made earlier than this time as provided by Florida Statute 119.071(1)(b). No announcement or review of the offer shall be conducted at the public opening. If the County rejects all offers and concurrently notices its intent to reissue the solicitation, initial offers are exempt until the County provide notice of its intended decision or, or 30 days after the opening of the new offers.

Based on the above, Manatee County will receive bids at the date and time stated, and will make public at the opening the names of the business entities of all that submitted an offer and any amount presented as a total offer without any verification of the mathematics or the completeness of the offer. Upon the expiration of the statutory term for exemption the actual documents may be inspected or copied. When County staff have completed a mathematic validation and inspected the completeness of the offers, tabulation shall be posted on www.mymanatee.org.

A.29 E-VERIFICATION

Contractor shall utilize the U.S. Department of Homeland Security's E-Verify system, in accordance with the terms governing use of the system, to confirm the employment eligibility of;

1. All persons employed by the Contractor during the term of the Contract to perform employment duties within Florida: and
2. All persons, including subcontractors, assigned by the Contractor to perform work pursuant to the contract with the State Agency.

NOTE: ANY OR ALL STATEMENTS CONTAINED IN THE FOLLOWING SECTIONS: BASIS OF AWARD, TERMS AND CONDITIONS OF THE CONTRACT, OR SPECIFICATIONS, WHICH VARY FROM THE INFORMATION TO BIDDERS, SHALL HAVE PRECEDENCE.

END OF SECTION A

SECTION 00020
BASIS OF AWARD

B.01 BASIS OF AWARD

Award shall be to the most responsive, responsible bidder meeting specifications and having the lowest Total Bid Price for **Bid "A",** or the lowest total price for **Bid "B"** for the requirements listed on the Bid Form for the Work as set forth in this Invitation For Bid. Bid Prices shall include costs for furnishing all labor, equipment and/or materials for the completion of the Work in accordance with and in the manner set forth and described in the Contract Documents to the County's satisfaction within the prescribed time.

Two schedules for Completion of the Work shall be considered. Each bid for completion by the specified stated time shall be offered as a separate "Total Bid Price". The County has the sole authority to select the bid based on the Completion Time which is in the best interest of the County. Only one award shall be made.

In evaluating bids, the County shall consider the qualifications of the bidders; and if required, may also consider the qualifications of the subcontractors, suppliers, and other persons and organizations proposed. County may also consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work.

Whenever two (2) or more bids which are equal with respect to price, quality and service are received, the award shall be determined by a chance drawing conducted by the Purchasing Office and open to the public.

B.02 SUBCONTRACTORS

Subcontractors shall be bound by the terms and conditions of this Contract insofar as it applies to their Work, but this shall not relieve the prime Contractor from the full responsibility of the County for the proper completion of all Work to be executed under this Contract.

The employment of unauthorized aliens by any vendor is considered a violation of Section 274 (e) of the Immigration and Employment Act. If the vendor knowingly employs unauthorized aliens, such violation shall be cause for unilateral cancellation of this agreement.

B.03 QUALIFICATIONS OF BIDDERS

Each bidder must possess all licenses required (in accordance with Chapter 489 Florida Statutes) for the Work which is the subject of this bid; and, upon request, shall submit a true copy of all applicable licenses. **The bidding Contractor (company supplying the bid) shall be an FDOT Pre-Qualified Contractor in the category of Traffic Signal and have a minimum of four (4) years experience in this type of construction which is the subject of this IFB to be considered for award.**

The bidding Contractor's corporate name must appear in the State FDOT database in this category on the bid due date. In addition, the certification must be maintained throughout the duration of the project.

To demonstrate qualifications to perform the Work, each bidder must be prepared to submit within five (5) days of County's request, written evidence such as financial data; previous experience, present commitments and other such data as may be requested. Bidder must be able to provide evidence of Bidder's qualification to do business in the state of Florida. Each bidder shall submit as a portion of their bid, a completed Contractor's Questionnaire included as Section 00430.

A complete list of all subcontractors proposed for any portion of the Work may be requested of any Bidder deemed necessary by the County. Subcontracts shall be awarded only to those subcontractors considered satisfactory by the County.

B.04 PREPARATION OF CONTRACT

A written notice confirming award or recommendation thereof will be forwarded to the successful Bidder accompanied by the required number of unsigned counterparts of the Agreement. Within ten (10) days thereafter, successful Bidder shall sign and deliver the required number of counterparts of the Agreement with any other required documents to County. (Note: Contract must be approved in accordance with the Manatee County Code of Laws, Chapter 2-26, Manatee County Purchasing Ordinance and the Standard and Procedures approved by the County Administrator).

B.05 INSPECTION OF SITE

Inspection of the site is a requirement to be considered for award of this Contract. Prior to submitting a Bid Form, each bidder shall examine the site and all conditions thereon fully familiarizing themselves with the full scope of the project. Failure to become familiar with site conditions will in no way relieve the successful bidder from the necessity of furnishing any materials or performing any work that is required to complete the project in accordance with the plans and specifications. Site visit (s) shall be acknowledged in Section 00300, Bid Form page # 00300-2.

END OF SECTION B

SECTION 00030

GENERAL TERMS AND CONDITIONS OF THE CONTRACT

C.01 CONTRACT FORMS

The agreement resulting from the acceptance of a bid shall be in the form of the agreement stated in this bid.

C.02 ASSIGNMENT OF CONTRACT

Contractor shall not assign, transfer, convey, sublet or otherwise dispose of this Contract or of his right, title, or interest therein, or his power to execute such Contract, or to assign any monies due or to become due there under to any other person, firm or corporation unless first obtaining the written consent of the County. The giving of such consent to a particular subcontractor assignment shall not dispense with the necessity of such consent to any further or other assignment.

C.03 COMPLETION OF WORK

The Work will be completed and ready for final inspection within the specified calendar days from the date the Contract Time commences to run. Two bids shall be considered based on **Bid "A" 120 calendar days** and **Bid "B"** based on **180 calendar days**. The County has the sole authority to select the bid based on the Completion Time which is in the best interest of the County. Only one award shall be made.

C.04 LIQUIDATED DAMAGES

If the Contractor refuses or fails to prosecute the Work, or any separable part thereof, with such diligence as will hinder its completion within the time specified, the County may seek damages. The actual damages for delay will be impossible to determine and in lieu thereof, the Contractor shall pay to the County the sum of **Three hundred eighty-eight dollars ($388.00)** as fixed, agreed, and liquidated damages for each calendar day of the delay until the Work is finally accepted by the County and the Contractor and his Surety shall be liable for the amount thereof.

C.05 PAYMENT

Contractor may apply for partial payment on monthly estimates, based on the amount of Work done or completed in compliance with the provisions of the Contract. Contractor shall submit an application, on a standard pay application form provided or approved by the County, of an approximate estimate of the proportionate value of the Work done, items and locations of the Work performed up to and including the last day of the period then ending. The County will then review said estimate and make any necessary revisions so that the estimate can receive approval for payment. If the Contractor and the County do not agree on the approximate estimate of the proportionate value of the Work done for any pay period, the determination of the County will be binding. The amount of said estimate after deducting any required retainage and all previous payments shall be due and payable to the Contractor, twenty (20) business days if County is its own Engineer of Record (EOR) or twenty-five (25) business days if outside agent approval is required after the pay estimate has been approved by the agent for the County.

C.05 PAYMENT (Continued)

In accordance with the Prompt Payment Act, Section 218.735 (7), Florida Statutes, a punch list shall be formulated.

Time allowed for development of punch list:

1. Awarded Contracts with an estimated cost of less than $10 million will be within thirty (30) calendar days after reaching substantial completion. Substantial completion is defined as reaching beneficial occupancy or use.

2. Awarded Contracts with a cost of $10 million dollars or more will be within thirty (30) calendar days OR if extended by Contract: up to sixty (60) calendar days after reaching substantial completion. Substantial completion is defined as reaching beneficial occupancy or use.

The final Contract completion date must be at least thirty (30) days after delivery of the list of items. If the list is not provided to the awarded Contractor by the agreed upon date, the Contract completion time must be extended by the number of days the County exceeds the delivery date.

It is the Contractor's responsibility for care of the materials. Any damage to or loss of said materials is the full responsibility of the Contractor. Any Periodical Pay Estimate signed by the Contractor shall be final as to the Contractor for any or all Work covered by the Periodical Pay Estimate.

Any requests for payment of materials stored on site must be accompanied with a paid receipt. The Contractor warrants and guarantees that title to all work, materials and equipment covered by any application for payment, whether incorporated in the project or not, will pass to the County at the time of payment free and clear of all liens, claims, security interests and encumbrances (hereafter referred to as "Liens").

The Contractor agrees to furnish an affidavit stating that all laborers, material men, and subcontractors have been paid on the project for Work covered by the application for payment and that a partial or complete release of lien, as may be necessary, be properly executed by the material men, laborers, subcontractors on the project for Work covered by the application for payment, sufficient to secure the County from any claim whatsoever arising out of the aforesaid Work.

When the Contractor has completed the Work in compliance with the terms of the Contract Documents, he shall notify the County in writing that the project is ready for final inspection. The County will then advise the Contractor as to the arrangements for final inspection and what Work, if any, is required to prepare the project or a portion thereof for final inspection. When the County determines the project or portion thereof is ready for final inspection, the County shall perform same. Upon completion of final inspection, the County will notify Contractor of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies. When all such errors have been corrected, a final re-inspection will be made. The process will be repeated until, in the opinion of the County, the project has been completed in compliance with the terms of the Contract Documents.

C.05 PAYMENT (Continued)

When final acceptance has been made by the County, the County will make final payment of the Contract amount, plus all approved additions, less approved deductions and previous payments made. The Contract will be considered complete when all work has been finished, the final inspection made, approved as-builts received, and the project finally accepted in writing by the County. The Contractor's responsibility shall then terminate except as otherwise stated.

C.06 RETAINAGE

A **retainage** of 2.5% of the total contract amount shall be withheld from payments after 75% completion of the Work. Upon substantial completion, this retainage shall be reduced to 1% of the total contract amount plus such amount as the County may reasonably deem necessary to repair, replace, complete or correct any damaged, defective, incorrect or incomplete work. Upon final acceptance, the remaining retainage shall be included in the final payment.

C.07 WARRANTY AND GUARANTEE PROVISIONS

All work, materials, and equipment furnished as defined herein shall be guaranteed and warranted by the Contractor for a minimum period of three (3) years, unless otherwise specified, from final acceptance by the County to be free from defects due either to faulty materials or equipment or faulty workmanship.

All materials, equipment, and workmanship furnished and installed by the Contractor is warranted and guaranteed by the Contractor to be such as to meet the required standards and to accomplish the purposes and functions required standards and to accomplish the purposes and functions of the project as defined, detailed, and specified herein.

The County shall, following discovery thereof, promptly give written notice to the Contractor of faulty materials, equipment, or workmanship within the period of the guarantee and the Contractor shall promptly replace any part of the faulty equipment, material, or workmanship at his own cost. These warranty and guarantee provisions create no limitations on the County as to any claims or actions for breach of guaranty or breach of warranty that the County might have against parties other than the Contractor, and do not constitute exclusive remedies of the County against the Contractor.

C.08 ROYALTIES AND PATENTS

The Contractor shall pay all royalties and license fees for equipment or processes in conjunction with the equipment and/or services being furnished. Contractor shall defend all suits or claims for infringement of any patent, trademark or copyright, and shall save the County harmless from loss on account thereof, including costs and attorney's fees.

C.09 AUTHORIZED PRODUCT REPRESENTATION

The Contractor, by virtue of submitting the name and specifications of a manufacturer's product, will be required to furnish the named manufacturer's product. Failure to perform accordingly may, in the County's sole discretion, be deemed a breach of Contract, and shall constitute grounds for the County's immediate termination of the Contract.

C.10 REGULATIONS

It shall be the responsibility of the Bidder to assure compliance with any OSHA, EPA and/or other federal or state of Florida rules, regulations or other requirements as each may apply.

C.11 CANCELLATION

Any failure of the Contractor to furnish or perform the Work (including, but not limited to commencement of the Work, failure to supply sufficient skilled workers or suitable materials or equipment) in accordance with the Contract, the County may order the stop of the Work, or any portion thereof, until the cause for such order has been eliminated. If the Contractor persistently fails to perform the Work in accordance with the Contract, the County reserves the right to terminate the Contract and select the next qualified bidder or re-advertise this procurement in part or in whole. The County reserves the right to cancel all or any undelivered or unexecuted portion of this Contract with or without cause.

C.12 INDEMNIFICATION

The Contractor covenants and agrees to indemnify and save harmless the County, its agents and employees, from and against all claims, suits, actions, damages, causes of action, or judgments arising out of the terms of the resulting agreement for any personal injury, loss of life, or damage to the property sustained as a result of the performance or non-performance of services or delivery of goods; from and against any orders, judgments, or decrees, which may be entered against the County, its agents or employees; and from and against all costs, attorney's fees, expenses and other liabilities incurred in the defense of any such claim, suit or action, and the investigation thereof. Nothing in the award, resulting Agreement, Contract or Purchase Order shall be deemed to affect the rights, privileges and immunities of the County as set forth in Florida Statute Section 768.28.

C.13 MANUALS, SCHEMATICS, HANDBOOKS (IF APPLICABLE)

All manuals, schematics and handbooks shall be provided which are applicable to the equipment delivered. An operators manual, parts manual and technician manual must also be provided. Parts lists (manuals) must include OEM part numbers for items not manufactured by the bidder. Vendor shall furnish two (2) copies of each.

C.14 INSURANCE

The Contractor will not commence work under a Contract until all insurance under this section and such insurance coverage as might be required by the County has been obtained. The Contractor shall obtain, and submit to purchasing within ten (10) calendar days of request, at his expense, the following minimum amounts of insurance (inclusive of any amounts provided by an umbrella or excess policy):

a. Workers' Compensation/Employers' Liability

Part One - There shall be no maximum limit (other than as limited by the applicable statute) for liability imposed by Florida Workers' Compensation Act or any other coverage required by the Contract documents which are customarily insured under Part One of the standard Workers' Compensation Policy.

Part Two - The minimum amount of coverage required by the Contract documents which are customarily insured under Part Two of the standard Workers' Compensation Policy shall be:

$100,000	(Each Accident)
$500,000	(Disease-Policy Limit)
$100,000	(Disease-Each Employee)

b. Commercial General Liability

The limits are to be applicable only to work performed under this Contract and shall be those that would be provided with the attachment of the Amendment of Limits of Insurance (Designated Project or Premises) endorsement (ISO Form CG 25 03) a Commercial General Liability Policy with the following minimum limits.

General Aggregate:	
Products/Completed Operations Aggregate	$1,000,000
Personal and Advertising Injury	$1,000,000
Each Occurrence	$1,000,000
Fire Damage (Any One Fire)	$Nil
Medical Expense (Any One Person)	$Nil

c. Business Auto Policy

Each Occurrence Bodily Injury and Property Damage Liability Combined	$ 300,000
Annual Aggregate (if applicable):	$1,000,000

d. County's Protective Liability Coverage

The minimum OPC Policy limits per occurrence and, if subject to an aggregate, annual aggregate to be provided by the Contractor shall be the same as the amounts shown above as the minimum per occurrence and general policy aggregate limits respectively required for the Commercial General Liability coverage. The limits afforded by the OPC Policy and any excess policies shall apply only to the County and the County's officials, officers, agents and employees and only to claims arising out of or in connection with the Work under this Contract.

C.14 INSURANCE (Continued)

e. Property Insurance
If this Contract includes construction of or additions to above ground buildings or structures, Contractor shall provide "**Builder's Risk**" insurance with the minimum amount of insurance to be 100% of the value of such addition(s), building(s), or structure(s).

f. Installation Floater
If this Contract does not include construction of or additions to above ground building or structures, **but does involve** the installation of machinery or equipment, Contractor shall provide an "**Installation Floater**" with the minimum amount of insurance to be 100% of the value of such addition(s), building(s), or structure(s).

g. Certificates of Insurance and Copies of Polices
Certificates of Insurance in triplicate evidencing the insurance coverage specified in the six above paragraphs a., b., c., d., e., and f., shall be filed with the Purchasing Official before operations are begun. The required certificates of insurance shall name the types of policy, policy number, date of expiration, amount of coverage, companies affording coverage, and also shall refer specifically to the bid number, project title and location of project. Insurance shall remain in force at least one (1) year after completion and acceptance of the project by the County, in the amounts and types as stated herein, with coverage for all products and services completed under this Contract.

ADDITIONAL INSURED: Manatee County, a political subdivision of the State of Florida, shall be named as additional insured on all applicable policies.

If the initial insurance expires prior to the completion of operations and/or services by the Contractor, renewal certificates of insurance and required copies of policies shall be furnished by the Contractor and delivered to the Purchasing Official thirty (30) days prior to the date of their expiration.

Nothing herein shall in any manner create any liability of the County in connection with any claim against the Contractor for labor, services, or materials, or of subcontractors; and nothing herein shall limit the liability of the Contractor or Contractor's sureties to the County or to any workers, suppliers, materialmen or employees in relation to this Contract.

C.15 BID BOND/CERTIFIED CHECK

By offering a submission to this Invitation For Bid, the Bidder agrees should the Bidder's bid be accepted, **to execute the form of Contract and present the same to Manatee County for approval within ten (10) calendar days after notice of Intent to Award**. The Bidder further agrees that failure to execute and deliver said form of Contract **within ten (10) days** will result in damages to Manatee County and as guarantee of payment of same a bid bond/certified check shall be enclosed within the submitted sealed bid in the amount of five (5%) percent of the total amount of the bid.

The Bidder further agrees that in case the Bidder fails to enter into a Contract, as prescribed by Manatee County, the bid bond/certified check accompanying the bid shall be forfeited to Manatee County as agreed liquidated damages. If the County enters into a Contract with a Bidder, or if the County rejects any and/or all bids, accompanying bond will be promptly returned.

C.16 PERFORMANCE AND PAYMENT BONDS

The successful Bidder shall furnish surety bonds using the form prescribed in F.S. 255.05, which is provided herein, as security for faithful performance of the Contract awarded as a result of this bid and for the payment of all persons performing labor and/or furnishing material in connection therewith. Failure to provide the required bonds on the prescribed form may result in successful bidder being deemed nonresponsive. Bonds must be in the form prescribed in F.S. § 255.05, and must not contain notice, demand or other terms and conditions, including informal pre-claim meetings, not provided for in F.S. § 255.05.

Surety of such bonds shall be in an amount equal to the bid award (100% each) issued by a duly authorized and nationally recognized surety company, authorized to do business in the State of Florida, satisfactory to this County. The attorney-in-fact who signs the bonds must file with the bonds, a certificate and effective dated copy of power-of-attorney. Performance and Payment bonds shall be issued to Manatee County, a political subdivision of the State of Florida, within ten (10) calendar days after notification of intent to award.

In addition, pursuant to F.S. § 255.05(1) (b), prior to commencing work, the Contractor shall be responsible and bear all costs associated to record the Performance and Payment bond with the Manatee County Clerk of the Circuit Court. A certified copy of said recording shall be furnished to the Purchasing Division upon filing. Pursuant to F.S. § 255.05(1) (b), the County will make no payment to the Contractor until the Contractor has complied with this paragraph.

Furnishing of the recorded Performance and Payment bonds shall be requisite to execution of a Contract with the County. Said Performance and Payment bonds will remain in force for the duration of the Contract with the premiums paid by the Contractor. Failure of the successful Bidder to execute such Contract and to supply the required bonds shall be just cause for cancellation of the award. The County may then contract with another acceptable Bidder or re-advertise this Invitation for Bid. If another Bidder is accepted, and notice given within ninety (90) days after the opening of bids, this acceptance shall bind the Bidder as though they were originally the successful Bidder.

C.16 PERFORMANCE AND PAYMENT BONDS (Continued)

Failure of the County at any time to require performance by the Contractor of any provisions set out in the Contract will in no way affect the right of the County, thereafter, to enforce those provisions.

C.17 NO DAMAGES FOR DELAY

No claim for damages or any claim other than for an extension of time shall be made or asserted against the County by reason of any delays. The Contractor shall not be entitled to an increase in the Total Contract Price or payment or compensation of any kind from the County or direct, indirect, consequential impact or other costs, expenses for damages, including but not limited to costs of acceleration or inefficiency arising because of delay, disruption, interference or hindrance from any cause whatsoever; provided; however, that this provision shall not preclude recovery or damages by the Contractor for hindrance or delays due solely to fraud, bad faith, or active interference on part of the County or its agents. Otherwise, the Contractor shall only be entitled to extensions of the Contract Time as the sole and exclusive remedy for such resulting delay, in accordance with and to the extent specifically provided above.

C.18 NO INTEREST

Any monies not paid by the County when claimed to be due to the Contractor under this Contract shall not be subject to interest including prejudgment interest. Any monies not paid by the County when claimed to be due to the Contractor for damages awarded in the case of construction delays shall not be subject to prejudgment interest.

C.19 CONSTRUCTION OF CONTRACT

This Contract and the rights and responsibilities hereunder shall not be construed more strongly against either party, regardless of the extent to which such party may have participated in the preparation hereof.

C.20 BE GREEN

All Vendors/Bidders/Quoters/Proposers *(as applicable)* are encouraged to use as many **environmentally preferable** "green" products, materials, supplies, etc. as possible in order to promote a safe and healthy environment. **Environmentally preferable are products or services that have a reduced adverse effect on the environment**. Provide detail of your organization's initiative and its ability to meet the goal of environmental sustainability.

END OF SECTION C

SECTION 00100
BID SUMMARY

D.01 THE WORK

The Work included in this Contract consists of an upgrade to the traffic signals and complete intersection improvements at US 41/US 301 at Haben Boulevard. The scope includes removal of four concrete strain poles with span wires and replacing them with two mast arm poles; one double mast arm with luminary and one single mast arm without luminary. Pedestrian signal features will be upgraded to current FDOT standards. Sidewalk ramps will be upgraded to meet ADA requirements. **All required MOT shall be provided by the contractor.**

The Work shall be done in accordance with Florida Department of Transportation Standard (FDOT), Articles and Sub articles of the General Requirements and Covenants Division (Division I) and all of the Construction Details and Materials Divisions (Division II and III) of the 2010 Edition of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, current edition, unless otherwise noted and Supplemental Specifications insofar as the same may apply.

The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis..

D.02 SUBCONTRACTORS, SUPPLIERS AND OTHERS

The identity of subcontractors, suppliers, and other persons and organizations (including those who are to furnish the principal items of material and equipment) may be requested by the County for each bid item from any of the Bidders; and the Bidder shall respond within five days after the date of such request. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such subcontractor, supplier, persons or organization if requested by County. If County, after due investigation, has reasonable objection to any proposed subcontractor, supplier, other person or organization, County may, before the Notice of Award is given, request the apparent successful Bidder to submit an acceptable substitute without an increase in Contract Price or Contract Time.

If apparent successful Bidder declines to make any such substitution, County may award the Contract to the next lowest qualified Bidder that proposes to use acceptable subcontractors, suppliers, and other persons who County does not make written objection to Contractor shall not be required to employ any subcontractor, supplier, other person or organization who Contractor has reasonable objection to.

Subcontractors shall be bound by the terms and conditions of this Contract insofar as it applies to their Work, but this shall not relieve the prime Contractor from the full responsibility to the County for the proper completion of all Work to be executed under this Contract.

D.02 SUBCONTRACTORS, SUPPLIERS AND OTHERS (Continued)

No more than 70% of the Total Bid Price, including labor and materials (excluding the Discretionary Work) shall be performed by subcontractors. It is a requirement of FHWA that a minimum of 30% of the Scope of Work shall be performed by the Prime Contractor. Bid Form includes a duplication of bid items where the Bidder shall state the percentage of work and a description of the work (of each item) which shall be performed by a Subcontractor.

D.03 BIDS

Bids are to be submitted in **triplicate, one original and two copies**, upon the County supplied forms. All blank spaces must be filled in as noted with amounts extended and totaled and no changes shall be made in the wording of the forms or in the items mentioned therein. In the event a change is made in your submittal, the Bidder shall write its initials by the change. Any bid may be rejected which contains any omissions, alterations, irregularities of any kind, or which shall in any manner fail to conform to bid requirements.

A bid made by an individual, either in his/her own or proper person or under a trade or firm name, shall be executed under the individual's signature. If made by a partnership, the bid shall be executed by two or more of the general partners. If made by a corporation, the bid shall be executed by its President or other legally authorized corporate officer or agent.

D.04 EXAMINATION OF CONTRACT DOCUMENTS AND SITE

It is the responsibility of each Bidder before submitting a Bid to (a) examine the Bid Documents thoroughly; (b) visit the site to become familiar with local conditions that may affect cost, progress, performance, or furnishing of the Work; (c) consider federal, state, and local codes, laws, and regulations that may affect costs, progress, performance, or furnishing of the Work; (d) study and carefully correlate Bidder's observations with the Bid Documents; and (e) notify County of all conflicts, errors, or discrepancies in the Bid Document.

The accuracy of the existing utility locations shown on the plans is approximate and without express or implied warranty. Each Bidder may, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies, and obtain any additional information and data which pertain to the physical conditions at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the Work and which Bidder deems necessary to determine his Bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

County will provide each Bidder access to the site to conduct such explorations and tests. Bidder shall fill all holes, clean up and restore the site to its former condition upon completion of such explorations. The lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and other lands designated for use by Contractor in performing the Work are identified in the Contract Documents.

All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by Contractor. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by County unless otherwise provided in the Contract Documents.

D.05 MATERIALS AND WORKMANSHIP

All materials and apparatus required for this Work, except as specifically specified otherwise, shall be new, of first class quality, and shall be furnished, delivered, connected and finished in every detail. Construction shall be prescribed by good industry practice and in accordance with manufacturer's recommendations for the type being installed.

Use skilled workman trained and experienced in the necessary trades and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this section.

D.06 REGULATIONS AND MATERIAL DISPOSAL

It shall be the responsibility of the Contractor to assure compliance with any OSHA, EPA, federal, state, and/or local rules, regulations or other requirements as each may apply.

D.07 PROJECT CLOSE-OUT

Clean construction site and remove any and all excess materials. Correct any damages to property that may have occurred as a result of installation and/or delivery. Repair and patch all surfaces cut for installation. The Contractor shall remedy any deficiencies promptly should the County determine any work is incomplete or defective.

When the County determines the Work is acceptable in accordance with this Invitation for Bid, the Contractor shall provide the close out submittals, including but not necessarily limited to the following:

1 set	Certificate of Warranties	
1 set	Manufacturer's product literature	(when applicable)
1 set	Project Record Drawings	
1 set	Subcontractor Information	(when applicable)

D.08 DISCRETIONARY WORK

This Bid Item entails minor increases (that may be directed by staff) to existing bid item quantities or minor modification items not bid which were unforeseen and necessary during the construction to provide a safe, complete project in accordance with Bid Documents. (This will not affect the requirement for change orders involving major modifications to the project.) Payment for all Work under this item shall be made only at the County's discretion in order to satisfactorily complete the project. In general, this item is for unanticipated conflicts and/or design changes required during construction which are necessary to complete the project without changing the initial scope of Work and without costly delays.

D.09 PROJECT IDENTIFICATION SIGNS

The Contractor shall be responsible for furnishing, installing and maintaining the Project Identification Sign. Contractor shall be responsible for the removal of same upon completion of the construction. Project Identification Sign shall be constructed and maintained at the Project Site as directed by the Owner. The Contractor shall erect, maintain and relocate the sign as directed for the duration of the Project.

The Contractor shall mount the sign(s) using 4-inch pressure treated lumber or as approved by the Engineer, and other supports as required, at a location mutually agreed by the Engineer and the Contractor.

The identification sign(s) shall not be less than 32 square feet in area. The Contractor shall coordinate with the Owner for the sign(s) verbiage before fabrication. The sign(s) shall be painted with graphic content to include:

- Title of Project
- Name of Owner
- Names and Titles of Authorities, as directed by Owner
- Prime Contractor
- Major Subcontractors
- Construction Costs

The sign(s) shall be erected prior to commencement of work at a lighted location of high public visibility, adjacent to the main entrance at each end of the project, as approved by the Engineer and Owner.

The sign(s) shall be a minimum of 8 feet wide and 4 feet high. The sign(s) shall be constructed of high density %" exterior plywood without waves or buckles, mounted and braced with pressure treated lumber as necessary and maintained in a presentable condition for the duration of the project. Hardware shall be galvanized. The surface of the sign(s) shall be of exterior plywood with medium density overlay.

Painting shall be constructed with materials to resist weathering and fading during the construction period. Experienced professionals shall perform painting. Graphic design and style shall be in accordance with the following:

The sign(s) shall be placed in accordance with Manatee County Development Code, Ordinance 90-01, Section 724, Signs and Section 713, Visibility Triangles.

D.10 PERMITS

The Contractor shall procure (unless otherwise stated) all permits and licenses, pay all charges, fees, and taxes and give all notices necessary and incidental to the due and lawful prosecution of the Work.

END OF SECTION D

BID FORM
SECTION 00300
(SUBMIT IN TRIPLICATE)

For: US301 @ Haben Boulevard, Palmetto, FL Signalization Improvement Plans

TOTAL BID PRICE "A": $_____
(Based on a Completion Time of 120 calendar days)
TOTAL BID PRICE "B": $_____
(Based on a Completion Time of 180 calendar days)

Two schedules for Completion of the Work shall be considered. Each bid for completion by the specified stated time shall be offered as a separate "Total Bid Price". The County has the sole authority to select the bid based on the Completion Time which is in the best interest of the County. Only one award shall be made.

We, the undersigned, hereby declare that we have carefully reviewed the bid documents, and with full knowledge and understanding of the aforementioned herewith submit this bid, meeting each and every specification, term, and condition contained in the Invitation for Bids.

We understand that the Bid package, in its entirety, including but not limited to, all specifications, terms, and conditions in their entirety shall be made a part of any Agreement or Contract between Manatee County and the successful bidder. Failure to comply shall result in Contract default, whereupon, the defaulting Contractor shall be required to pay for any and all re-procurement costs, damages, and attorney fees as incurred by the County.

Communications concerning this Bid shall be addressed as follows:

Person's Name: _____

Address: _____ Phone: _____

Date: _____ FL Contractor License# _____

License in the Name of: _____

Bidder is a WBE/MBE Vendor? _____ Certification _____

COMPANY'S NAME: _____

AUTHORIZED SIGNATURE(S): _____

Name and Title of Above Signer(s) _____

CO. MAILING ADDRESS: _____

_____

STATE OF INCORPORATION _____ (if applicable)

TELEPHONE: (_____) _____ FAX: (_____) _____

Email address: _____

Acknowledge Addendum No._____ Dated: _____ Acknowledge Addendum No._____ Dated: _____

Acknowledge Addendum No._____ Dated: _____ Acknowledge Addendum No._____ Dated: _____

SIGN AND CONFIRM DATE OF PROJECT VISIT: _____ **DATE:** _____

BID FORM

(Submit in Triplicate) Section 00300

US 301 @ HABEN BOULEVARD, PALMETTO, FL

LAP Agreement (FIN #429873-1-58-01) MANATEE COUNTY PROJECT NO. 6082460

Bid "A" Based on Completion Time of 120 Calendar Days

PAY ITEM NO.	FDOT ITEM NUMBER		DESCRIPTION	UNITS	QTY.	BID PRICE PER UNIT ($)	TOTAL BID PRICE ($)
1	101-1		MOBILIZATION	LS	1	$ _____	$ _____
2	102-1		MAINTENANCE OF TRAFFIC	LS	1	$ _____	$ _____
3	102-14		TRAFFIC CONTROLL OFFICER	MH	40	$ _____	$ _____
4	110-4		REMOVAL OF EXISTING CONCRETE PAVEMENT	SY	28.2	$ _____	$ _____
5	120-6		EMBANKMENT	CY	55	$ _____	$ _____
6	285-712		OPTIONAL BASE, BASE GROUP 12	SY	22.1	$ _____	$ _____
7	334-1-14		SUPERPAVE ASPHALTIC CONCRETE, TRAFFIC D	TN	4.86	$ _____	$ _____
8	337-7-5		ASPHALTIC CONCRETE FRICTION COURSE (FC-5)(3/4")	TN	0.95	$ _____	$ _____
9	520-1-10		CONCRETE CURB & GUTTER, TYPE F	LF	125	$ _____	$ _____
10	520-5-12		CONCRETE SEPARATOR (TYPE I) (6' WIDE)	LF	6	$ _____	$ _____
11	522-2		CONCRETE SIDEWALK, 6" THICK	SY	185	$ _____	$ _____
12	555-1-3		DIRECTIONAL BORE (12" TO <18") (2" HDPE)	LF	265	$ _____	$ _____
13	630-1-11	*	CONDUIT (F&I) (ABOVEGROUND) (2")	LF	40	$ _____	$ _____
14	630-1-12	*	CONDUIT (F&I) (UNDERGROUND) (2")	LF	553	$ _____	$ _____
15	632-7-1	*	CABLE (SIGNAL) (F&I)	PI	1	$ _____	$ _____
16	635-1-11	*	PULL AND JUNCTION BOXES (F&I) (PULL BOX)	EA	15	$ _____	$ _____
17	639-1-22	*	ELECTRICAL POWER SERVICE (UNDERGROUND)	AS	1	$ _____	$ _____
18	639-2-1	*	ELECTRICAL SERVICE WIRE (F&I)	LF	1110	$ _____	$ _____
19	639-3-11	*	ELECTRICAL SERVICE DISCONNECT, F&I, POLE MOUNT	EA	1	$ _____	$ _____
20	641-2-12	*	PRESTRESSED CONCRETE POLE (F&I) (TYPE P-II POLE)	EA	2	$ _____	$ _____

Bidder Name: _____

Authorized Signature: _____

BID FORM

(Submit in Triplicate) Section 00300

US 301 @ HABEN BOULEVARD, PALMETTO, FL

LAP Agreement (FIN #429873-1-58-01) MANATEE COUNTY PROJECT NO. 6082460

Bid "A" Based on Completion Time of 120 Calendar Days

PAY ITEM NO.	FDOT ITEM NUMBER		DESCRIPTION	UNITS	QTY.	BID PRICE PER UNIT ($)	TOTAL BID PRICE ($)
21	646-1-11	*	ALUMINUM SIGNALS POLE (F&I) (PEDESTAL)	EA	4	$ _____	$ _____
22	649-31-203	*	STEEL MAST ARM ASSEMBLY (F&I) (130MPH)(56')	EA	1	$ _____	$ _____
23	649-31-999	*	STEEL MAST ARM ASSEMBLY (F&I) (CUSTOM)	EA	1	$ _____	$ _____
24	650-1-311	*	TRAFFIC SIGNAL (F&I) (3 SECT.) (1-WAY) (LED)	AS	5	$ _____	$ _____
25	650-1-511	*	TRAFFIC SIGNAL (F&I) (5 SECT.) (1-WAY) (LED)	AS	3	$ _____	$ _____
26	653-191	*	PEDESTRIAN SIGNALS (F&I) (LED) (1 WAY)(COUNTDOWN)	AS	4	$ _____	$ _____
27	663-74-15	*	VEHICLE DETECTOR ASSEMBLIES (F&I) (VIDEO)	EA	3	$ _____	$ _____
28	665-13	*	PED. DETECTOR (F&I) (DETECTOR WITH SIGN ONLY)	EA	4	$ _____	$ _____
29	670-5-310	*	TRAFFIC CONTROLLER ASSEMBLY (F&I) (NEMA) (NO PREEMPT)	AS	1	$ _____	$ _____
30	690-10		REMOVE SIGNAL HEAD ASSEMBLY	EA	6	$ _____	$ _____
31	690-34-1		REMOVE POLE (DEEP) (DIRECT BURIAL)	EA	4	$ _____	$ _____
32	690-50		REMOVE CONTROLLER ASSEMBLY	EA	1	$ _____	$ _____
33	690-60		REMOVE VEHICLE DETECTOR ASSEMBLY	EA	7	$ _____	$ _____
34	690-80		REMOVE SPAN WIRE ASSEMBLY	EA	3	$ _____	$ _____
35	690-90		REMOVE CONDUIT & CABLING	PI	1	$ _____	$ _____
36	690-100		REMOVE MISCELLANEOUS SIGNAL EQUIPMENT	PI	1	$ _____	$ _____
37	699-1-1	*	INTERNALLY ILLUMINATED SIGN (F&I) (EDGE LIT LED)	EA	3	$ _____	$ _____
38	700-20-11		SINGLE POST SIGN, F&I, LESS THAN 12 SF	AS	4	$ _____	$ _____
39	700-48-18		SIGN PANEL (F&I)	EA	4	$ _____	$ _____
40	700-48-60		SIGN PANEL (REMOVE)	AS	1	$ _____	$ _____

Bidder Name: _____

Authorized Signature: _____

BID FORM

(Submit in Triplicate) Section 00300

US 301 @ HABEN BOULEVARD, PALMETTO, FL

LAP Agreement (FIN #429873-1-58-01) MANATEE COUNTY PROJECT NO. 6082460

Bid "A" Based on Completion Time of 120 Calendar Days

PAY ITEM NO.	FDOT ITEM NUMBER		DESCRIPTION	UNITS	QTY.	BID PRICE PER UNIT ($)	TOTAL BID PRICE ($)
41	705-11-3		DELINEATOR, FLEXIBLE HIGH VISIBILITY (MEDIAN)	EA	2	$ _____	$ _____
42	710-11-290		PAINT, STANDARD YELLOW, ISLAND NOSE	SF	20	$ _____	$ _____
43	711-11-123		THERMOPLASTIC PAVEMENT MARKING (12" WHITE)	LF	362	$ _____	$ _____
44	711-11-125		THERMOPLASTIC PAVEMENT MARKING (24" WHITE)	LF	125	$ _____	$ _____
45	711-11-151		THERMOPLASTIC PAVEMENT MARKING (6" WHITE SKIP)	LF	30	$ _____	$ _____
46	711-11-170		THERMOPLASTIC STANDAR, WHITE, MESSAGE	EA	4	$ _____	$ _____
47	711-11-251		THERMOPLASTIC PAVEMENT MARKING (6" YELLOW SKIP)	LF	100	$ _____	$ _____
48	711-17		THERMOPLASTIC (REMOVE)	SF	310	$ _____	$ _____
49	715-2-11	*	LIGHTING CONDUIT (F&I) (UNDERGROUND)	LF	110	$ _____	$ _____
50	715-11-111	*	LUMINAIRE (F&I) (ROADWAY) (COBRA)	EA	1	$ _____	$ _____
51	715-14-11	*	LIGHTING PULL BOX (F&I) (ROADSIDE)	EA	3	$ _____	$ _____
52	783-2-31	*	ITS FIBER OPTIC (INSTALL) (SPLICE)	EA	4	$ _____	$ _____
53	783-4-112	*	ITS CONDUIT (F&I) (UNDERGROUND)	LF	70	$ _____	$ _____
54	783-8-1	*	ITS MULTI CONDUCTOR COMMUNICATION CABLE	EA	1038	$ _____	$ _____
55			**DISCRETIONARY WORK (USED ONLY WITH COUNTY APPROVAL)**	LS	1		$20,000.00
			TOTAL PRICE FOR BID "A" - Based on Completion Time of 120 Calendar Days				$ _____

Bidder Note: * Indicates items that require Shop Drawing submittal. The contractor shall be responsible for the preparation and submittal of all Shop Drawings in accordance with FDOT Standard Specifications for Road and Bridge Cosntruction 5-1.4.2 *Work Items Requiring Shop Drawings*.

Bidder Name: _____

Authorized Signature: _____

BID FORM- SUBCONTRACTOR PERCENTAGE

(Submit in Triplicate) Section 00300

US 301 @ HABEN BOULEVARD, PALMETTO, FL

LAP Agreement (FIN #429873-1-58-01) MANATEE COUNTY PROJECT NO. 6082460

Bid "A" Based on Completion Time of 120 Calendar Days

PAY ITEM NO.	FDOT ITEM NUMBER	DESCRIPTION	%	MBE/DBE	Descriptioon of Work by Subcontractor
1	101-1	MOBILIZATION			
2	102-1	MAINTENANCE OF TRAFFIC			
3	102-14	TRAFFIC CONTROLL OFFICER			
4	110-4	REMOVAL OF EXISTING CONCRETE PAVEMENT			
5	120-6	EMBANKMENT			
6	285-712	OPTIONAL BASE, BASE GROUP 12			
7	334-1-14	SUPERPAVE ASPHALTIC CONCRETE, TRAFFIC D			
8	337-7-5	ASPHALTIC CONCRETE FRICTION COURSE (FC-5)(3/4")			
9	520-1-10	CONCRETE CURB & GUTTER, TYPE F			
10	520-5-12	CONCRETE SEPARATOR (TYPE I) (6' WIDE)			
11	522-2	CONCRETE SIDEWALK, 6" THICK			
12	555-1-3	DIRECTIONAL BORE (12" TO <18") (2" HDPE)			
13	630-1-11	CONDUIT (F&I) (ABOVEGROUND) (2")			
14	630-1-12	CONDUIT (F&I) (UNDERGROUND) (2")			
15	632-7-1	CABLE (SIGNAL) (F&I)			
16	635-1-11	PULL AND JUNCTION BOXES (F&I) (PULL BOX)			
17	639-1-22	ELECTRICAL POWER SERVICE (UNDERGROUND)			
18	639-2-1	ELECTRICAL SERVICE WIRE (F&I)			
19	639-3-11	ELECTRICAL SERVICE DISCONNECT, F&I, POLE MOUNT			
20	641-2-12	PRESTRESSED CONCRETE POLE (F&I) (TYPE P-II POLE)			

Bidder Name: _____

Authorized Signature: _____

BID FORM- SUBCONTRACTOR PERCENTAGE

(Submit in Triplicate) Section 00300

US 301 @ HABEN BOULEVARD, PALMETTO, FL

LAP Agreement (FIN #429873-1-58-01) MANATEE COUNTY PROJECT NO. 6082460

Bid "A" Based on Completion Time of 120 Calendar Days

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22	649-31-203	STEEL MAST ARM ASSEMBLY (F&I) (130MPH)(56')			
23	649-31-999	STEEL MAST ARM ASSEMBLY (F&I) (CUSTOM)			
24	650-1-311	TRAFFIC SIGNAL (F&I) (3 SECT.) (1-WAY) (LED)			
25	650-1-511	TRAFFIC SIGNAL (F&I) (5 SECT.) (1-WAY) (LED)			
26	653-191	PEDESTRIAN SIGNALS (F&I) (LED) (1 WAY)(COUNTDOWN)			
27	663-74-15	VEHICLE DETECTOR ASSEMBLIES (F&I) (VIDEO)			
28	665-13	PED. DETECTOR (F&I) (DETECTOR WITH SIGN ONLY)			
29	670-5-310	TRAFFIC CONTROLLER ASSEMBLY (F&I) (NEMA) (NO PREEMPT)			
30	690-10	REMOVE SIGNAL HEAD ASSEMBLY			
31	690-34-1	REMOVE POLE (DEEP) (DIRECT BURIAL)			
32	690-50	REMOVE CONTROLLER ASSEMBLY			
33	690-60	REMOVE VEHICLE DETECTOR ASSEMBLY			
34	690-80	REMOVE SPAN WIRE ASSEMBLY			
35	690-90	REMOVE CONDUIT & CABLING			
36	690-100	REMOVE MISCELLANEOUS SIGNAL EQUIPMENT			
37	699-1-1	INTERNALLY ILLUMINATED SIGN (F&I) (EDGE LIT LED)			
38	700-20-11	SINGLE POST SIGN, F&I, LESS THAN 12 SF			
39	700-48-18	SIGN PANEL (F&I)			
40	700-48-60	SIGN PANEL (REMOVE)			

Bidder Name: _____

Authorized Signature: _____

BID FORM- SUBCONTRACTOR PERCENTAGE

(Submit in Triplicate) Section 00300

US 301 @ HABEN BOULEVARD, PALMETTO, FL

LAP Agreement (FIN #429873-1-58-01) MANATEE COUNTY PROJECT NO. 6082460

Bid "A" Based on Completion Time of 120 Calendar Days

PAY ITEM NO.	FDOT ITEM NUMBER	DESCRIPTION	%	MBE/DBE	Descriptioon of Work by Subcontractor
41	705-11-3	DELINEATOR, FLEXIBLE HIGH VISIBILITY (MEDIAN)			
42	710-11-290	PAINT, STANDARD YELLOW, ISLAND NOSE			
43	711-11-123	THERMOPLASTIC PAVEMENT MARKING (12" WHITE)			
44	711-11-125	THERMOPLASTIC PAVEMENT MARKING (24" WHITE)			
45	711-11-151	THERMOPLASTIC PAVEMENT MARKING (6" WHITE SKIP)			
46	711-11-170	THERMOPLASTIC STANDAR, WHITE, MESSAGE			
47	711-11-251	THERMOPLASTIC PAVEMENT MARKING (6" YELLOW SKIP)			
48	711-17	THERMOPLASTIC (REMOVE)			
49	715-2-11	LIGHTING CONDUIT (F&I) (UNDERGROUND)			
50	715-11-111	LUMINAIRE (F&I) (ROADWAY) (COBRA)			
51	715-14-11	LIGHTING PULL BOX (F&I) (ROADSIDE)			
52	783-2-31	ITS FIBER OPTIC (INSTALL) (SPLICE)			
53	783-4-112	ITS CONDUIT (F&I) (UNDERGROUND)			
54	783-8-1	ITS MULTI CONDUCTOR COMMUNICATION CABLE			
		TOTAL PRICE FOR BID "A" - Based on Completion Time of 120 Calendar Days			

This bid form is a duplication of the bid items where the Bidder shall state the percentage (%) of work of each item listed and a brief description of the work that shall be performed by the subcontractor.

Bidder Name: _____

Authorized Signature: _____

BID FORM

(Submit in Triplicate) Section 00300

US 301 @ HABEN BOULEVARD, PALMETTO, FL

LAP Agreement (FIN #429873-1-58-01) MANATEE COUNTY PROJECT NO. 6082460

Bid "B" Based on Completion Time of 180 Calendar Days

PAY ITEM NO.	FDOT ITEM NUMBER		DESCRIPTION	UNITS	QTY.	BID PRICE PER UNIT ($)	TOTAL BID PRICE ($)
1	101-1		MOBILIZATION	LS	1	$ _____	$ _____
2	102-1		MAINTENANCE OF TRAFFIC	LS	1	$ _____	$ _____
3	102-14		TRAFFIC CONTROLL OFFICER	MH	40	$ _____	$ _____
4	110-4		REMOVAL OF EXISTING CONCRETE PAVEMENT	SY	28.2	$ _____	$ _____
5	120-6		EMBANKMENT	CY	55	$ _____	$ _____
6	285-712		OPTIONAL BASE, BASE GROUP 12	SY	22.1	$ _____	$ _____
7	334-1-14		SUPERPAVE ASPHALTIC CONCRETE, TRAFFIC D	TN	4.86	$ _____	$ _____
8	337-7-5		ASPHALTIC CONCRETE FRICTION COURSE (FC-5)(3/4")	TN	0.95	$ _____	$ _____
9	520-1-10		CONCRETE CURB & GUTTER, TYPE F	LF	125	$ _____	$ _____
10	520-5-12		CONCRETE SEPARATOR (TYPE I) (6' WIDE)	LF	6	$ _____	$ _____
11	522-2		CONCRETE SIDEWALK, 6" THICK	SY	185	$ _____	$ _____
12	555-1-3		DIRECTIONAL BORE (12" TO <18") (2" HDPE)	LF	265	$ _____	$ _____
13	630-1-11	*	CONDUIT (F&I) (ABOVEGROUND) (2")	LF	40	$ _____	$ _____
14	630-1-12	*	CONDUIT (F&I) (UNDERGROUND) (2")	LF	553	$ _____	$ _____
15	632-7-1	*	CABLE (SIGNAL) (F&I)	PI	1	$ _____	$ _____
16	635-1-11	*	PULL AND JUNCTION BOXES (F&I) (PULL BOX)	EA	15	$ _____	$ _____
17	639-1-22	*	ELECTRICAL POWER SERVICE (UNDERGROUND)	AS	1	$ _____	$ _____
18	639-2-1	*	ELECTRICAL SERVICE WIRE (F&I)	LF	1110	$ _____	$ _____
19	639-3-11	*	ELECTRICAL SERVICE DISCONNECT, F&I, POLE MOUNT	EA	1	$ _____	$ _____
20	641-2-12	*	PRESTRESSED CONCRETE POLE (F&I) (TYPE P-II POLE)	EA	2	$ _____	$ _____

Bidder Name: _____

Authorized Signature: _____

BID FORM

(Submit in Triplicate) Section 00300

US 301 @ HABEN BOULEVARD, PALMETTO, FL

LAP Agreement (FIN #429873-1-58-01) MANATEE COUNTY PROJECT NO. 6082460

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PAY ITEM NO.	FDOT ITEM NUMBER		DESCRIPTION	UNITS	QTY.	BID PRICE PER UNIT ($)	TOTAL BID PRICE ($)
21	646-1-11	*	ALUMINUM SIGNALS POLE (F&I) (PEDESTAL)	EA	4	$ _____	$ _____
22	649-31-203	*	STEEL MAST ARM ASSEMBLY (F&I) (130MPH)(56')	EA	1	$ _____	$ _____
23	649-31-999	*	STEEL MAST ARM ASSEMBLY (F&I) (CUSTOM)	EA	1	$ _____	$ _____
24	650-1-311	*	TRAFFIC SIGNAL (F&I) (3 SECT.) (1-WAY) (LED)	AS	5	$ _____	$ _____
25	650-1-511	*	TRAFFIC SIGNAL (F&I) (5 SECT.) (1-WAY) (LED)	AS	3	$ _____	$ _____
26	653-191	*	PEDESTRIAN SIGNALS (F&I) (LED) (1 WAY)(COUNTDOWN)	AS	4	$ _____	$ _____
27	663-74-15	*	VEHICLE DETECTOR ASSEMBLIES (F&I) (VIDEO)	EA	3	$ _____	$ _____
28	665-13	*	PED. DETECTOR (F&I) (DETECTOR WITH SIGN ONLY)	EA	4	$ _____	$ _____
29	670-5-310	*	TRAFFIC CONTROLLER ASSEMBLY (F&I) (NEMA) (NO PREEMPT)	AS	1	$ _____	$ _____
30	690-10		REMOVE SIGNAL HEAD ASSEMBLY	EA	6	$ _____	$ _____
31	690-34-1		REMOVE POLE (DEEP) (DIRECT BURIAL)	EA	4	$ _____	$ _____
32	690-50		REMOVE CONTROLLER ASSEMBLY	EA	1	$ _____	$ _____
33	690-60		REMOVE VEHICLE DETECTOR ASSEMBLY	EA	7	$ _____	$ _____
34	690-80		REMOVE SPAN WIRE ASSEMBLY	EA	3	$ _____	$ _____
35	690-90		REMOVE CONDUIT & CABLING	PI	1	$ _____	$ _____
36	690-100		REMOVE MISCELLANEOUS SIGNAL EQUIPMENT	PI	1	$ _____	$ _____
37	699-1-1	*	INTERNALLY ILLUMINATED SIGN (F&I) (EDGE LIT LED)	EA	3	$ _____	$ _____
38	700-20-11		SINGLE POST SIGN, F&I, LESS THAN 12 SF	AS	4	$ _____	$ _____
39	700-48-18		SIGN PANEL (F&I)	EA	4	$ _____	$ _____
40	700-48-60		SIGN PANEL (REMOVE)	AS	1	$ _____	$ _____

Bidder Name: _____

Authorized Signature: _____

BID FORM

(Submit in Triplicate) Section 00300

US 301 @ HABEN BOULEVARD, PALMETTO, FL

LAP Agreement (FIN #429873-1-58-01) MANATEE COUNTY PROJECT NO. 6082460

Bid "B" Based on Completion Time of 180 Calendar Days

PAY ITEM NO.	FDOT ITEM NUMBER		DESCRIPTION	UNITS	QTY.	BID PRICE PER UNIT ($)	TOTAL BID PRICE ($)
41	705-11-3		DELINEATOR, FLEXIBLE HIGH VISIBILITY (MEDIAN)	EA	2	$ _____	$ _____
42	710-11-290		PAINT, STANDARD YELLOW, ISLAND NOSE	SF	20	$ _____	$ _____
43	711-11-123		THERMOPLASTIC PAVEMENT MARKING (12" WHITE)	LF	362	$ _____	$ _____
44	711-11-125		THERMOPLASTIC PAVEMENT MARKING (24" WHITE)	LF	125	$ _____	$ _____
45	711-11-151		THERMOPLASTIC PAVEMENT MARKING (6" WHITE SKIP)	LF	30	$ _____	$ _____
46	711-11-170		THERMOPLASTIC STANDAR, WHITE, MESSAGE	EA	4	$ _____	$ _____
47	711-11-251		THERMOPLASTIC PAVEMENT MARKING (6" YELLOW SKIP)	LF	100	$ _____	$ _____
48	711-17		THERMOPLASTIC (REMOVE)	SF	310	$ _____	$ _____
49	715-2-11	*	LIGHTING CONDUIT (F&I) (UNDERGROUND)	LF	110	$ _____	$ _____
50	715-11-111	*	LUMINAIRE (F&I) (ROADWAY) (COBRA)	EA	1	$ _____	$ _____
51	715-14-11	*	LIGHTING PULL BOX (F&I) (ROADSIDE)	EA	3	$ _____	$ _____
52	783-2-31	*	ITS FIBER OPTIC (INSTALL) (SPLICE)	EA	4	$ _____	$ _____
53	783-4-112	*	ITS CONDUIT (F&I) (UNDERGROUND)	LF	70	$ _____	$ _____
54	783-8-1	*	ITS MULTI CONDUCTOR COMMUNICATION CABLE	EA	1038	$ _____	$ _____
55			**DISCRETIONARY WORK (USED ONLY WITH COUNTY APPROVAL)**	LS	1		$20,000.00
			TOTAL PRICE FOR BID "B" - Based on Completion Time of 180 Calendar Days				$ _____

Bidder Note: * Indicates items that require Shop Drawing submittal. The contractor shall be responsible for the preparation and submittal of all Shop Drawings in accordance with FDOT Standard Specifications for Road and Bridge Cosntruction 5-1.4.2 *Work Items Requiring Shop Drawings*.

Bidder Name: _____

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BID FORM- SUBCONTRACTOR PERCENTAGE

(Submit in Triplicate) Section 00300

US 301 @ HABEN BOULEVARD, PALMETTO, FL

LAP Agreement (FIN #429873-1-58-01) MANATEE COUNTY PROJECT NO. 6082460

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9	520-1-10	CONCRETE CURB & GUTTER, TYPE F			
10	520-5-12	CONCRETE SEPARATOR (TYPE I) (6' WIDE)			
11	522-2	CONCRETE SIDEWALK, 6" THICK			
12	555-1-3	DIRECTIONAL BORE (12" TO <18") (2" HDPE)			
13	630-1-11	CONDUIT (F&I) (ABOVEGROUND) (2")			
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15	632-7-1	CABLE (SIGNAL) (F&I)			
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17	639-1-22	ELECTRICAL POWER SERVICE (UNDERGROUND)			
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30	690-10	REMOVE SIGNAL HEAD ASSEMBLY			
31	690-34-1	REMOVE POLE (DEEP) (DIRECT BURIAL)			
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34	690-80	REMOVE SPAN WIRE ASSEMBLY			
35	690-90	REMOVE CONDUIT & CABLING			
36	690-100	REMOVE MISCELLANEOUS SIGNAL EQUIPMENT			
37	699-1-1	INTERNALLY ILLUMINATED SIGN (F&I) (EDGE LIT LED)			
38	700-20-11	SINGLE POST SIGN, F&I, LESS THAN 12 SF			
39	700-48-18	SIGN PANEL (F&I)			
40	700-48-60	SIGN PANEL (REMOVE)			

Bidder Name: _____

Authorized Signature: _____

BID FORM- SUBCONTRACTOR PERCENTAGE

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US 301 @ HABEN BOULEVARD, PALMETTO, FL

LAP Agreement (FIN #429873-1-58-01) MANATEE COUNTY PROJECT NO. 6082460

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45	711-11-151	THERMOPLASTIC PAVEMENT MARKING (6" WHITE SKIP)			
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54	783-8-1	ITS MULTI CONDUCTOR COMMUNICATION CABLE			
		TOTAL PRICE FOR BID "B" - Based on Completion Time of 180 Calendar Days			

This bid form is a duplication of the bid items where the Bidder shall state the percentage (%) of work of each item listed and a brief description of the work that shall be performed by the subcontractor.

Bidder Name: _____

Authorized Signature: _____

SWORN STATEMENT
THE FLORIDA TRENCH SAFETY ACT

THIS FORM MUST BE SIGNED IN THE PRESENCE OF A NOTARY PUBLIC OR BY AN OFFICER AUTHORIZED TO ADMINISTER OATHS.

1. This Sworn Statement is submitted with IFB No. **#12-3020CD**

2. This Sworn Statement is submitted by_____ whose business address is_____ and, if applicable, its Federal Employer Identification Number (FEIN) is_____. If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement _____.

3. Name of individual signing this Sworn Statement is: _____, Whose relationship to the above entity is: _____.

4. The Trench Safety Standards that will be in effect during the construction of this project shall include, but are not limited to: Laws of Florida, Chapters 90-96, TRENCH SAFETY ACT, and OSHA RULES AND REGULATIONS 29 CFR 1926.650 Subpart P, effective October 1, 1990.

5. The undersigned assures that the entity will comply with the applicable Trench Safety Standards and agrees to indemnify and hold harmless the County and Engineer, and any of their agents or employees from any claims arising from the failure to comply with said standard.

6. The undersigned has appropriated the following costs for compliance with the applicable standards:

Trench Safety Measure (Description)	Units of Measure (LF, SY)	Unit Quantity	Unit Cost	Extended Cost
a. _____	_____	_____	$_____	_____
b. _____	_____	_____	$_____	_____
c. _____	_____	_____	$_____	_____
d. _____	_____	_____	$_____	_____

7. The undersigned intends to comply with these standards by instituting the following procedures:
_____
_____
_____

THE UNDERSIGNED, in submitting this Bid, represents that they have reviewed and considered all available geotechnical information and made such other investigations and tests as they may deem necessary to adequately design the trench safety system(s) to be utilized on this project.

_____
(AUTHORIZED SIGNATURE / TITLE)

SWORN to and subscribed before me this _____ day of _____, 2012.

(Impress official seal)

Notary Public, State of Florida: _____

My commission expires: _____

SECTION 00430

CONTRACTOR'S QUESTIONNAIRE

(Submit in Triplicate)

The Bidder warrants the truth and accuracy of all statements and answers herein contained. (Include additional sheets if necessary.)

THIS QUESTIONNAIRE MUST BE COMPLETED AND SUBMITTED WITH YOUR BID/QUOTE.

1. LICENSE #: _____

   License Issued to _____

   COMPANY'S NAME: _____

   _____

   CO. PHYSICAL ADDRESS

   _____

   CITY

   _____STATE of INCORPORATION, IF APPLICABLE) _____ (ZIP CODE)

   (_____) _____TELEPHONE NUMBER: (____) _____FAX

   EMAIL ADDRESS: _____

2. Bidding as an individual ___a partnership: __ a corporation; ___a joint venture__

3. If a partnership: list names and addresses of partners; if a corporation: list names of officers, directors, shareholders, and state of incorporation; if joint venture: list names and address of ventures' and the same if any venture are a corporation for each such corporation, partnership, or joint venture:

   _____

   _____

   _____

   _____

4. Your organization has been in business (under this firm's name) as a

   _____

   _____

   For how many years? _____ Is this firm in bankruptcy? _____

BIDDER: _____

5. Describe and give the date and Owner of the last three government or private mitigation bank work of similar scope you've completed which are similar in cost, type, size, and nature as the one proposed (for a public entity),include contact name and phone number. Provide the Budget, Actual Cost, Size and Summary of Work for each project. "Attach additional pages as necessary".

_____

_____

_____

_____

6. Have you ever been assessed liquidated damages under a Contract during the past five (5) years? If so, state when, where (contact name, address, and phone number) and why.

_____

_____

_____

7. Have you ever failed to complete work awarded to you? Or provide projects not completed within Contract time. If so, state when, where (Contact name, address, phone number) and why?

_____

_____

_____

_____

_____

8. Have you ever been debarred or prohibited from bidding on a governmental entity's construction project? If yes, name the entity and describe the circumstances:

_____

_____

_____

BIDDER: _____

9. Name three individuals, governmental entities, or corporations for which you (Bidding Entity) have performed similar work and to which you refer. Include contact name and phone number:

1. _____

2. _____

3. _____

10. What specific steps have you taken to examine the physical conditions at or contiguous to the site, including but not limited to, the location of existing underground facilities?
Have you visited the site (s)? _____

Provide date/ (s) of site visit: _____

_____

_____

_____

11. What specific physical conditions, including, but not limited to, the location of existing underground facilities have you found which will, in any manner, affect cost, progress, performance, or finishing of the work?

_____

_____

_____

12. Will you subcontract any part of this Work? If so, describe which major portion(s):

_____

_____

_____

13. If any, list (with Contract amount) WBE/MBE to be utilized:

_____

_____

_____

BIDDER: _____

14. What equipment do you own to accomplish this Work? (A listing may be attached)

_____

_____

_____

15. What equipment will you purchase/rent for the Work? (Specify which)

_____

_____

_____

16. List the following in connection with the Surety which is providing the Bond(s):

Surety's Name: _____

Surety's Address: _____

Surety's Address: _____

Name, address and phone number of Surety's resident agent for service of process in Florida:

_____

_____

_____

_____

Phone: (_____) _____

Email_____

BIDDER: _____

PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES CERTIFICATION

SWORN STATEMENT PURSUANT TO ARTICLE V, MANATEE COUNTY PURCHASING CODE

THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.

This sworn statement is submitted to the Manatee County Board of County Commissioners by

_____

[Print individual's name and title]

____ for _____[print name of entity submitting sworn statement]

whose business address is: _____

and (if applicable) its Federal Employer Identification Number (FEIN) is _____.If the entity has no FEIN, include

the Social Security Number of the individual signing this sworn statement: _____

I understand that no person or entity shall be awarded or receive a county contract for public improvements, procurement of goods or services (including professional services) or a county lease, franchise, concession or management agreement, or shall receive a grant of county monies unless such person or entity has submitted a written certification to the County that it has not:

(1) been convicted of bribery or attempting to bribe a public officer or employee of Manatee County, the State of Florida, or any other public entity, including, but not limited to the Government of the United States, any state, or any local government authority in the United States, in that officer's or employee's official capacity; or

(2) been convicted of an agreement or collusion among bidders or prospective bidders in restraint of freedom of competition, by agreement to bid a fixed price, or otherwise; or

(3) been convicted of a violation of an environmental law that, in the sole opinion of the County's Purchasing Director, reflects negatively upon the ability of the person or entity to conduct business in a responsible manner; or

(4) made an admission of guilt of such conduct described in items (1), (2) or (3) above, which is a matter of record, but has not been prosecuted for such conduct, or has made an admission of guilt of such conduct, which is a matter of record, pursuant to formal prosecution. An admission of guilt shall be construed to include a plea of nolo contendere; or

(5) where an officer, official, agent or employee of a business entity has been convicted of or has admitted guilt to any of the crimes set forth above on behalf of such an entity and pursuant to the direction or authorization of an official thereof (including the person committing the offense, if he is an official of the business entity), the business shall be chargeable with the conduct herein above set forth. A business entity shall be chargeable with the conduct of an affiliated entity, whether wholly owned, partially owned, or one which has common ownership or a common Board of Directors. For purposes of this Form, business entities are affiliated if, directly or indirectly, one business entity controls or has the power to control another business entity, or if an individual or group of individuals controls or has the power to control both entities. Indicia of control shall include, without limitation, interlocking management or ownership, identity of interests among family members, shared organization of a business entity following the ineligibility of a business entity under this Article, or using substantially the same management, ownership or principles as the ineligible entity.

(Cont'd.)

Any person or entity who claims that this Article is inapplicable to him/her/it because a conviction or judgment has been reversed by a court of competent jurisdiction shall prove the same with documentation satisfactory to the County's Purchasing Director. Upon presentation of such satisfactory proof, the person or entity shall be allowed to contract with the County.

I UNDERSTAND THAT THE SUBMISSION OF THIS FORM TO THE CONTRACTING OFFICER FOR MANATEE COUNTY IS VALID THROUGH DECEMBER 31 OF THE CALENDAR YEAR IN WHICH IT IS FILED. I ALSO UNDERSTAND THAT ANY CONTRACT OR BUSINESS TRANSACTION SHALL PROVIDE FOR SUSPENSION OF PAYMENTS, OR TERMINATION, OR BOTH, IF THE CONTRACTING OFFICER OR THE COUNTY ADMINISTRATOR DETERMINES THAT **SUCH PERSON OR ENTITY HAS MADE FALSE CERTIFICATION.**

_____
[Signature]

STATE OF FLORIDA
COUNTY OF _____

Sworn to and subscribed before me this ____ day of _____, 2012 by _____

Personally known _____ OR Produced identification _____
[Type of identification]

_____ My commission expires _____
Notary Public Signature

_____
[Print, type or stamp Commissioned name of Notary Public]

Signatory Requirement - In the case of a business entity other than a partnership or a corporation, this affidavit shall be executed by an authorized agent of the entity. In the case of a partnership, this affidavit shall be executed by the general partner(s). In the case of a corporation, this affidavit shall be executed by the corporate president.

SECTION 00500
FORM OF AGREEMENT
BETWEEN THE
COUNTY OF MANATEE, FLORIDA
AND THE CONTRACTOR AS IDENTIFIED BELOW
ON THE BASIS OF A STIPULATED UNIT COST CONTRACT PRICE

THIS AGREEMENT is made and entered into by and between the COUNTY OF MANATEE, a political subdivision of the state of Florida, hereinafter referred to as the "COUNTY" and XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX hereinafter referred to as the "CONTRACTOR," duly authorized to transact business in the state of Florida, with offices located at XXXXXXXXXXXXXXXXXXXXXXXXXX
Phone: ( )_____

ARTICLE 1. WORK

CONTRACTOR shall furnish all labor, materials, supplies, and other items required to complete the Work for IFB No.**12-3020CD US301 @ Haben Boulevard, Palmetto, FL Improvements for Signalization Plans** in strict accordance with Contract Documents and any duly authorized subsequent addenda thereto, all of which are made a part hereof.

ARTICLE 2. COMPENSATION

As compensation to the CONTRACTOR, the COUNTY shall pay and the CONTRACTOR will accept as full consideration for the performance of all Work required by **(IFB #12-3020CD US301 @ Haben Boulevard, Palmetto, FL Improvements for Signalization Plans)** subject to additions and deductions as provided therein, the sum of _____ Dollars and xxxxxxxxxxxxxxx Cents ($ xxxxxxxxxxxxx) for Bid " X " based on Completion Time of _xxx_ calendar days

ARTICLE 3. LIQUIDATED DAMAGES

Time is of the essence in this Agreement. As of the date of this Agreement, the damages that will be suffered by the County in the event of the Contractor's failure to timely complete the Work are impossible to determine. In lieu thereof, it is agreed that if the Contractor fails to achieve Substantial Completion of the Work within ____ calendar days of issuance of the Notice to Proceed (accounting, however, for any extensions of time granted pursuant to approved Change Orders), the Contractor shall pay to the County, as liquidated damages (and not as a penalty), the sum of **$388** per calendar day for each day beyond ____ days until the Contractor achieves Substantial Completion. The County shall have the option of withholding said liquidated damages from any Pay Application(s) thereafter submitted by the Contractor. Alternatively, the Contractor shall immediately pay said sums to the County upon the County's demand for same.

ARTICLE 4. ENGINEER

The County of Manatee, Public Works Department, is responsible as the COUNTY and **Cardno TBE** hereinafter referred to as "ENGINEER," designed this project and is responsible for technical/engineering reviews and decisions. The ENGINEER is a member of the OWNER'S project management team which is collectively responsible in ensuring the Work is completed in accordance with the Contract Documents.

All communication involving this project will be addressed to Eyra Cash, Project Engineer II, Public Works Department. **All invoicing** will be addressed to the attention of Eyra Cash (address noted below) with **invoice copies** sent to Larry R. Mau, Cardno TBE (address noted below).

Manatee County Public Works Dept.
IFB# 12-3020CD
Attention: Eyra Cash
Project Engineer II
1022 26th Avenue East
Bradenton, Florida 34208
Phone (941) 708-7450 ext. 7344

Cardno TBE
IFB# 12-3020CD
Attn: Larry R. Mau, PE
Project Manager
22 Sarasota Center Blvd.
Sarasota, Florida 34240
Phone (941) 870-5740

Where the terms ENGINEER and/or COUNTY are used in the Contract Documents, it shall mean the COUNTY'S project management team.

ARTICLE 5. CONTRACTOR'S REPRESENTATIONS

In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations:

5.1 CONTRACTOR has familiarized itself with the nature and extent of the Bid Documents, Work, site, locality and all local conditions and laws and regulations that in any manner may affect cost, progress, performance or furnishing of the Work.

5.2 CONTRACTOR has studied carefully all drawings of the physical conditions upon which CONTRACTOR is entitled to rely.

5.3 CONTRACTOR has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, reports and studies which pertain to the physical conditions at or contiguous to the site or which otherwise may affect the cost, progress, performance or furnishing of the Work as CONTRACTOR considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Bid Documents; and no additional examinations, investigations, explorations, tests, reports, studies or similar information or data are or will be required by CONTRACTOR for such purposes.

5.4 CONTRACTOR has reviewed and checked all information and data shown or indicated on the Bid Documents with respect to existing underground facilities at or contiguous to the site and assumes responsibility for the accurate location of said underground facilities. Any additional examinations, investigations, explorations, tests, reports, studies or similar information or data in respect of said underground facilities conducted by the CONTRACTOR will be done at the CONTRACTOR'S expense.

5.5 CONTRACTOR has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Bid.

5.6 CONTRACTOR has given OWNER written notice of all conflicts, errors or discrepancies that have been discovered in the Bid Documents and the written resolution thereof by OWNER is acceptable to CONTRACTOR.

5.7 CONTRACTOR shall schedule and perform the Work subject to OWNER'S approval and shall hold OWNER harmless from all liabilities incurred due to CONTRACTOR'S failure to coordinate with the OWNER.

ARTICLE 6. CONTRACT DOCUMENTS

The Contract Documents which comprise the entire Agreement between COUNTY and CONTRACTOR concerning the Work consist of the following:

6.1 This Agreement and Bid Document (**IFB #12-3020CD**)

6.2 Performance and/or other Bonds and Insurance Certificate(s)

6.3 Drawings/Plans (not attached)

6.4 Addendum number _#_ to _#_ inclusive

6.5 CONTRACTOR'S Bid Form

6.6 Reports

6.7 The following, which may be delivered or issued after the effective date of the Agreement and are not attached hereto: all written Change Orders and other documents amending, modifying, or supplementing the Contract Documents.

6.8 The documents listed in paragraphs above are attached to this Agreement (except as noted otherwise above). There are no Contract Documents other than those listed above in this Article 6.

ARTICLE 7. MISCELLANEOUS

7.1 Terms used in this Agreement are defined in Article 1 of the General Conditions.

7.2 No assignment by a party hereto of any rights under or interest in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation, monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law); and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignee from any duty or responsibility under the Contract Documents.

7.3 COUNTY and CONTRACTOR each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.

AGREEMENT
IFB #12-3020CD

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed by their authorized representatives.

CONTRACTOR

By: _____

_____
Print Name & Title of Signer

Date: _____

COUNTY OF MANATEE, FLORIDA

By: _____
Melissa M. Wendel, CPPO
Purchasing Official

Date: _____

SECTION 00700
GENERAL CONDITIONS

ARTICLE I - DEFINITIONS

Whenever used in the Bid Documents, the following terms have the meaning indicated which are applicable to both the singular and plural thereof:

Addendum - Written or graphic instruments issued prior to the opening of bids which clarify or change the bidding documents or the contract documents.

Agreement - The written Agreement between Owner and Contractor covering the Work to be performed; other contract documents are attached to the Agreement and made a part thereof as provided therein.

Application for Payment - The form accepted by the Project Representative which is to be used by Contractor in requesting progress or final payments and which is to include such supporting documentation as is required by the contract documents.

Award - Acceptance of the bid from the person, firm, or corporation which in the Owner's sole and absolute judgment will under all circumstances best serve the public interest. Award shall be made in accordance with Manatee County Code of Laws.

Bid - The offer of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

Bidder - One who submits a bid directly to the Owner, as distinct from a sub-bidder, who submits a bid to a Bidder.

Bidding Documents - Consists of the Invitation for Bid, which includes but is not limited to: the bid form, drawings, technical specifications, terms and conditions, and the proposed contract documents (including all Addenda issued prior to receipt of bids); and becomes a part of the Agreement.

Bonds - Performance and payment bonds and other instruments of security.

Change Order - A document recommended by the Project Representative which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the contract price or the contract time, issued on or after the effective date of the Agreement.

Compensable Delay - Any delay beyond the control and without the fault or negligence of the Contractor resulting from Owner-caused changes in the Work, differing site conditions, suspensions of the Work, or termination for convenience by Owner.

Contract Documents - The Agreement, Addenda (which pertain to the Contract documents), Contractor's bid (including documentation accompanying the bid and any post-bid documentation submitted prior to the Notice of Award), the bonds, the specifications and the drawings, together with all amendments, modifications and supplements issued on or after the effective date of the Agreement.

Contract Price - The monies payable by Owner to Contractor under the Contract documents as stated in the Agreement.

Contract Time - The number of days or the date stated in the Notice to Proceed for the completion of the Work.

Contractor - The person, firm or corporation with whom Owner has entered into an Agreement.

Days - All references to days are to be considered calendar days except as specified differently.

Defective - An adjective which when modifying the work refers to work that is unsatisfactory, faulty or deficient, or does not conform to the Contract documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract documents, or has been damaged prior to Project Representative's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner).

Discretionary – Payment for all work that shall be made only at the Owner's discretion in order to satisfactorily complete the project in accordance with the Plans and Specifications.

Drawings - The drawings which show the character and scope of the Work to be performed and which have been prepared or approved by Engineer and are referred to in the bidding and Contract documents.

Effective Date of the Agreement - The date indicated in the Agreement on which it becomes effective (date of execution).

Excusable Delay - Any delay beyond the control and without the negligence of the Contractor, the Owner, or any other Contractor caused by events or circumstances such as, but not limited to, acts of God or of the public enemy, fires, floods, freight embargoes, acts of government other than Owner or epidemics. Labor disputes and above average rainfall shall give rise only to excusable delays.

Field Order - A written order issued by Project Representative which orders minor changes in the Work, but which does not involve a change in the contract price or the contract time.

Float or Slack Time - The time available in the progress schedule during which an unexpected activity can be completed without delaying substantial completion of the Work.

Inexcusable Delay - Any delay caused by events or circumstances within the control of the Contractor, such as inadequate crewing, slow submittals, etc., which might have been avoided by the exercise of care, prudence, foresight, or diligence on the part of the Contractor.

Non-prejudicial Delay - Any delay impacting a portion of the Work within the available total float or slack time and not necessarily preventing completion of the Work within the Contract time.

Notice of Award - The written notice to the successful bidder stating Award has been approved by the Board of County Commissioners; or by the Purchasing Official in accordance with Manatee County Purchasing Code of Law, Chapter 2-26, Manatee County Purchasing Ordinance.

Notice of Intent to Award - The written notice to the apparent low bidder stating Award has been recommended with final Award to be authorized by the Board of County Commissioners.

Notice to Proceed - Written notice by Owner (after execution of Contract) to Contractor fixing the date on which the Contract time will commence to run and on which Contractor shall start to perform ten (10) days from date of such notice Contractor's obligations under the Contract documents.

Owner - Manatee County, Florida, Board of County Commissioners.

Preconstruction Conference - Prior to starting the Work, a meeting scheduled by Owner with Contractor to review the Work schedules, to establish procedures for handling shop drawings and other submissions, for processing periodical pay estimates, and such other matters as may be pertinent to the project.

Prejudicial Delay - Any excusable or compensable delay impacting the Work and exceeding the total float available in the progress schedule, thus preventing completion of the Work within the Contract time unless the Work is accelerated.

Pre-operation Testing - All field inspections, installation checks, water tests, performance tests and necessary corrections required of Contractor to demonstrate that individual components of the work have been properly constructed and do operate in accordance with the Contract documents for their intended purposes.

Project - The total construction of which the Work to be provided under the Contract documents may be the whole or a part as indicated elsewhere in the Contract documents.

Project Representative - The authorized representative of Owner who is assigned to the project or any part thereof.

Schedule of Values – Unit Prices shall be established for this Contract by the submission of a schedule of values. The Contractor shall submit a Schedule of Values within ten days of Notice to Proceed date. The Schedule shall include quantities and prices of items equaling the Total Bid Price and will subdivide the Work into components parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work. Upon request of the County, the Contractor shall support the values with data which will substantiate their correctness.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for Contractor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a supplier and submitted by Contractor to illustrate material or equipment for some portion of the Work.

Specifications - Those portions of the Contract documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

Subcontractor - An individual or corporation having a direct contact with Contractor or with any other subcontractor for the performance of a part of the Work at the site. Such person or firm has contractual relations with the Contractor, not with the Owner.

Substantial Completion - The Work (or a specified part thereof) has progressed to the point when, in the opinion of the Engineer as evidenced by Engineer's definitive certificate of Substantial Completion, it is sufficiently complete in accordance with Contract documents so that the work can be utilized for the purposes for which it is intended; or if there be no such certificate issued, when final payment is due.

Successful Bidder - The lowest qualified, responsible and responsive bidder to whom an award is made.

Supplier - A manufacturer, fabricator, supplier, distributor, materialman or vendor.

Underground Facilities - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments and any encasement containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

Unit Price Work - Work to be paid for on the basis of unit prices.

Work - The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract documents. Work is the result of performing services, furnishing labor and furnishing and incorporating materials and equipment into the construction, all as required by the Contract documents.

Work Directive Change - A written directive to Contractor, issued on or after the effective date of the Agreement and signed by Owner and recommended by Project Representative ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed or to emergencies.

A work directive change may not change the Contract price or the Contract time; but is evidence that the parties expect that the change directed or documented by a work directive change will be incorporated in a subsequently issued change order following negotiations by the parties as to its effect, if any, on the Contract price or Contract time.

Written Amendment - A written amendment of the contract documents, signed by Owner and Contractor on or after the effective date of the Agreement and normally dealing with the non-engineering or non-technical rather than strictly work related aspects of the contract documents.

ARTICLE 2 - PRELIMINARY MATTERS

Computation of Time: When time is referred to in the Contract documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or legal holiday, such day will be omitted from the computation.

2.1 The Contractor must submit a proposed schedule of the Work at the preconstruction conference. The purpose of this schedule is to enable the Owner to govern the Work, to protect the functions of the local government and its citizens and to aid in providing appropriate surveillance. The Owner shall have the right to reschedule work provided such rescheduling is in accord with the remainder of terms of the Contract. The schedule shall show, as a minimum, the approximate dates on which each segment of the work is expected to be started and finished, the proposed traffic flows during each month, the anticipated earnings by the Contractor for each month and the approximate number of crews and equipment to be used. The Owner, after necessary rescheduling and obtaining additional information for specific purposes, shall review and approve the schedule. The Contractor shall also forward to the Owner, as soon as practicable after the first day of each month, a summary report of the progress of the various parts of the work under the Contract, in fabrication and in the field, stating the existing status, estimated time of completion and cause of delay, if any. Together with the summary report, the Contractor shall submit any necessary revisions to the original schedule for the Owner's review and approval. In addition, more detailed schedules may be required by the Owner for daily traffic control.

2.2 A Notice to Proceed may be given at any time within thirty (30) days after the effective date of the Agreement. The Contract time will commence at the time specified in such notice. Contractor shall start to perform the Work on the date specified in the Notice to Proceed, but no work shall be done at the site prior to the date on which the Contract time commences to run.

2.3 If at any time the materials and appliances to be used appear to the Owner as insufficient or improper for securing the quality of work required or the required rate of progress, the Owner may order the Contractor to increase his efficiency or to improve the character of his work and the Contractor shall conform to such an order. The failure of the Owner to demand any increase of such efficiency of any improvement shall not release the Owner from his obligation to secure the quality of work or the rate of progress necessary to complete the Work within the limits imposed by the Contract. The Owner may require the Contractor to remove from the Work such employees as the Owner deems incompetent, careless, insubordinate or otherwise objectionable, or whose continued employment on the Work is deemed to be contrary to the Owner's interest.

2.4 The Owner reserves the right to let other Contracts in connection with this Work. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and execution of their Work, and promptly connect and coordinate the Work with theirs.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, RE-USE

3.1 The Contract documents comprise the entire Agreement between Owner and Contractor concerning the work. The Contract documents are complementary; what is called for by one is as binding as if called for by all. The Contract documents will be construed in accordance with the laws and ordinances of the State of Florida and Manatee County.

Should a conflict exist within the Contract documents, the precedence in ascending order of authority are as follows: 1) Standard Printed Contract Documents, 2) Special Conditions, 3) General Conditions and 4) Drawings., Note: Computed dimensions shall govern over scaled dimensions.

3.2 It is the intent of the Contract documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract documents. Any work, materials or equipment that may reasonably be inferred from the Contract documents as being required to produce the intended result will be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe work, materials, or equipment, such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or laws or regulations in effect at the time of opening of bids, except as may be otherwise specifically stated.
However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract documents) shall be effective to change the duties and responsibilities of Owner, Contractor or Engineer, or any of their agents or employees from those set forth in the Contract Documents

3.3 The Contract documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:

3.3.1 Formal Written Amendment

3.3.2 Change Order

3.3.3 Administrative Contract Adjustment (ACA)

3.3.4 Work Directive Change

3.4 In addition, the requirements of the Contract documents may be supplemented and minor variations and deviations in the Work may be authorized in one or more of the following ways:

1.4.1 Discretionary Work – Field Directive

3.4.2 Engineer's Approval of a Shop Drawing or Sample.

ARTICLE 4 - CONTRACTOR'S RESPONSIBILITIES

4.1 Contractor shall keep on the Work at all times during its progress a competent resident superintendent; who shall be the Contractor's representative at the site and shall have authority to act on behalf of Contractor. All communications given to the superintendent shall be as binding as if given to Contractor.

4.2 Contractor shall provide competent, suitable qualified personnel to survey and lay out the Work and perform construction as required by the Contract documents. Contractor shall at all times maintain good discipline and order at the site. Except in connection with the safety or protection of persons or the Work or property at the site or adjacent thereto and except as otherwise indicated in the Contract documents, all Work at the site shall be performed during regular working hours and Contractor will not permit overtime work or the performance of work on Saturday, Sunday or legal holiday without Owner's written consent given after prior notice to Engineer (at least 72 hours in advance).

4.2.1 Contractor shall pay for all additional engineering charges to the Owner for any overtime work which may be authorized. Such additional engineering charges shall be a subsidiary obligation of Contractor and no extra payment shall be made by Owner on account of such overtime work. At Owner's option, overtime costs may be deducted from Contractor's monthly payment request or Contractor's retainage prior to release of final payment.

4.3 Unless otherwise specified, Contractor shall furnish and assume full responsibility for all bonds, insurance, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

4.4 All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract documents. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instruction of the applicable supplier except as otherwise provided in the Contract documents.

4.5 Contractor shall be fully responsible to Owner for all acts and omissions of the subcontractors, suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect Contract with Contractor just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents shall create any contractual relationship between Owner or Engineer and any such subcontractor, supplier or other person or organization, nor shall it create any obligation on the part of Owner to pay or to see to the payment of any monies due any such subcontractor, supplier or other person or organization.

4.6 Permits: Unless otherwise provided, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work.

4.7 During the progress of the Work, Contractor shall keep the premises free from accumulation of waste materials rubbish and other debris resulting from the Work. At the completion of the Work, Contractor shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery and surplus materials and shall leave the site clean and ready for occupancy by Owner. Contractor shall restore to original conditions all property not designated for alteration by the Contract Documents.

4.8 Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

4.9 Safety and Protection: Contractor shall comply with the Florida Department of Commerce Safety Regulations and any local safety regulations. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of and shall provide the necessary protection to prevent damage, injury or loss to:

4.9.1 all employees on the work and other persons and organizations who may be affected thereby;

4.9.2 all the work and materials and equipment to be incorporated therein, whether in storage on or off the site; and

4.9.3 other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of construction.

Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall provide and maintain all passageways, guard fences, lights and other facilities for the protection required by public authority or local conditions. Contractor shall provide reasonable maintenance of traffic way for the public and preservation of the Owner's business, taking into full consideration all local conditions. Contractor's duties and responsibilities for the safety and protection of the work shall continue until such time as all the work is completed.

4.10 Emergencies: In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, Contractor, without special instruction or authorization from Engineer or Owner, is obligated to act to prevent threatened damage, injury or loss. Contractor shall give Owner prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract documents have been caused thereby. If Owner determines that a change in the Contract documents is required because of the action taken in response to an emergency, a work directive change or change order will be issued to document the consequences of the changes or variation.

4.11 For substitutes not included with the bid, but submitted after the effective date of the Agreement, Contractor shall make written application to Engineer for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified.

The application will also contain an itemized estimate of all costs and delays or schedule impacts that will result directly or indirectly from review, acceptance and provisions of such substitute, including costs of redesign and claims of other Contractors affected by the resulting change, all of which will be considered by the Engineer in evaluating the proposed substitute. Engineer may require Contractor to furnish at Contractor's expense, additional data about the proposed substitute. In rendering a decision, Owner/Engineer and Contractor shall have access to any available float time in the construction schedule. In the event that substitute materials or equipment not included as part of the bid, but proposed after the effective date of the agreement, are accepted and are less costly than the originally specified materials or equipment, then the net difference in cost shall be credited to the Owner and an appropriate change order executed.

4.11.1 If a specific means, method, technique, sequence of procedure of construction is indicated in or required by the Contract documents, Contractor may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to Engineer if Contractor submits sufficient information to allow Engineer to determine that the substitute proposed is equivalent to that indicated or required by the Contract documents.

4.11.2 Engineer will be allowed a reasonable time within which to evaluate each proposed substitute. Engineer will be the sole judge of acceptability and no substitute will be ordered, installed or utilized without Engineer's prior written acceptance which will be evidenced by either a change order or an approved shop drawing. Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

4.11.3 Contractor shall reimburse Owner for the charges of Engineer and Engineer's Consultants for evaluating each proposed substitute submitted after the effective date of the Agreement and all costs resulting from any delays in the work while the substitute was undergoing review.

4.12 The Contractor shall furnish, free of charge, all labor, stakes, surveys, batter boards for structures, grade lines and other materials and supplies and shall set construction stakes and batter boards for establishing lines, position of structures, slopes and other controlling points necessary for the proper prosecution of the construction work. Where rights-of-way, easements, property lines or any other conditions which make the lay-out of the project or parts of the project critical are involved, the Contractor will employ a competent surveyor who is registered in the State of Florida for lay-out and staking. These stakes and marks shall constitute the field control by and in accord with which the Contractor shall govern and execute the Work.

The Contractor will be held responsible for the preservation of all stakes, marks and if for any reason any of the stakes or marks or batter boards become destroyed or disturbed, they will be immediately and accurately replaced by the Contractor.

4.13 The Contractor has, by careful examination, satisfied himself as to the nature and location of the work and all other matters which can in any way affect the work under this Contract, including, but not limited to details pertaining to boring, as shown on the drawings, are not guaranteed 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 Contractor shall examine boring data, where available, and make his own interpretation of the subsoil investigations and other preliminary data, and shall base his bid on his own opinion of the conditions likely to be encountered. In no event shall an extension of time be considered for any conditions that existed at the time of bidding, nor shall the Contractor receive extra compensation for completion of the project as intended by the drawings and in keeping with the contact documents. No verbal agreement or conversation with any officer, agent or employee of the Owner, before or after the execution of this Contract, shall affect or modify any of the terms or obligations herein contained.

4.14 If the Contractor, in the course of the Work, finds that the drawings and/or Contract Documents cannot be followed, he shall immediately inform the Owner in writing, and the Owner shall promptly check the accuracy of the information. Any work done after such discovery, until any necessary changes are authorized, will be done at the Contractor's risk.

ARTICLE 5 - OWNER'S RESPONSIBILITIES

5.1 Owner shall furnish the data required of Owner under the Contract documents promptly and shall make payments to the Contractor within a reasonable time {no more than twenty (20) days} after the Work has been accepted by the Owner. The form of all submittals, notices, change orders and other documents permitted or required to be used or transmitted under the Contract documents shall be determined by the Owner/Engineer. Standard County forms shall be utilized.

5.2 The Owner shall provide the lands upon which the Work under this Contract is to be done, except that the Contractor shall provide all necessary additional land required for the erection of temporary construction facilities and storage of his materials, together with right of access to same.

5.3 The Owner shall have the right to take possession of and use any completed portions of the work, although the time for completing the entire work or such portions may not have expired, but such taking possession and use shall not be deemed an acceptance of any work not completed in accordance with the Contract Documents.

ARTICLE 6 - CHANGES IN THE WORK

6.1 Without invalidating the Agreement and without notice to any surety, Owner may, at any time, order additions, deletions or revisions in the Work. These will be authorized by a written amendment, a change order, or a work directive change. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract documents (except as otherwise specifically provided).

6.2 Contractor shall not be entitled to an increase in the Contract price or an extension of the Contract time with respect to any Work performed that is not required by the Contract documents as amended, modified and supplemented.

6.3 Owner and Contractor shall execute appropriate change orders (or written amendments) covering changes in the Work which are ordered by Owner, or which may be required because of acceptance of defective Work.

6.4 At any time Engineer may request a quotation from Contractor for a proposed change in the Work and within twenty-one (21) calendar days after receipt, Contractor shall submit a written and detailed proposal for an increase or decrease in the Contract price or Contract time for the proposed change. Engineer shall have twenty-one (21) calendar days after receipt of the detailed proposal to respond in writing. The proposal shall include an itemized estimate of all costs and time for performance that will result directly or indirectly from the proposed change. Unless otherwise directed, itemized estimates shall be in sufficient detail to reasonably permit an analysis by Engineer of all material, labor, equipment, subcontracts, overhead costs and fees, and shall cover all Work involved in the change, whether such Work was deleted, added, changed or impacted. Notwithstanding the request for quotation, Contractor shall carry on the Work and maintain the progress schedule. Delays in the submittal of the written and detailed proposal will be considered non-prejudicial.

ARTICLE 7 - CHANGE OF CONTRACT PRICE

7.1 The Contract price constitutes the total compensation (subject to authorized adjustments) payable to Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at his expense without change in the Contract price.

7.2 The Contract price may only be changed by change order or by a written amendment. Any claim for an increase or decrease in the Contract price shall be based on written notice delivered by the party making the claim to the other party. Notice of the amount of the claim with supporting data shall be delivered within ten (10) days from the beginning of such occurrence and shall be accompanied by claimant's written statement that the amount claimed covers all known amounts (direct, indirect and consequential) to which the claimant is entitled as a result of the occurrence of said event.

7.3 The value of any Work covered by a change order or of any claim for an increase or decrease in the Contract price shall be determined in one (1) of the following ways (at Owner's discretion):

7.3.1 Where the Work involved is covered by unit prices contained in the Contract documents, cost will be determined by application of such unit prices to the quantities of the items involved.

7.3.2 By mutual acceptance of lump sum.

7.3.3 On the basis of the cost of the Work, plus a 15% Contractor's fee for overhead and profit. (Contractor shall submit an itemized cost breakdown together with supporting data.)

7.4 Either Owner or Contractor may make a claim for an adjustment in the Contract price. The unit price of an item of unit price Work shall be subject to re-evaluation and adjustment under the following conditions:

7.4.1 If the total cost of a particular item of unit price Work amounts to 5% or more of the Contract price and the variation in the quantity of the particular item of unit price Work performed by Contractor differs by more than 15% from the estimated quantity of such item indicated in the Agreement; and

7.4.2 If there is no corresponding adjustment with respect to any other item of Work; and

7.4.3 If a Contractor believes that it has incurred additional expense as a result thereof; or

7.4.4 If Owner believes that the quantity variation entitles it to an adjustment in the unit price; or

7.4.5 If the parties are unable to agree as to the effect of any such variations in the quantity of unit price Work performed.

ARTICLE 8 - CHANGE OF CONTRACT TIME

8.1 Contract time may only be changed by a change order or a written amendment. Any claim for an extension or shortening of the Contract time shall be based on written notice delivered by the party making the claim to the other party. Notice of the extent of the claim with supporting data shall be delivered within fifteen (15) days from detection or beginning of such occurrence and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event.

8.2 The Contract time will be extended in an amount equal to time lost due to delays beyond the control of Contractor. Such delays shall include, but not be limited to, acts or neglect by Owner or others performing additional work, or to fires, floods, epidemics, abnormal weather conditions or acts of God.

8.3 All time limits stated in the Contract documents are of the essence.

ARTICLE 9 - WARRANTY, TEST/INSPECTION, CORRECTION

9.1 Contractor warrants (for a minimum period of three (3) years or as otherwise stated herein) and guarantees to Owner that all Work will be in accordance with the Contract documents and will not be defective; that Owner, representatives of Owner, governmental agencies with jurisdictional interests will have access to the Work at reasonable time for their observation, inspecting and testing. (Contractor shall give Engineer timely notice of readiness of the work for all required approvals and shall assume full responsibility, including costs, in obtaining required tests, inspections, and approval certifications and/or acceptance, unless otherwise stated by Owner.)

9.2 If any work (including work of others) that is to be inspected, tested, or approved is covered without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation. Such uncovering shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice. Neither observations by Engineer nor inspections, tests, or approvals by others shall relieve Contractor from Contractor's obligations to perform the Work in accordance with the Contract documents.

9.3 If the Work is defective, or Contractor fails to supply sufficient skilled workers, or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract documents, Owner may order Contractor to stop the Work, or any portion thereof and terminate payments to the Contractor until the cause for such order has been eliminated.

Contractor shall bear all direct, indirect and consequential costs for satisfactory reconstruction or removal and replacement with non-defective Work, including, but not limited to fees and charges of engineers, architects, attorneys and other professionals and any additional expenses experienced by Owner due to delays to other Contractors performing additional Work and an appropriate deductive change order shall be issued. Contractor shall further bear the responsibility for maintaining schedule and shall not be entitled to an extension of the Contract time and the recovery of delay damages due to correcting or removing defective Work.

9.3.1 If Contractor fails within seven (7) days after written notice to correct defective Work, or fails to perform the Work in accordance with the Contract documents, or fails to comply with any other provision of the Contract documents, Owner may correct and remedy any such deficiency. To the extent necessary to complete corrective and remedial action, Owner may exclude Contractor from all or part of the site, take possession of all or part of the Work, Contractor's tools, construction equipment and machinery at the site or for which Owner has paid Contractor but which are stored elsewhere. All direct, indirect and costs of Owner in exercising such rights and remedies will be charged against Contractor in an amount approved as to reasonableness by Engineer and a change order will be issued incorporating the necessary revisions.

9.3.2 If within three (3) years after the date of completion or such longer period of time as may be prescribed by laws or regulations or by the terms of any applicable special guarantee required by the Contract documents, any Work is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions, either correct such defective Work or if it has been rejected by Owner, remove it from the site and replace it with non-defective Work. If Contractor does not promptly comply with the terms of such instruction, Owner may have the defective Work corrected/removed and all direct, indirect and consequential costs of such removal and replacement will be paid by Contractor.

ARTICLE 10 - SUSPENSION/TERMINATION OF WORK

10.1 Owner may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than ninety (90) days by written notice to Contractor, which will fix the date on which Work will be resumed. Contractor shall be allowed an increase in the Contract price or an extension of the Contract time, or both, directly attributable to any suspension if Contractor makes an approved claim therefore.

10.2 Owner may terminate the Contract if Contractor commences a voluntary case under any chapter of the Bankruptcy Code or any similar action by filing a petition under any other federal or state law relating to the bankruptcy or insolvency; if a petition is filed against the Contractor under any chapter of the Bankruptcy Code or similar relief under any other federal or state law; if Contractor persistently fails to perform the Work in accordance with the Contract documents; if Contractor disregards laws or regulations of any public body having jurisdiction or the Engineer; or otherwise violates in any substantial way any provisions of the Contract.

10.2.1 Owner may, after giving Contractor (and the surety, if there is one) seven (7) days written notice and to the extent permitted by laws and regulations, terminate the services of Contractor; exclude Contractor from the site and take possession of the Work and of all Contractor's tools, construction equipment and machinery at the site and use the same to the full extent they could be used (without liability to Contractor for trespass or conversion); incorporate in the Work all materials and equipment stored at the site or for which Owner has paid Contractor but which are stored elsewhere, and finish the Work as Owner may deem expedient. In such case, Contractor shall not be entitled to receive any further payment beyond an amount equal to the value of material and equipment not incorporated in the Work, but delivered and suitably stored, less the aggregate of payments previously made. If the direct and indirect costs of completing the Work exceed the unpaid balance of the Contract price, Contractor shall pay the difference to Owner. Such costs incurred by Owner shall be verified by Owner and incorporated in a change order; but in finishing the Work, Owner shall not be required to obtain the lowest figure for the Work performed. Contractor's obligations to pay the difference between such costs and such unpaid balance shall survive termination of the Agreement.

10.3 If, through no act or fault of Contractor, the Work is suspended for a period of more than ninety (90) days by Owner or under an order of court or other public authority, or Engineer fails to act on any application or fails to pay Contractor any sum finally determined to be due; then Contractor may, upon seven (7) days written notice to Owner terminate the Agreement and recover from Owner payment for all Work executed, any expense sustained plus reasonable termination expenses. In lieu of terminating the Agreement, if Engineer has failed to act on any application of payment or Owner has failed to make any payment as aforesaid, Contractor may upon seven (7) days written notice to Owner, stop the Work until payment is made of all amounts then due.

ARTICLE 11 - CONTRACT CLAIMS

11.1 The rendering of a decision by Engineer with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment) will be a condition precedent to any exercise by Owner or Contractor of such right or remedies as either may otherwise have under the Contract documents or by laws or regulations in respect of any such claim, dispute or other matter. No action, either at law or at equity, shall be brought in connection with any such claim, dispute or other matter later than thirty (30) days after the date on which Owner/Engineer has rendered such written decision in respect thereof. Failure to bring an action within said thirty (30) day period shall result in Engineer's decision being final and binding on the Contractor. In no event may any such action be brought after the time at which instituting such proceedings would be otherwise barred by the applicable statute of limitations.

11.2 Before bringing any action in court pertaining to any claim, dispute or other matter in question(s) arising out of or relating to the Contract documents or the breach thereof, or Engineer's final decision, except for claims which have been waived by the making and acceptance of final payment, the Contractor shall first submit written notice(s) of Contract claims to the Purchasing Official for a decision; within the earlier of sixty (60) days after the last date on which the Contractor provided any goods or services required by the Contract or after the date on which the Contractor knew or should have known such a claim existed. The Manatee County Code of Law Section 2-26-63 Contract Claims details the requirements and process for such a claim.

ARTICLE 12 - RESIDENT PROJECT REPRESENTATIVE – DUTIES/RESPONSIBILITIES

12.1 Resident Project Representative is Engineer/Owner's Agent, who will act as directed by and under the supervision of the Engineer, and who will confer with Owner/Engineer regarding his actions. Resident Project Representative's dealing in matters pertaining to the on-site Work shall, in general, be only with the Owner/Engineer and Contractor and dealings with subcontractors shall only be through or with the full knowledge of Contractor.

12.2 Resident Project Representative will:

12.2.1 Review the progress schedule, schedule of shop drawing submissions and schedule of values prepared by Contractor and consult with Owner/Engineer concerning their acceptability.

12.2.2 Attend preconstruction conferences. Arrange a schedule of progress meetings and other job conferences as required in consultation with Owner/Engineer and notify those expected to attend in advance. Attend meetings and maintain and circulate copies of minutes thereof.

12.2.3 Serve as Owner/Engineer's liaison with Contractor, working principally through Contractor's superintendent and assist him in understanding the intent of the Contract documents. As requested by Owner/Engineer, assist in obtaining additional details or information when required at the job site for proper execution of the Work.

12.2.4 Receive and record date of receipt of shop drawings and samples, receive samples which are furnished at the site by Contractor and notify Owner/Engineer of their availability for examination.

12.2.5 Advise Owner/Engineer and Contractor or his superintendent immediately of the commencement of any Work requiring a shop drawing or sample submission if the submission has not been approved by the Owner/Engineer.

12.2.6 Conduct on-site observations of the Work in progress to assist Owner/Engineer in determining if the Work is proceeding in accordance with the Contract documents and that completed Work will conform to the Contract documents.

12.2.7 Report to Owner/Engineer whenever he believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract documents, or does not meet the requirements of any inspections, tests or approvals required or if Work has been damaged prior to final payment; and advise Owner/Engineer when he believes Work should be corrected or rejected or should be uncovered of observation or requires special testing, inspection or approval.

12.2.8 Verify that tests, equipment and system start-ups and operating and maintenance instructions are conducted as required by the Contract documents and in the presence of the required personnel, and that Contractor maintains adequate records thereof; observe, record and report to Engineer appropriate details relative to the test procedures and start-ups.

12.2.9 Accompany visiting inspectors representing public or other agencies having jurisdiction over the project; record the outcome of these inspections and report to Owner/Engineer.

12.2.10 Transmit to Contractor, Owner/Engineer's clarifications and interpretations of the Contract documents.

12.2.11 Consider and evaluate Contractor's suggestions or modifications in drawings or Contract Documents and report them with recommendations to Owner/Engineer.

12.2.12 Maintain at the job site orderly files for correspondence, reports of job conferences, shop drawings and sample submissions, reproductions of original Contract documents including all addenda, change orders, field orders, additional drawings issued subsequent to the execution of the Contract, Owner/Engineer's clarifications and interpretations of the Contract documents, progress reports and other project related documents.

12.2.13 Keep a diary or log book, recording hours on the job site, weather conditions, data relative to questions of extras or deductions; list of visiting officials and representatives or manufacturers, fabricators, suppliers and distributors; daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures. Send copies to Owner/Engineer.

12.2.14 Record names, addresses and telephone numbers of all Contractors, subcontractors and major suppliers of materials and equipment.

12.2.15 Furnish Owner/Engineer periodic reports as required of progress of the Work and Contractor's compliance with the approved progress schedule and schedule of shop drawing submissions.

12.2.16 Consult with Owner/Engineer in advance of scheduling major tests, inspections or start of important phases of the Work.

12.2.17 Report immediately the occurrence of any accident.

12.2.18 Review applications for payment with Contractor for compliance with the established procedure for their submission and forward them with recommendations to Owner/Engineer, noting particularly their relation to the schedule of values, Work completed and materials and equipment delivered at the site, but not incorporated in the Work.

12.2.19 During the course of the Work, verify that certificates, maintenance and operations manuals and other data required to be assembled and furnished by Contractor are applicable to the items actually installed, and deliver this material to Owner/Engineer for his review prior to final acceptance of the Work.

12.2.20 Before Owner/Engineer issues a Certificate of Substantial Completion, submit to Contractor a list of observed items requiring completion or correction.

12.2.21 Conduct final inspection in the company of Owner/Engineer and Contractor and prepare a final list of items to be completed or corrected.

12.2.22 Verify that all items on final list have been completed or corrected and make recommendations to Owner/Engineer concerning acceptance.

12.3 Except upon written instructions of Owner/Engineer, Resident Project Representative.

12.3.1 Shall not authorize any deviation from the Contract documents or approve any substitute materials or equipment;

12.3.2 Shall not exceed limitations on Owner/Engineer's authority as set forth in the Contract documents;

12.3.3 Shall not undertake any of the responsibilities of Contractor, Subcontractors or Contractor's Superintendent, or expedite the Work;

12.3.4 Shall not advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract documents;

12.3.5 Shall not advise on or issue directions as to safety precautions and programs in connection with the Work;

12.3.6 Shall not authorize Owner to occupy the project in whole or in part; and

12.3.7 Shall not participate in specialized field or laboratory tests.

ARTICLE 13 - APPRENTICES

13.1 If Successful Contractor employs apprentices, he shall be governed and comply with the provisions of Florida State Statute 446.011.

NOTE: The form of all submittals, notices, change orders and other documents permitted or required to be used or transmitted under the Contract shall be determined by the Owner. Standard County forms shall be utilized.

END OF SECTION

MANATEE COUNTY GOVERMENT
PUBLIC CONSTRUCTION BOND

Bond No. _____
(Enter bond number)

BY THIS BOND, We_____, located at _____, as
(Name of Contractor) (Address)

Principal and _____, a corporation, whose address is
(Name of Surety)

_____

are bound to Manatee County, a political subdivision of the State of Florida, herein called County, in the sum of $ _____, for payment of which we bind ourselves, our heirs, personal representatives, successors, and assigns, jointly and severally.

WHEREAS, the Contractor has entered into Contract No. _____ with the County for the project titled _____, with conditions and provisions as are further described in the aforementioned Contract, which Contract is by reference made a part hereof for the purposes of explaining this bond.

THE CONDITION OF THIS BOND is that if Principal:

1. Performs Contract No. _____, between Principal and County for construction of

_____, the Contract being made a part of this bond by reference, at
(Title of Project)

the times and in the manner prescribed in the Contract; and

2. Promptly makes payments to all claimants, as defined in Section 255.05(1), Florida Statutes, supplying Principal with labor, materials, or supplies, used directly or indirectly by Principal in the prosecution of the Work provided for in the Contract; and

3. Pays County all losses, damages, expenses, costs, and attorney's fees, including appellate proceedings, that County sustains because of a default by Principal under the Contract; and

4. Performs the guarantee of all Work and materials furnished under the Contract for the time specified in the Contract, then this bond is void; otherwise it remains in full force.

Any action instituted by a claimant under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05(2), Florida Statutes.

Any changes in or under the Contract documents and compliance or noncompliance with any formalities connected with the Contract or the changes does not affect Surety's obligation under this bond.

DATED ON _____.

CONTRACTOR AS PRINCIPAL	**SURETY**
_____	_____
Company Name	Company Name
_____	_____
Signature	Signature
_____	_____
Print Name & Title	Print Name & Title
(Corporate Seal)	*(Corporate Seal)*

AGENT or **BROKER**

_____
Company Name

_____
Address

_____

_____
Telephone

Licensed Florida Insurance Agent? ☐ **Yes** ☐ **No**

License #: _____

State of: _____

County of: _____

City of: _____

Chapter 2
Units of Measure

2.1 Abbreviations

Listed below are selected abbreviations used in the Basis of Estimates. For a more complete list of abbreviations, refer to Design Standards, Index No. 001.

AC	Acre
AS	Assembly*
BU	Bushel
CF	Cubic Foot
CO	Cleanout*
CY	Cubic Yard
DA	Day
DD	Dollars per Day
EA	Each
ED	Each Day
GA	Gallon
GK	Gross Kilometer
GM	Gross Mile
HA	Hectare
HR	Hour
KG	Kilogram
KL	Kiloliter
KM	Kilometer
LB	Pound
LF	Foot
LI	Liter
LO	Location
LS	Lump Sum
LU	Luminaire
M1	Meter
M2	Square Meter
M2	Square Meter
M3	Cubic Meter
MB	Board Measure/ Thousand Feet
MG	Thousand Gallons
MH	Man-hour**
MI	Mile
MO	Month
MT	Metric Ton
NK	Net Kilometer
NM	Net Mile
PA	Per Analysis*

PB	Per Building*
PI	Per Intersection*
PL	Plant*
PM	Per Mile*
PS	Per Set*
PW	Per Well*
SF	Square Foot
SY	Square Yard
TH	Therms
TN	Ton
YD	Yard

*Units which may be replaced with unit of Each (EA), upon pay item review
** Units may be replaced with Hour (HR), upon review.

2.2 ACCURACY

Unless otherwise indicated for a specific pay item, accuracy is recorded as follows:

Unit of Measure	Accuracy*
AC	1/10 of an acre
CF	1/10 of a cubic foot
CY	1/10 of a cubic yard
GM	1/1000 of a mile
MB	1/10 of a thousand foot board measure
NM	1/1000 of a mile
TN	1/10 of a Ton
Unit items	Unit quantity: each, assembly, location, set, intersection
Others	To the nearest whole number: pound, foot, square yard, gallon, day,

*Note: Calculations are performed with one additional significant figure, and then rounded to the above accuracy for measurement/payment.

2.3 CONVERSION FACTORS

Linear Measure
25.4 mm/in
0.03937 in/mm
0.3048 m/ft
3.2808 ft/m
0.9144 m/yd
1.0936 yd/m
1.609 km/mi
0.621 mi/km

Area Measure
9 ft^2/yd^2

0.836 m^2/yd^2
1.2 yd^2/m^2
0.40 ha/ac
4047 m^2/ac
2.477 ac/ha
43,560ft^2/ac
4840 yd^2/ac
640 ac/mi^2
0.386 mi^2/km^2
2.590 km^2/mi^2

Volume, Liquid Measure
1728 in^3/ft^3
0.028 m^3/ft^3
0.765 m^3/yd^3
27 ft^3/yd^3
0.2642 gal/l
3.785 l/gal

Force, Weight Measure
2.205 lb/kg
1.10 TN/MT
0.907 MT/TN (short ton)
2000 lb/ton (short ton)
1000 kg/MT

Additional items to be added upon request.

Chapter 2 Revision History

11-23-11: Updated header dates for 2012 edition.
12-1-10: Updated header dates for 2011 edition.
10-30-09: Updated header dates for 2010 edition.
1-28-09: Added 2.2 Accuracy. Renumbered 2.3 Conversion Factors.
10-1-2008: Updated header dates for 2009 edition.

Name: US 301 @ Haben Boulevard, Palmetto, FL
IFB No. 12-3020CD (Project File: 429873-1-58-01)
Revised: August 4, 2011
Revised: February 27, 2012

FLORIDA DEPARTMENT OF TRANSPORTATION
(Construction Contract)
LOCAL AGENCY PROGRAM SUPPLEMENTAL CONDITIONS

The supplemental conditions contained in this section are intended to cooperate with, to supplement, and to modify the general conditions and other specifications. In case of disagreement with any other section of this contract, the Supplemental Conditions shall govern.

Item **Page**

1. Bonding and Prequalification

Upon award, furnish to the Agency, and maintain in effect throughout the life of the Contract, an acceptable surety bond in a sum at least equal to the amount of the Contract. Execute such bond on the form furnished by the Agency. Obtain a surety that has a resident agent in the State of Florida, meets all of the requirements of the laws of Florida and the regulations of the Agency, and has the Agency's approval. Ensure that the surety's resident agent's name, address and telephone number is clearly stated on the face of the Contract Bond.

A contractor desiring to bid for the performance of any construction contract located on the National Highway System (NHS) or the State Highway System (SHS) in excess of $250,000 must be certified by the Department of Transportation as qualified in accordance with Section 337.14(1), Florida Statutes and Rule 14-22, Florida Administrative Code. Any bid for the performance of any construction contract in excess of $250,000 submitted by a contractor not certified by the Department of Transportation as qualified shall be declared "IRREGULAR" and will be REJECTED.

2.&10. Buy America and Foreign Contractor and Supplier Restriction

6-12.2 Source of Supply - Steel (Federal-Aid Contracts Only): **For Federal-aid Contracts**, only use steel and iron produced in the United States, in accordance with the Buy America provisions of 23 CFR 635.410, as amended. Ensure that all manufacturing processes for this material occur in the United States. As used in this specification, a manufacturing process is any process that modifies the chemical content, physical shape or size, or final finish of a product beginning with the initial melting and mixing and continuing through the bending and coating stages. A manufactured steel or iron product is complete only when all grinding, drilling, welding, finishing and coating have been completed. If a domestic product is taken outside the United States for any process, it becomes foreign source material. When using steel and iron as a component of any manufactured product incorporated into the project (e.g., concrete pipe, pres-stressed beams, corrugated steel pipe, etc.), these same provisions apply, except that the manufacturer may use minimal quantities of foreign steel and iron when the cost of such foreign materials does not exceed 0.1% of the total Contract amount or $2,500.00, whichever is greater. These requirements are applicable to all steel and iron materials incorporated into the finished work, but are not applicable to steel and iron items that the Contractor uses but does not incorporate into the finished work. Provide a certification from the producer of steel or iron, or any product containing steel or iron as a component, stating that all steel or iron furnished or incorporated into the furnished product was manufactured in the United States in accordance with the requirements of this specification and the Buy America provisions of 23 CFR 635.410, as amended. Such certification shall also include (1) a statement that the product was produced entirely within the United States, or (2) a statement that the product was produced within the United States except for minimal quantities of foreign steel and iron valued at $(actual value). Furnish each such certification to the Engineer prior to incorporating the material into the project. When FHWA allows the use of foreign steel on a project, furnish invoices to document the cost of such material, and obtain the Engineer's written approval prior to incorporating the material into the project.

3. Change Orders

Contractor shall not be entitled to an increase in the contract price or an extension of the contract time with respect to any Work performed that is not required by the contract documents as amended, modified and supplemented.

Owner and Contractor shall execute appropriate change orders (or written amendments) covering changes in the Work which are ordered by Owner, or which may be required because of acceptance of defective Work.

At any time Engineer may request a quotation from Contractor for a proposed change in the Work and within twenty-one (21) calendar days after receipt, Contractor shall submit a written and detailed proposal for an increase or decrease in the contract price or contract time for the proposed change. Engineer shall have 21 calendar days after receipt of the detailed proposal to respond in writing. The proposal shall include an itemized estimate of all costs and time for performance that will result directly or indirectly from the proposed change. Unless otherwise directed, itemized estimates shall be in sufficient detail to reasonably permit an analysis by Engineer of all material, labor, equipment, subcontracts, overhead costs and fees, and shall cover all Work involved in the change, whether such Work was deleted, shall carry on the Work and maintain the progress schedule. Delays in the submittal of the written and detailed proposal will be considered non-prejudicial. The contract price constitutes the total compensation (subject to authorized adjustments) payable to Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at his expense without change in the contract price.

The contract price may only be changed by change order or by a written amendment. Any claim for an increase or decrease in the contract price shall be based on written notice delivered by the Party making the claim to the other party. Notice of the amount of the claim with supporting data shall be delivered within ten (10) days from the beginning of such occurrence and shall be accompanied by claimant's written statement that the amount claimed covers all known amounts (direct, indirect and consequential) to which the claimant is entitled as a result of the occurrence of said event.

The value of any Work covered by a change order or for any claim for an increase or decrease in the contract price shall be determined in one of the following ways (at County's discretion):

Where the Work involved is covered by unit prices contained in the contract documents, cost will be determined by application of such unit prices to the quantities of the items involved.

By mutual acceptance of lump sum.

On the basis of the cost of the Work, plus a 15% Contractor's fee for overhead and profit. (Contractor shall submit an itemized cost breakdown together with supporting data.)

Either Owner or Contractor may make a claim for an adjustment in the contract price. The unit price of an item of unit price Work shall be subject to re-evaluation and adjustment under the following conditions:

If the total cost of a particular item of unit price Work amounts to 5% or more of the contract price and the variation in the quantity of the particular item of unit price Work performed by Contractor differs by more than 15% from the estimated quantity of such item indicated in the Agreement; and

If there is no corresponding adjustment with respect to any other item of Work; and

If a Contractor believes that it has incurred additional expense as a result thereof; or

If Owner believes that the quantity variation entitles it to an adjustment in the unit price; or

If the parties are unable to agree as to the effect of any such variations in the quantity of unit price Work performed.

4. Claims

The rendering of a decision by Engineer with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment) will be a condition precedent to any exercise by Owner or Contractor of such right or remedies as either may otherwise have under the contract documents or by laws or regulations in respect of any such claim, dispute or other matter. No action, either at law or at equity, shall be brought in connection with any such claim, dispute or other matter later than thirty (30) days after the date on which Owner/Engineer has rendered such written decision in respect thereof. Failure to bring an action within said thirty (30) day period shall result in Engineer's decision being final and binding on the Contractor. In no event may any such action be brought after the time at which instituting such proceedings would be otherwise barred by the applicable statute of limitations. Before bringing any action in court pertaining to any claim, dispute or other matter in question(s) arising out of or relating to the contract documents or the breach thereof, or Engineer's final decision, except for claims which have been waived by the making and acceptance of final payment, the Contractor shall first submit written notice(s) of contract claims to the Purchasing Director for a decision' the Contractor may request a conference with the Purchasing Director. Claims include, without limitation, disputes arising under the contract and those based upon breach of contract, mistake, misrepresentation, or other cause for contract modification or revision. The Purchasing Director is authorized to resolve any claim prior to the filing of a request for a hearing with the Board of County Commissioners or the commencement of an action in a court of competent jurisdiction; but may not settle any such claim for consideration of $10,000.00 or more in value without the prior approval of the Board of County Commissioners.

The decision of the Purchasing Director shall be promptly issued in writing to the Contractor. If an adverse decision has been rendered, the notice of decision shall inform the Contractor of his right to request a hearing with the Board of County Commissioners.

The Purchasing Director's decision shall be final and conclusive unless, within ten (10) calendar days from the date of receipt of the decision, the Contractor files a written request for hearing with the Board of County Commissioners.

If the Purchasing Director does not issue a written decision regarding any contract controversy within fourteen (14) days after receipt of a written request for a final decision, or within such longer period as may be agreed upon between the parties, then the aggrieved party may proceed as if an adverse decision had been issued.

5. Contractor Purchased Equipment for State or Local Ownership

The OWNER does not allow.

6. Disadvantage Business Enterprise (DBE)

General: Prior to award of the Contract, have an approved Disadvantaged Business Enterprise (DBE) Affirmative Action Program Plan filed with the Equal Opportunity Office. Update and resubmit the plan every three years. No Contract will be awarded until the Department (FDOT) approves the plan. The DBE Affirmative Action Program Plan and commitment to carry out the Plan must be incorporated into and become a part of the awarded Contract. **Effective October 1, 2011, the new DBE goal will be 8.60%. This will be in place until September 30, 2014**.

Required Contract and Subcontract DBE Assurance Language: Per 49 CFR 26.13 (b) each Contract FDOT signs with a Contractor (and each subcontract the prime contractor signs with a subcontractor) must included the following assurance: "The Contractor, sub-recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted Contracts. Failure by the Contractor to carry out these requirements is a material breach of this Contract, which may result in the termination of this Contract or such other remedy as the recipient deems appropriate."

Plan Requirements: Include the following in the DBE Affirmative Action Program Plan:

(a) A policy statement, expressing a commitment to use DBEs in all aspects of contracting to the maximum extent feasible. The policy making body must issue a policy statement signed by the chairperson, which expresses its commitment to utilize DBEs, outlines the various levels of responsibility, and states the objectives of the program. Circulate the policy statement throughout the Contractor's organization.

(b) The designation of a Liaison Officer within the Contractor's organization, as well as support staff, necessary and proper to administer the program, and a description of the authority, responsibility, and duties of the Liaison Officer and support staff. The Liaison Officer and staff are responsible for developing, managing, and implementing the program on a day-to-day basis for carrying out technical assistance activities for DBEs and for disseminating information on available business opportunities so that DBEs are provided an equitable opportunity to participate in Contracts let by the Department.

Use techniques to facilitate DBE participation in contracting activities which include, but are not limited to:

1. Soliciting price quotations and arranging a time for the review of plans, quantities, specifications, and delivery schedules, and for the preparation and presentation of quotations.

2. Providing assistance to DBEs in overcoming barriers such as the inability to obtain bonding, financing, or technical assistance.

3. Carrying out information and communication programs or workshops on contracting procedures and specific contracting opportunities in a timely manner, with such programs being bilingual where appropriate.

4. Encouraging eligible DBEs to apply for certification with the FDOT.

5. Contacting Minority Contractor Associations and city and county agencies with programs for disadvantaged individuals for assistance in recruiting and encouraging eligible DBE contractors to apply for certification with the FDOT.

DBE Records and Reports: Submit the following through the Equal Opportunity Compliance System:

1. Bid Opportunity List – within 3 business days after submission of bid proposal.
2. Anticipated DBE Participation Statement within 3 business days after the Pre-Construction Conference or contract execution, whichever occurs later.
3. Report monthly, through the Equal Opportunity Compliance System on the FDOT's Website, actual payments, (including retainage) made to DBEs for work performed with their own workforce and equipment in the area in which they are certified. Report payments made to all DBE and Minority Business Enterprise (MBE) subcontractors and DBE and MBE construction material and major suppliers. The Equal Opportunity Office will provide instruction on accessing this system. Develop a record keeping system to monitor DBE affirmative action efforts which include the following:

   (a) the procedures adopted to comply with these Specifications;

   (b) the number of subordinated Contracts on FDOT projects awarded to DBEs;

   (c) the dollar value of the Contracts awarded to DBEs;

   (d) the percentage of the dollar value of all subordinated Contracts awarded to DBEs as a percentage of the total Contract amount;

   (e) a description of the general categories of Contracts awarded to DBEs; and

   (f) the specific efforts employed to identify and award Contracts to DBEs.

   Upon request, provide the records to the FDOT for review.

All such records are required to be maintained for a period of five years following acceptance of final payment and have them available for inspection by the FDOT and the Federal Highway Administration.

Counting DBE Participation and Commercially Useful Functions: 49 CFR Part 26.55 specifies when DBE credit shall be awarded for work performed by a DBE. DBE credit can only be awarded for work actually performed by DBEs themselves for the types of work for which they are certified. On the Anticipated DBE Participation Statement only include the dollars that a DBE is expected to earn for work they perform with their own workforce and equipment. Submit a revised Anticipated DBE Participation State to reflect changes to the initial Anticipated DBE Participation Statement within 14 business days from the date of the change.

When a DBE participates in a contract, the value of the work is determined in accordance with 49 CFR Part 26.55, for example:

(a) The Department will count only the value of the work performed by the DBE toward DBE goals. The entire amount of the contract that is performed by the DBE's own forces (including the cost of supplies, equipment and materials obtained by the DBE for the contract work) will be counted ad DBE credit.

(b) The Department will count the entire amount of fees or commissions changed by the DBE firm for providing bona fide service, such as professional, technical, consultant, or managerial services or for providing bonds or insurance specifically required for the performance of a Department-assisted contract, toward DBE goals, provided that the Department determines the fees to be reasonable and not excessive as compared with fees customarily followed for similar services.

(c) When the DBE subcontracts part of the work of its contract to another firm, the Department will count the value of the subcontracted work only if the DBE's subcontractor is itself a DBE. Work that a DBE subcontracts to a non-DBE firm does not count toward DBE goals.

(d) When a DBE performs as a participant in a joint venture, the Department will count the portion of the dollar value of the contract equal to the distinct, clearly defined portion of the work the DBE performs with its own forces toward DBE goals.

(e) The Contractors shall ensure that only expenditures to DBEs that perform a commercially useful function in the work of a contract may be counted toward the voluntary DBE goal.

(f) A DBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a commercially useful function, the DBE must also be responsible, with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material, and installing (where applicable) and paying for the material itself.

(g) To determine whether a DBE is performing a commercially useful function, the Department will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the contract is commensurate with the work it is actually performing and the DBE credit claimed for its performance of the work and other relevant factors.

(h) A DBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of DBE participation.

(i) If a DBE does not perform or exercise responsibility for at least 30 percent of the total cost of its contract with its own workforce, or if the DBE subcontracts a greater portion of the work of a contract than would be expected on the basis of normal industry practice for the type of work involved, the DBE has not performed a commercially useful function.

7. On-The Job Training Requirements

As part of the Contractor's equal employment opportunity affirmative action program, training shall be provided as follows:

The Contractor shall provide on-the-job training aimed at developing full journeymen in the type(s) of trade or job classification(s) involved in the work. In the event the Contractor subcontracts a portion of the contract work, he/she shall determine how many, if any, of the trainees are to be trained by the subcontractor provided, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this Section. The Contractor shall apply the requirements of this Section to such subcontract. Where feasible, 25% of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees will be estimated on the number of calendar days of the contract, the dollar value, and the scope of work to be performed. The trainee goal will be finalized at the Post-Preconstruction Trainee Evaluation Meeting and the goal will be distributed among the work classifications based on the following criteria:

1) Determine the number of trainees on Federal Aid Contract:
   (a) No trainees will be required for contracts with a contract time allowance of less than 225 calendar days.
   (b) If the contract time allowance is 225 calendar days or more, the number of trainees shall be established in accordance with the following chart:

Estimated Contract Amount	Trainees Required
Under $1,000,000	0
Over $1,000,000 to $4,000,000	2
Over $4000,000 to $6,000,000	3
Over $6,000,000 to $12,000,000	5
Over $12,000,000 to $18,000,000	7
Over $18,000,000 to $24,000,000	9
Over $24,000,000 to $31,000,000	12
Over $31,000,000 to $37,000,000	13
Over $37,000,000 to $43,000,000	14
Over $43,000,000 to $49,000,000	15
Over $49,000,000 to $55,000,000	16
Over $55,000,000 to $62,000,000	17
Over $62,000,000 to $68,000,000	18
Over $68,000,000 to $74,000,000	19
Over $74,000,000 to $81,000,000	20
Over $81,000,000 to $87,000,000	21
Over $87,000,000 to $93,000,000	22
Over $93,000,000 to $99,000,000	23
Over $99,000,000 to $105,000,000	24
Over $105,000,000 to $112,000,000	25
Over $112,000,000 to $118,000,000	26
Over $118,000,000 to $124,000,000	27
Over $124,000,000 to $130,000,000	28
Over $130,000,000*	
*One additional trainee per $6,000,000 of estimated Construction Contract amount over $130,000,000	

Further, if the Contractor or subcontractor requests to utilize banked trainees as discussed later in this Section, a Banking Certificate will be validated at this meeting allowing credit to the Contractor for previously banked trainees. Banked credits of prime Contractors working as Subcontractors may be accepted for credit. The Contractor's Project Manager, the Construction Project Engineer and the Department's District Contract Compliance Manager will attend this meeting. Within ten days after the Post-Preconstruction Training Evaluation Meeting, the Contractor shall submit to the Department for approval an On-The Job Training Schedule indicating the number of trainees to be trained in each selected classification and the portion of the contract time during which training of each trainee is to take place. This schedule may be subject to change if the following occur:

1. When a start date on the approved On-The-Job Training Schedule has been missed by 14 or more days;
2. When there is a change(s) in previously approved classifications;
3. When replacement trainees are added due to voluntary or involuntary termination

The revised schedule will be resubmitted to and approved by the Department's District Contract Compliance Manager. The following criteria will be used in

determining whether or not the Contractor has complied with this Section as it relates to the number of trainees to be trained:

1. Full credit will be allowed for each trainee that is both enrolled and satisfactorily completes training on this Contract. Credit for trainees, over the established number for this Contract, will be carried in a "bank" for the Contractor and credit will be allowed for those surplus trainees in subsequent, applicable projects. A "banked" trainee" is described as an employee who has been trained on a project, over and above the established goal and for which the Contractor desires to preserve credit for utilization on a subsequent project.
2. Full credit will be allowed for each trainee that has been previously enrolled in the Department's approved training program on another contract and continues training in the same job classification for significant period and completes his/her training on this Contract.
3. Full credit will be allowed for each trainee who, due to the amount of work available in his/her classification, is given the greatest practical amount of training on the contract regardless of whether or not the trainee completes training.
4. Full credit will be allowed for any training position indicated in the approved On-The-Job Training Schedule, if the Contractor can demonstrate that he/she has made his/her a good faith effort to provide training in that classification.
5. No credit will be allowed for trainee whose employment by the Contractor is involuntarily terminated unless the Contractor can clearly demonstrate good cause for this action.

The Contractor shall, as far as is practical, comply with the time frames established in the approved On-The-Job Training Schedule. When this proves to be impractical, a revised schedule shall be submitted and approved as provided above.

Training and upgrading of minorities, women and economically disadvantaged persons toward journeyman status is a primary objective of this Section. Accordingly, the contractor shall make every effort to enroll minority trainees and women (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent such persons are available within a reasonable area of recruitment. If a non-minority male is enrolled into On-The-Job Training, the On-The-Job Training Notification of Personnel Action Form notifying the District Contract Compliance Manager of such action shall be accompanied by a disadvantaged certification or justification for such action acceptable to the Department's District Contract Compliance Manager. The Contractor will be given an opportunity and will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance with this Section. This training is not intended and shall not be used, to discriminate against any applicant for training, whether a minority, woman or disadvantaged person.

No employee shall be employed as a trainee in any classification in which he/she has successfully completed a training course leading to journeyman status, has been employed as a journeyman, or had had extensive experience in the classification being considered for training. The Contractor shall satisfy this requirement by including appropriate questions in the employee application or by other suitable means.

Regardless of the method used, the Contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be established at the Post-Preconstruction Trainee Evaluation Meeting and approved by the Department. Graduation to journeyman status will be based upon satisfactory completion of Proficiency Demonstration set up at the completion of training and established for the specific training classification, completion of the minimum hours in a training classification range, and the employer's satisfaction that the trainee does meet journeyman status in the classification of training. Upon reaching journeyman status, the following documentation must be forwarded to the District Contract Compliance Office:

Trainee Enrollment and Personnel Action form

Proficiency Demonstration Verification Form indicating completion of each standard established for the classification signed by representatives of both the contractor and the Department; and,

A letter stating that the trainee has sufficiently progressed in the craft and is being promoted to journeyman status.

The Department and the Contractor shall establish a program that is tied to the scope of the work in the project and the length of operations providing it is reasonably calculated to meet the equal employment opportunity obligations of the contractor and to qualify the average trainee for journeyman status in the classifications concerned, by at least, the minimum hours prescribed for a training classification. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training or with a State Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal Aid highway construction contract. Approval or acceptance of training schedule shall be obtained from the Department prior to commencing work on the classifications covered by the program.

A voluntary On-The-Job Training Program is available to a Contractor which has been awarded a state funded project. Through this program, the Contractor will have the option to train employees on state funded projects for "banked credit" as discussed previously in this provision, to be utilized on subsequent Federal Aid Projects where training is required. Those Contractors availing themselves of this opportunity to train personnel on state funded projects and bank trainee hours for credit shall comply with all training criteria set forth in this Section for Federal Aid Projects; voluntary banking may be denied by the Department if staff is not available to monitor compliance with the training criteria.

It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial type positions. Training is permissible in positions such as office engineers, estimators, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the District Contract Compliance Office. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not compromise a significant part of the overall training.

When approved in advance by the District Contract Compliance Manager, credit will be given for training of persons in excess of the number specified herein under the current contract or a Contractor will be allowed to bank trainees who have successfully completed a training program and may apply those trainees to a training requirement in subsequent project(s) upon approval of the Department's District Contract Compliance

Manager. This credit will be given even though the contractor may receive training program funds from other sources, provided such other source do not specifically prohibit the Contractor from receiving other form of compensation. Credit for offsite training indicated above may only be made to the Contractor where he does one or more of the following and the trainees are concurrently employed on a Federal Aid Project; contributes to the cost of the training, provides the instruction to the trainee and pays the trainee's wages during the offsite training period.

No credit shall be given to the Contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman for a period ample enough to allow the employee time to gain experience in the training classification or failure to continue training the employee time to gain experience in the training classifications is caused by the Contractor and evidences a lack of good faith on the part of the Contractor in meeting the requirements of this Section.

The Contractor shall compensate the trainee at no less than the laborer rate established in the Contract at the onset of training. This compensation rate will be increased to the journeyman's wage for that classification upon graduation from the training program.

The Contractor shall furnish the trainee a copy of the program he will follow in providing the training. The Contractor shall provide each trainee with a certification showing the type and length of training satisfactorily completed. The Contractor shall enroll a trainee in one training classification at a time to completion before the trainee can be enrolled in another classification on the same project.

The Contractor shall maintain records to document the actual hours each trainee is engaged in training on work being performed as a part of this Contract.

The Contractor shall submit to the District contract Compliance Manager a copy of an On-The-Job Training Notification of Personnel Action form no later than seven days after the effective date of the action when the following occurs: a trainee is transferred on the project, transferred from the project to continue training on another contract, completes training, is upgraded to journeyman status or voluntary terminates or is involuntary terminated from the project.

The Contractor shall furnish to the District Contract Compliance Manager a copy of a Monthly Time Report for each trainee. The Monthly Time Report for each month shall be submitted no later than the tenth day of the subsequent month. The Monthly Time Report shall indicate the phases and sub-phases of the number of hours devoted to each.

Highway or Bridge Carpenter Helper, Mechanic Helper, Rodman/Chainman, Timekeeper, trainees will not be approved for the On-The-Job Training Program.

Painters, Electricians and Mechanics are identified as crafts under-utilized by minorities. All training classifications except Laborers are identified as under-utilized by females.

Priority selection should also include those crafts under-utilized and/or void of minorities and/or female by the particular company's workforce.

If the Contractor does not select a training classification that has been targeted as an under-utilized craft, and those classifications can be used for the selection of training for this project, the On-The-Job Training Schedule will not be approved unless written justification for exceptions is attached.

8. Equal Employment Opportunity

Equal Employment Opportunity Policy: Accept as the operating policy, the following statement which is designed to further the provision of equal employment opportunity to all persons without regard to their age, race, color, religion, national origin, sex, or disability and to promote the full realization of equal employment opportunity through a positive continuing program:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their age, race, religion, color, national origin, sex, or disability. Such action must include: employment upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training.

Equal Employment Opportunity Officer: Designate and make known to the Department's contracting officers an equal employment opportunity officer (hereinafter referred to as the EEO Officer) who must be capable of effectively administering and promoting an active Contractor program employment opportunity and who must be assigned adequate authority and responsibility to do so.

Dissemination of Policy: All members of the Contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the Contractor's equal employment opportunity policy and contractual responsibilities.

Recruitment: When advertising for employees, include in all advertisements for employees the notation "An Equal Opportunity Employer".

Personnel Actions: Establish and administer wages, working conditions, employee benefits, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination without regard to age, race, color, religion, national origin, sex, or disability.

Follow the following procedures:

(1) Conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

(2) Periodically evaluate the spread of wages paid with each classification to determine any evidence of discriminatory wage practices.

(3) Periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action must include all affected persons.

(4) Investigate all complaints of alleged discrimination made in connection with obligations under this Contract, attempt to resolve such complaints, and take appropriate corrective action. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action must include such other persons. Upon completion of each investigation inform every complainant of all of the avenues of appeal.

Subcontracting: Use the best efforts to ensure subcontractor compliance with their equal employment opportunity policy.

Records and Reports: Keep such records as are necessary to determine compliance with the equal employment opportunity obligations. The records kept will be designed to indicate the following:

(1) The number of minority and non-minority group members employed in each work classification on the project.

(2) The progress and efforts being made in cooperation with unions to increase minority group employment opportunities (applicable only to Contractors who rely in whole or in part on unions as a source of their work force).

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority group employees as deemed appropriate to comply with their Equal Employment Opportunity Policy.

(4) The progress and efforts being made in securing the services of minority group subcontractors or subcontractors with meaningful minority group representation among their employees as deemed appropriate to comply with their Equal Employment Opportunity Policy.

All such records must be retained for a period of three years following completion of the contract work and be available at reasonable times and places for inspection by authorized representatives to the Department and the Federal Highway Administration.

Upon request, submit to the Department a report of the number of minority and non-minority group employees currently engaged in each work classification required by the Contract work.

9. Equipment Rental Rates

For any machinery or special equipment (other than small tools, including fuel and lubricant, the Contractor will receive 100% of the "Rental Rate Blue Book" for the actual time that such equipment is in operation on the work, and 50% of the "Rental Rate Blue Book" for the time the equipment is directed to standby and remain on the project site, to be calculated as indicated below. The equipment rates will be based on the latest edition (as of the date the work to be performed begins) of the "Rental Rate Blue Book for Construction Equipment" or the "Rental Rate Blue Book for Older Construction Equipment," whichever is applicable, as published by Machinery Information Division of PRIMEDIA Information, Inc. (version current at the time of bid), using all instructions and adjustments contained therein as modified below. On all projects, the Engineer will adjust the rates using regional adjustments and Rate Adjustment Tables according to the instructions in the Blue Book.

Allowable equipment rates will be established as set out below:

(1) Allowable Hourly Equipment Rate = Monthly Rate/176 x Adjustment Factors x 100%.

(2) Allowable Hourly Operating Cost = Hourly Operating Cost x 100%.

(3) Allowable Rate Per Hour = Allowable Hourly Equipment Rage + Allowable Hourly Operating Cost.

(4) Standby Rate = Allowable Hourly Equipment Rate x 50%.

The Monthly Rate is The Basic Machine Rate Plus Any Attachments. Standby rates will apply when equipment is not in operation and is directed by the Engineer to standby at the project sit when needed again to complete work and the cost of moving the equipment will exceed the accumulated standby cost. Standby rates will not apply on any day the equipment operates for eight or more hours. Standby payment will be limited to only that number of hours which, when added to the operating time for that day equals eight hours. Standby payment will not be made on days that are not normally considered work days on the project.

The Owner will allow for the cost of transporting the equipment to and from the location at which it will be used. If the equipment requires assembly or disassembly for transport, the Owner will pay for the time to perform this work at the rate for standby equipment. Equipment may include vehicles utilized only by Labor, as defined above.

10. Foreign Contractor and Supplier Restriction

This item is combined with item #2 above

11. Incentive/Disincentive Clauses

Not applicable to this contract.

12. Indian Preference On Federal-Aid Projects (Labor & Employment)

Not applicable to this contract.

13. REQUIREMENTS FOR FEDERAL JOBS – COMPLIANCE WITH FHWA 1273

The FHWA-1273 Electronic version, dated March 1994 is posted on the Department of Transportation's website at the following URL address: www.dot.state.fl.us/specificationsoffice/Implemented/URSinSpecs/files/df1273.pdf.
Take responsibility to obtain this information and comply with all requirements posted on this website through five (5) calendar days before the opening of bids. Comply with the provisions contained in FHWA-1273 and certify monthly compliance with the EEO provisions of FHWA-1273 (Section II. Nondiscrimination and Section III. Non-segregated Facilities). In addition to the requirements of FHWA-1273, Section V, No. 2 (b), include GENDER and RACE in the weekly annotated payroll records. Federal Regulations (29 CRF 3.5) states that Social Security numbers and address of employees shall not be included on submitted payrolls for contracts let after January 18, 2009. In lieu of a Social Security number, an employee identifying number must be listed. The employer may use the last four (4) digits of the Social Security number or another assigned number as the employee identifying number.

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding $10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under

this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are

applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor

will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding $2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 “Contract provisions and related matters” with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH–1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b.(1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or

will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b.(1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term “perform work with its own organization” refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
(2) the prime contractor remains responsible for the quality of the work of the leased employees;
(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost $25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1**. Instructions for Certification – First Tier Participants:**

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. **Instructions for Certification - Lower Tier Participants:**

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost $25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the

department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS ROAD CONTRACTS

This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

15. Liquidated Damages

Applicable liquidated damages are the amounts established in the following schedule:

Contract Amount	Daily Charge Per Calendar Day
$50,000 and under	$278
Over $50,000 but less than $250,000	$388
$250,000 but less than $500,000	$566
$500,000 but less than $2,500,000	$1148
$2,500,000 but less than $5,000,000	$1914
$5,000,000 but less than $10,000,000	$2514
$10,000,000 but less than $15,000,000	$3300
$15,000,000 but less than $20,000,000	$3782
$20,000,000 and over	$5684 plus 0.00005 of any amount over $20 million

For all contracts, regardless of whether the contract time is stipulated in calendar days or working days, the Engineer will count default days in calendar days. If the Contractor or, in case of his default, the surety fails to complete the work within the time stipulated in the Contract, or within such extra time that the Owner may have granted the Contractor or, in case of his default, the surety shall pay to the Owner, not as a penalty, but as liquidated damages, in the amount of $388.00 per calendar day in which work is not completed.

The Owner has the right to apply, as payment on such liquidated damages, any money the Owner owes the Contractor.

The Owner does not waive its right to liquidated damages due under the Contract by allowing the Contractor to continue and finish the work, or any part of it, after the expiration of the Contract Time including granted time extensions.

In the case of default of the Contract and the completion of the work by the Owner, the Contractor and his surety are liable for the liquidated damages under the Contract, but the Owner will not charge liquidated damages for any delay in the final completion of the Owner's performance of the work due to any unreasonable action or delay on the part of the Owner.

The Owner considers the Contract complete when the Contractor has completed all work and the Owner has accepted the work. The Owner will then release the Contractor from further obligation except as set forth in his bond.

16. State/Local Hiring Preference

The Owner certifies that this contract does not include state or local hiring preferences.

17. Method of Bidding

The OWNER certifies that this project shall be awarded to the lowest responsive and responsible bidder.

18. Owner Force Account/Cost Effective Justification

Not applicable to this contract. Manatee County will be utilizing an independent contractor to perform the scope of work

19. Patented/Proprietary Materials

The Owner certifies that neither patented or proprietary materials are required or specifically named in the specifications to be used for this project.

20. Prevailing Minimum Wage

For this contract, payment of predetermined minimum wages applies. The U.S. Department of Labor Wage Rates applicable to this Contract are listed in Wage Rate Decision Number(s) **FL120223 01/06/2012 FL223 Highway, for Manatee County,** as modified up through ten days prior to the opening of bids.

Obtain the applicable General Decision(s) (Wage Tables) through the Department's Office of Construction website and ensure that employees receive the minimum compensation applicable. Review the General Decisions for all classifications necessary to complete the project. Request additional classifications through the Engineer's office when needed.

State: Florida

Construction Type: Highway

Counties: Brevard, Collier, Hernando, Hillsborough, Lee,
Manatee, Martin, Orange, Osceola, Pasco, Pinellas, Polk,
Sarasota, Seminole and St Lucie Counties in Florida.

EXCLUDING CAPE CANAVERAL AIR FORCE STATION, PATRICK AIR FORCE BASE, KENNEDY SPLACE FLIGHT CENTER AND MELABAR RADAR SITE
HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects, & railroad construction; bascule, suspension & spandrel arch bridges; bridges designed for commercial navigation; bridges involving marine construction; & other major bridges.

IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REVIEW THE LABOR WAGE RATES APPLICABLE TO THIS CONTRACT TEN DAYS PRIOR TO THE OPENING BID DATE.

General Decision Number: FL120223 01/06/2012 FL223

Superseded General Decision Number: FL20100322

State: Florida

Construction Type: Highway

County: Manatee County in Florida.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number Publication Date
0 01/06/2012

* ELEC0915-004 12/01/2009

	Rates	Fringes
ELECTRICIAN	$ 24.16	34%+$0.22

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* SUFL2009-219 08/05/2009

	Rates	Fringes
CARPENTER	$ 15.30	2.54
CEMENT MASON/CONCRETE FINISHER	$ 12.30	0.00
HIGHWAY/PARKING LOT STRIPING: Operator (Striping Machine)	$ 11.97	2.23
HIGHWAY/PARKING LOT STRIPING: Painter	$ 13.31	0.00
IRONWORKER, REINFORCING	$ 14.50	1.37
IRONWORKER, STRUCTURAL	$ 16.75	3.88
LABORER: Asphalt Shoveler	$ 10.70	0.00
LABORER: Common or General	$ 9.00	0.00
LABORER: Flagger	$ 12.75	0.00
LABORER: Grade Checker	$ 10.50	0.55
LABORER: Landscape and Irrigation	$ 8.77	0.00
LABORER: Luteman	$ 10.32	0.00
LABORER: Mason Tender - Cement/Concrete	$ 12.00	1.80
LABORER: Pipelayer	$ 11.63	2.65

LABORER: Power Tool Operator (Hand Held Drills/Saws, Jackhammer and Power Saws	$ 11.23	1.96
OPERATOR: Asphalt Paver	$ 11.52	0.00
OPERATOR: Asphalt Plant	$ 12.20	0.00
OPERATOR: Asphalt Spreader	$ 10.76	0.00
OPERATOR: Auger	$ 19.40	0.44
OPERATOR: Backhoe Loader Combo	$ 15.33	0.97
OPERATOR: Backhoe	$ 15.50	2.28
OPERATOR: Boom	$ 16.61	0.00
OPERATOR: Bulldozer	$ 13.71	1.55
OPERATOR: Crane	$ 19.94	1.37
OPERATOR: Distributor	$ 11.47	0.00
OPERATOR: Drill	$ 13.00	1.59
OPERATOR: Grader/Blade	$ 14.32	0.00
OPERATOR: Loader	$ 12.83	1.29
OPERATOR: Mechanic	$ 16.31	1.37
OPERATOR: Milling Machine	$ 11.92	0.00
OPERATOR: Oiler	$ 11.92	1.91
OPERATOR: Paver	$ 12.42	0.86
OPERATOR: Piledriver	$ 15.59	4.00
OPERATOR: Roller	$ 11.33	0.00
OPERATOR: Scraper	$ 10.70	1.60
OPERATOR: Screed	$ 10.82	0.00
OPERATOR: Tractor	$ 12.78	0.00
OPERATOR: Trencher	$ 13.41	0.49
PAINTER: Spray and Steel	$ 16.62	0.00
TRUCK DRIVER: Distributor	$ 11.30	2.26
TRUCK DRIVER: Dump Truck	$ 10.05	0.00

TRUCK DRIVER: Lowboy Truck.....$ 14.05 0.00

TRUCK DRIVER: Material Truck....$ 12.76 9.80

TRUCK DRIVER: Tractor Haul
Truck.....$ 10.64 0.00

TRUCK DRIVER: Water Truck.....$ 10.50 0.00

TRUCK DRIVER: 10 Yard Haul
Away.....$ 12.50 0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters , PLUM, indicate the international union and the four-digit number, 0198, that follows indicates the local union number or district council number where applicable , i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rate.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

END OF GENERAL DECISION

21. Progress Payments/Estimates

Partial Payments

General: The Engineer will make partial payments on monthly estimates based on the amount of work that the Contractor completes during the month (including deliver of certain materials, as specified herein below). The Engineer will make approximate monthly payments, and the Owner will correct all partial estimates and payments in the subsequent estimates and in the final estimate and payment.

The Owner will base the amount of such payments on the total value of the work that the Contractor has performed to the date of the estimate, based on the quantities completed and the Contract prices, less payments previously made and less any retainage withheld.

Retainage will not be withheld until the percent of allowable Contract time used exceeds 75%. From that time forward, the Owner will withhold retainage of 10% of the amount due on the current estimate as retainage when the percent of allowable Contract time used exceeds the percent of Contract amount earned by more than15%.

Contract amount is defined as the original Contract amount adjusted by approved supplemental agreements. Contract time is defined as the original Contract time adjusted by approved Contract time extensions.

Retainage will be determined for each job on multiple job Contracts. The Owner will not accept Securities, Certificates of Deposit or letters of credit as a replacement for retainage. Amounts withheld will not be released until payment of the final estimate.

Unsatisfactory Payment Record: In accordance with Sections 255.05 and 337.16 of the Florida Statutes, and the rules of the Owner, the Owner may disqualify the Contractor from bidding on future Owner contracts if the Contractor's payment record in connection with contract work becomes unsatisfactory. The Owner may also disqualify the surety from issuing bonds for future Owner contracts if they similarly fail to perform under the terms of their bond.

Withholding Payment for Defective Work: If the Owner discovers any defective work or material prior to the final acceptance, or if the Owner has a reasonable doubt as to the integrity of any part of the completed work prior to final acceptance, then the Owner will not allow payment for such defective or questioned work until the Contractor has remedied the defect and removed any causes of doubt.

Withholding Payment for Failure to Comply: The Owner will withhold progress payments from the Contractor if he fails to comply with any or all of the following within 60 days after beginning work;

(a) Comply with and submit required paperwork relating to prevailing wage rate provisions, Equal Employment Opportunity, On-The-Job Training and Affirmative Action;
(b) Comply with the requirement to all necessary information, including actual payments to DBEs, all other subcontractors and major suppliers, through the Internet based Equal Opportunity Report System;
(c) Comply with or make a good faith effort to ensure employment opportunity for minorities and females in accordance with the required contract provisions for Federal Aid Construction Contracts, and
(d) Comply with or make a good faith effort to meet On-The-Job Training goals.

The Owner will withhold progress payments until the Contract has satisfied the above conditions.

Release of Retainage After Acceptance: When the Contractor has furnished the Owner with all submittals required by the Contract, such as invoices, EEO reports, materials certifications, certification of materials procured, etc., (excluding Contractor's letter of acceptance of final amount due) and the Engineer has determined that the measurement and computation of pay quantities is correct, the Owner may reduce the retainage to $1,000 plus any amount that the Owner elects to deduct for defective work.

The Owner will not allow a semifinal estimate under the provisions of the above paragraphs unless the time elapsing between (1) acceptance of the project and receipt of all test reports, invoices, etc., and (2) submission of the final estimate to the Contractor for acceptance, exceeds or is expected to exceed ten days.

The Owner may deduct from payment estimates any sums that the Contractor owes to the Owner on any account. Where more than one project or job (separate job number) is included in the Contract, the Owner will distribute the reduced retainage as provided in the first paragraph of this Subarticle to each separate project or job in the ratio that the Contract value of the work for the particular job bears to the total Contract amount.

Partial Payments for Delivery of Certain Materials:

General: The Owner will allow partial payments for new materials that will be permanently incorporated into the project and are stockpiled in approved locations in the project vicinity. Stockpile materials so that they will not be damaged by the elements and in a manner that identifies the project on which they are to be used.

The following conditions apply to all payments for stockpiled materials:

(1) There must be reasonable assurance that the stockpiled material will be incorporated into the specific project on which partial payment is made.
(2) The stockpiled material must be approved as meeting applicable specifications.
(3) The total quantity for which partial payment is made shall not exceed the estimated total quantity required to complete the project.
(4) The Contractor shall furnish the Engineer with copies of certified invoices to document the value of the materials received. The amount of the partial payment will be determined from invoices for the material up to the unit price in the Contract.
(5) Delivery charges for materials delivered to the jobsite will be included in partial payments if properly documented.
(6) Partial payments will not be made for materials which were stockpiled prior to award of the Contract for a project.

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 payments for structural steel and precast pre-stressed items will not exceed 85% of the bid price for the item. Partial payments for all other items will not exceed 75% of the bid prices of the item in which the material is to be used.
(3) 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 Owner requires suspension of paving and base construction after the initial paving operations, partial payments will be reinstated until the paving and base construction resumes.

Off Site Storage: If the conditions of the General section above are satisfied, partial payments will be allowed for materials stockpiled in approved in-state locations. Additionally, partial payments for materials stockpiled in approved out-of-state locations will be allowed if the conditions above and the following conditions are met:

(1) Furnish the Owner a Materials Bond stating the supplier guarantees to furnish the material described in the Contract to the Contractor and Owner. Under this bond, the Obligor shall be the material supplier and the Obligees shall be the Contractor and the Owner. The bond shall be in the full dollar amount of the bid price for the materials described in the contract.
(2) The following clauses must be added to the constructions contract between the Contractor and the supplier of the stockpiled materials:
"Notwithstanding anything to the contrary, <supplier> will be liable to the Contractor and the Owner should <supplier> default in the performance of this agreement."
"Notwithstanding anything to the contrary, this agreement, and the performance bond issued pursuant to this agreement, does not alter, modify, or otherwise change

the contractor's obligation to furnish the materials described in this agreement to the Owner."

(3) The agreement between the Contractor and the supplier of the stockpiled materials must include provisions that the supplier will store the materials and that such materials are the property of the Contract.

Certification of Payment to Subcontractors: The term "subcontractor," as used herein, includes persons or firms furnishing materials or equipment incorporated into the work or stockpiled for which the Owner has made partial payment and firms working under equipment-rental agreements. The contractor is required to pay all subcontractors for satisfactory performance of their Contracts before the Owner will make a further progress (partial) payment. The Contractor shall also return all retainage withheld to the subcontractors within 30 days after the subcontractor's work is satisfactorily complete, as determined by the Owner. Prior to receipt of any progress (partial) payment, the prime contractor shall certify that all Subcontractors having an interest in the Contract were paid for satisfactory performance of their Contracts and that the retainage is returned to subcontractors within 30 days after satisfactory completion of the subcontractor's work. Provide this certification in the form designated by the Owner.

Within 30 days of the Contractor's receipt of the final progress payment or any other payments thereafter, except the final payment, the Contractor shall pay all subcontractors and suppliers having an interest in the Contract for all work completed and materials furnished. The Owner will honor an exception to the above when the written notification of any such good cause to both the Owner and the affected subcontractors or suppliers within said 30 day period.

Acceptance and Final Payment Documents: Whenever the Contractor has completely performed the work provided for under the Contract and the Engineer has performed a final inspection and made final acceptance the Engineer will prepare a final estimate showing the value of the work as soon as the Engineer makes the necessary measurements and computations. The Engineer will correct all prior estimates and payments in the final estimate and payment. The Owner will pay the estimate, less any sums that the Owner may have deducted or retained under the provisions of the Contract, as soon as practicable after final acceptance of the work, along with all executed supplemental agreements received after final acceptance.

22. Prohibition Against Convict Produced Materials

Source of Supply — Convict Labor (Federal-Aid Contracts Only): Do not use materials that were produced after July 1, 1991, by convict labor for Federal-aid highway construction projects unless the prison facility has been producing convict-made materials for Federal-aid highway construction projects before July 1, 1987.

Use materials that were produced prior to July 2, 1991, by convicts on Federal-aid highway construction projects free from the restrictions placed on the use of these materials by 23 U.S.C. 114. The Department will limit the use of materials produced by convict labor for use in Federal-aid highway construction projects to:

1. materials produced by convicts on parole, supervised release, or probation from a prison or,

2. materials produced in a qualified prison facility.

The amount of such materials produced for Federal-aid highway construction during any 12-month period shall not exceed the amount produced in such facility for use in such construction during the 12-month period ending July 1, 1987.

23. Public Agencies in Competition With the Private Sector

The OWNER does not allow other Public Agencies to compete with or bid on construction projects against the private sector.

24. Publicly-Owned Equipment

The OWNER does not allow Contractors the use of publicly owned equipment.

25. Salvage Credits

The OWNER does not allow the contractor to get credits for salvageable materials.

26. Standardized Changes Conditions Contract Clauses

Differing site conditions. (i) During the progress of the work, if subsurface or latent physical conditions are encountered at the site differing materially from those indicated in the contract or if unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract, are encountered at the site, the party discovering such conditions shall promptly notify the other party in writing of the specific differing conditions before the site is disturbed and before the affected work is performed.

(ii) Upon written notification, the engineer will investigate the conditions, and if it is determined that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any work under the contract, an adjustment, excluding anticipated profits, will be made and the contract modified in writing accordingly. The engineer will notify the contractor of the determination whether or not an adjustment of the contract is warranted.

(iii) No contract adjustment which results in a benefit to the contractor will be allowed unless the contractor has provided the required written notice.

(iv) No contract adjustment will be allowed under this clause for any effects caused on unchanged work.

Suspensions of work ordered by the engineer. (i) If the performance of all or any portion of the work is suspended or delayed by the engineer in writing for an unreasonable period of time (not originally anticipated, customary, or inherent to the construction industry) and the contractor believes that additional compensation and/or contract time is due as a result of such suspension or delay, the contractor shall submit to the engineer in writing a request for adjustment within 7 calendar days of receipt of the notice to resume work. The request shall set forth the reasons and support for such

adjustment.

(ii) Upon receipt, the engineer will evaluate the contractor's request. If the engineer agrees that the cost and/or time required for the performance of the contract has increased as a result of such suspension and the suspension was caused by conditions beyond the control of and not the fault of the contractor, its suppliers, or subcontractors at any approved tier, and not caused by weather, the engineer will make an adjustment (excluding profit) and modify the contract in writing accordingly. The contractor will be notified of the engineer's determination whether or not an adjustment of the contract is warranted.

(iii) No contract adjustment will be allowed unless the contractor has submitted the request for adjustment within the time prescribed.

(iv) No contract adjustment will be allowed under this clause to the extent that performance would have been suspended or delayed by any other cause, or for which an adjustment is provided or excluded under any other term or condition of this contract.

Significant changes in the character of work. (i) The engineer reserves the right to make, in writing, at any time during the work, such changes in quantities and such alterations in the work as are necessary to satisfactorily complete the project. Such changes in quantities and alterations shall not invalidate the contract nor release the surety, and the contractor agrees to perform the work as altered.

(ii) If the alterations or changes in quantities significantly change the character of the work under the contract, whether such alterations or changes are in themselves significant changes to the character of the work or by affecting other work cause such other work to become significantly different in character, an adjustment, excluding anticipated profit, will be made to the contract. The basis for the adjustment shall be agreed upon prior to the performance of the work. If a basis cannot be agreed upon, then an adjustment will be made either for or against the contractor in such amount as the engineer may determine to be fair and equitable.

(iii) If the alterations or changes in quantities do not significantly change the character of the work to be performed under the contract, the altered work will be paid for as provided elsewhere in the contract.

(iv) The term ``significant change'' shall be construed to apply only to the following circumstances:

(A) When the character of the work as altered differs materially in kind or nature from that involved or included in the original proposed construction; or

(B) When a major item of work, as defined elsewhere in the contract, is increased in excess of 125 percent or decreased below 75 percent of the original contract quantity. Any allowance for an increase in quantity shall apply only to that portion in excess of 125 percent of original contract item quantity, or in case of a decrease below 75 percent, to the actual amount of work performed.

27. State Produced Materials (Florida or other)

The OWNER certifies that preference is not given to contractors who purchases materials from and specifically designated state.

28. State/Local Owned/Furnished/Desginated Materials

All materials required for this project shall be furnished by the contractor. Projects located on the National Highway System shall require FHWA approval for direct purchase of materials by the Owner.

29. Subcontracting

Do not sell, transfer, assign or otherwise dispose of the Contract or Contracts or any portion thereof, or of the right, title, or interest therein, without written consent of the Owner. If the Contractor chooses to sublet any portion of the Contract, the Contractor must provide a written request to sublet work on the Certification of Sublet Work form developed by the Owner for this purpose. With the Engineer's acceptance of the request, the contractor may sublet a portion of the work, but shall perform with his own organization work amounting to not less than 30% of the total Contract amount. The Certification of Sublet Work request will be deemed acceptable by the Owner, for purposes of the Owner's consent, unless the engineer notifies the Contractor within 5 business days of receipt of the Certification of Sublet Work that the Owner is not consenting to the requested subletting.

Include in the total Contract amount the cost of materials and manufactured component products, and their transportation to the project site. For the purpose of meeting this requirement the Owner will not consider off-site commercial production of materials and manufactured component products that the Contractor purchases, or their transportation to the project, as subcontracted work.

If the contractor sublets a part of a Contract item, the Owner will use only the sublet proportional cost in determining the percentage of subcontracted normal work.

Execute all agreements to sublet work in writing and include all pertinent provisions and requirements of the Contract. Upon request, furnish the Owner with a copy of the subcontract. The subletting of work does not relieve the Owner or the surety of their respective liabilities under the Contract.

The Owner recognizes a subcontractor only in the capacity of an employee or agent of the Contractor and Engineer may require the Contractor to remove the subcontractor as in the case of an employee.

30. Termination of Contract

Owner may, at any time and without cause, suspend the work or any portion thereof for a period of not more than ninety (90) days by written notice to the Contractor, which will fix the date on which work will be resumed. Contractor shall be allowed an increase in the contract price or an extension of the contract time, or both, directly attributable to any suspension if Contractor makes an approved claim thereof.

Owner may terminate the contract if Contractor commences a voluntary case under any chapter of the Bankruptcy Code or any similar action by filing a petition under any other federal or state law relating to the bankruptcy or insolvency; if a petition is filed against the Contractor under any chapter of the Bankruptcy Code or similar relief under any other federal or state law; if Contractor persistently fails to perform the work in accordance with the contract documents; if Contractor disregards laws or regulations of any public body having jurisdiction or the Engineer; or otherwise violates in any substantial way any provisions of the contract.

Owner may, after giving Contractor (and the surety, if there is one) seven (7) days written notice and to the extent permitted by laws and regulations, terminate the services of Contractor; exclude Contractor from the site and take possession of the work and of all Contractor's tools, construction equipment and machinery at the site and use the same to the full extent they could be used (without liability to Contractor for trespass or conversion); incorporate in the work all materials and equipment stored at the site or for which Owner has paid Contractor but which are stored elsewhere, and finish the work as Owner may deem expedient. In such case, Contractor shall not be entitled to receive any further payment beyond an amount equal to the value of material and equipment not incorporated in the work, but delivered and suitably stored, less the aggregate of payments previously made. If the direct and indirect costs of completion exceed the unpaid balance of the contract price, Contractor shall pay the difference to Owner.

Such costs incurred by Owner shall be verified by Owner and incorporated in a change order; but in finishing the work, Owner shall not be required to obtain the lowest figure for the work performed. Contractor's obligations to pay the difference between such costs and such unpaid balance shall survive termination of the Agreement.

If, through no act or fault of Contractor, the work is suspended for a period of more than ninety (90) days by Owner or under an order of court or other public authority, or Engineer fails to act on any application or fails to pay Contractor any sum finally determined to be due; then Contractor may, upon seven days written notice to Owner terminate the Agreement and recover from Owner payment for all work executed, any expense sustained plus reasonable termination expenses. In lieu of terminating the Agreement, if Engineer has failed to act on any application of payment or Owner has failed to make any payment as aforesaid, Contractor may upon seven (7) days written notice to Owner stop the work until payment of all amounts then due.

31. Time Extensions

Contract time may only be changed by a change order or a written amendment. Any claim for an extension or shortening of the contract time shall be based on written notice delivered by the party making the claim to the other party. Notice of the extent of the claim with supporting data shall be delivered within fifteen (15) days from detection or beginning of such occurrence and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event.

The contract time will be extended in an amount equal to time lost due to delays beyond the control of Contractor. Such delays shall include, but not be limited to, acts or neglect by Owner or others performing additional work; or to fires, floods, epidemics, abnormal weather conditions or acts of God.

All time limits stated in the contract documents are of the essence. The provision of this Article shall not exclude recovery for damages (including, but not limited to fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs) for delay by either party.

32. E- VERIFY

Vendor/Contractor:

1. Shall utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the Vendor / Contractor during the term of the contract; and

2. Shall expressly require any subcontractors performing work or providing services pursuant to the state contract to likewise utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the subcontractor during the contract term.

33. Title VI – Of the Civil Right Act of 1964 and Related Statutes

The sub-recipient or Contractor, in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 200d to 200d-7 and title 49, Code of Federal Regulations, Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally assisted programs of the Department of Transportation issued pursuant to such Act, hereby notifies all bidders that it will affirmatively insure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises as defined at 49 CFR Part 26 will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin, sex, age, disability in consideration for an award.

While performing this contract, the contractor – for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") – agrees to the following:

1. Compliance with Regulations: The contractor will comply with the Regulations on nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation ("USDOT") Title 49, Code of Federal Regulations, Part 21. The recommendations may be amended from time to time, (from here on referred to as the Regulations). They are incorporated hereby reference and made a part of this contract.

2. Nondiscrimination: In work performed during the contract, the Contractor will not discriminate on the grounds of race, color, or national origin in the selection and

holding of subcontractors. This includes obtaining materials and leases of equipment. The contractor will not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations. This includes employment practices when the contract covers a program set forth in Appendix B of the Regulations.

3. Solicitations for Subcontractors, Including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, the contractor will inform each potential subcontractor or supplier of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the rounds of race, color, or national origin. The solicitations including obtaining materials or leases of equipment.

4. Information and Reports: The contractor will provide all information and reports required by the Regulations or directives. It will also permit access to its books, records, accounts, other source of information, and its facilities that are determined by the (Recipient) or the (Name of Appropriate Administration) to be important to ensure compliance with such Regulations, orders and instructions. In some cases, another entity possesses the information required of a contractor and refuses to give the information.

Here, the contractor will confirm the lack of information with the (Recipient), or the Name of the Administration) as appropriate, and will explain its efforts to obtain the information.

5. Sanctions for Noncompliance: In the event that the contractor does not comply with the nondiscrimination provisions of this contract, the (Recipient) should enforce contract sanctions as it or the (Name of Appropriate Administration) may determine to be appropriate. Sanctions may include, but not limit to:

a. Withholding of payment to the contractor under the contract until the contractor complies, and/or

b. Cancellation, termination or suspension of the contract, in whole or in part.

6. Incorporation of Provision: The contractor should include the terms of paragraphs (1) through (6) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued modifying the Provisions. The contractor will take action with on any subcontract or procurement that the (Recipient) or the (Name of appropriate administration) directs in order to enforce provisions including sanctions for non-compliance. However, if a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier because of such direction, the contractor may ask the (Recipient) to enter into such litigation to protect the interests of the (Recipient). Also, the contractor may ask the United States to enter into such litigation to protect the interests of the United States.

THE CONTRACTOR CERTIFIES THE FOLLOWING STATEMENTS:

34. Non-Collusion Provision

The undersigned hereby certifies, to the best of his or her knowledge and belief, that on behalf of the person, firm, association, or corporation submitting the bid certifying that such person, firm association, or corporation has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action, in restraint of free competitive bidding in connection with the submitted bid. Failure to submit the executed statement as part of the bidding documents will make the bid nonresponsive and not eligible for award consideration.

35. Lobbying Certification

"The undersigned hereby certifies, to the best of her knowledge and belief, that:
(a) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence either directly or indirectly an officer or employee of any state or federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal Contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant loan, or cooperative agreement, the undersigned shall complete and submit Standard Form –L "Disclosure Form to Report Lobbying", in accordance with its instructions.

(c) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is prerequisite for making or entering into this transaction imposed by section 1352, title 31, US Code. Any persons who fail to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each failure."

36. Suspension and Debarment

"The Bidder certifies that, neither the firm nor any person associated therewith in the capacity of owner, partner, director, officer, principal, investigator, project director, manager, auditor, and/or position involving the administration of federal funds:

(a) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transaction, as defined in 49 CFR s29.110(a), by any federal department or agency;

(b) has within a three-year period preceding this certification been convicted of or had a civil judgment rendered against it for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a federal, state, or local government transaction or public contract; violation of federal or state antitrust statutes; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) is presently indicted for or otherwise criminally or civilly charged by a federal, state, or local governmental entity with commission of any of the offenses enumerated in paragraph 9(b) of this certification; and

(d) has within a three-year period preceding this certification had one or more federal, state, or local government public transactions terminated for cause or default.

The Bidder certifies that it shall not knowingly enter into any transaction with any subcontractor, material supplier or vendor who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this project by any federal agency unless authorized by the Florida Department of Transportation."

THE CONTRACTOR CERTIFIES THE ABOVE STATEMENTS:

_____

Signature

_____

Printed Name

_____

Firm Name

CONTRACT DRAWINGS

US 41 AND HABEN BLVD. IMPROVEMENTS

FOR

MANATEE COUNTY, FLORIDA

COUNTY PROJECT NUMBER: 0019901

FINANCIAL PROJECT ID: 429873-1-58-01

MANATEE COUNTY (13010)

(FEDERAL FUNDS)

SIGNALIZATION PLANS

GOVERNING STANDARDS AND SPECIFICATIONS:

FLORIDA DEPARTMENT OF TRANSPORTATION DESIGN STANDARDS, DATED 2010 AND APPLICABLE SECTIONS, ARTICLES AND SUBARTICLES OF DIVISION I AND ALL DIVISION II & III OF THE FLORIDA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, DATED 2010, INCLUDING ALL SUPPLEMENTAL SPECIFICATIONS, AS AMENDED BY CONTRACT DOCUMENTS.

APPLICABLE DESIGN STANDARDS MODIFICATIONS: 1-1-12. FOR DESIGN STANDARDS MODIFICATIONS CLICK ON "DESIGN STANDARDS" AT THE FOLLOWING WEBSITE: HTTP://WWW.DOT.STATE.FL.US/RDDESIGN/.

ATTENTION IS DIRECTED TO THE FACT THAT THESE PLANS MAY HAVE BEEN REDUCED IN SIZE BY REPRODUCTION. THIS MUST BE CONSIDERED WHEN OBTAINING SCALED DATA.

UTILITY WARNING NOTE

ABOVE GROUND AND / OR UNDERGROUND UTILITIES MAY BE IN THE AREA OF THIS PROJECT – PROCEED WITH CAUTION – THE CONTRACTOR SHALL CALL SUNSHINE STATE "ONE CALL" AT 1-800-432-4770 AND THE UTILITY OWNERS IN ADVANCE OF BEGINNING WORK, IN ACCORDANCE WITH CHAPTER 556, FLORIDA STATUTES.

SUMMARY OF REVISIONS	
DATE	DESCRIPTION

NTS

INDEX OF SIGNALIZATION PLANS

SHOP DRAWINGS TO BE SUBMITTED TO:

UPIK Y. SUWARNO, P.E.
CARDNO TBE
12481 TELECOM DRIVE
TAMPA, FLORIDA 33637
(813) 221-0048

48 HOURS BEFORE DIGGING
"CALL SUNSHINE"
1-800-432-4770

FINAL

MAY 2012

PLANS PREPARED BY:

Cardno TBE
380 Park Place Blvd., Suite 300, Clearwater, Florida 33759
www.cardnotbe.com - 727.531.3505
Certificate of Authorization No. 3843

UPIK Y. SUWARNO LICENSE No. 62995 STATE OF FLORIDA PROFESSIONAL ENGINEER

ENGINEER OF RECORD

UPIK Y. SUWARNO, PE

5-18-12

DATE

62995

FL. LICENSE NO.

DATE: 05-18-2012
SHEET: T-1

FILE: O:\JOB\61930\193-008-14\ACAD\CV19300611-1.dwg LAST SAVED: Fri, 05/18/12-8:33a PLOTTED: Fri, 05/18/12-8:34a BY: Upik.Suwarno

TABULATION OF QUANTITIES

PAY ITEM NO.	DESCRIPTION	UNIT	SHEET NUMBERS																				TOTAL THIS SHEET		GRAND TOTAL		REF. SHEET
			T-5		T-10		T-11																				
			PLAN	FINAL	PLAN	FINAL	PLAN	FINAL	PLAN	FINAL	PLAN	FINAL	PLAN	FINAL	PLAN	FINAL	PLAN	FINAL	PLAN	FINAL	PLAN	FINAL	PLAN	FINAL	PLAN	FINAL	
101-1	MOBILIZATION	LS																					1		1		
102-1	MAINTENANCE OF TRAFFIC	LS																					1		1		
102-14	TRAFFIC CONTROL OFFICER	MH																					40		40		
110-4	REMOVAL OF EXISTING CONCRETE PAVEMENT	SY					28.2																28.2		28.2		
120-6	EMBANKMENT	CY					55																55		55		
285-712	OPTIONAL BASE, BASE GROUP 12	SY					22.1																22.1		22.1		
334-1-14	SUPERPAVE ASPHALTIC CONCRETE, TRAFFIC D	TN					4.86																4.86		4.86		
337-7-5	ASPHALTIC CONCRETE FRICTION COURSE (FC-5)(3/4")	TN					0.95																0.95		0.95		
520-1-10	CONCRETE CURB & GUTTER, TYPE F	LF					125																125		125		
520-5-12	CONCRETE SEPARATOR (TYPE I) (6' WIDE)	LF					6																6		6		
522-2	CONCRETE SIDEWALK, 6" THICK	SY					185																185		185		
555-1-3	DIRECTIONAL BORE (12" TO <18") (2" HDPE)	LF	265																				265		265		
630-1-11	CONDUIT (F&I) (ABOVEGROUND) (2")	LF	40																				40		40		
630-1-12	CONDUIT (F&I) (UNDERGROUND) (2")	LF	553																				553		553		
632-7-1	CABLE (SIGNAL) (F&I)	PI	1																				1		1		
635-1-11	PULL & JUNCTION BOXES (F&I) (PULL BOX)	EA	15																				15		15		
639-1-22	ELECTRICAL POWER SERVICE (UNDERGROUND)	AS	1																				1		1		
	(PURCHASED BY CONTRACTOR FROM POWER CO)																										
639-2-1	ELECTRICAL SERVICE WIRE (F&I)	LF	1110																				1110		1110		
639-3-11	ELECTRICAL SERVICE DISCONNECT, F&I, POLE MOUNT	EA	1																				1		1		
641-2-12	PRESTRESSED CONCRETE POLE (F&I)		2																				2		2		
	(TYPE P-11 SERVICE POLE) (12FT)																										
646-1-11	ALUMINUM SIGNALS POLE (F&I) (PEDESTAL)	EA	4																				4		4		
649-31-203	STEEL MAST ARM ASSEMBLY(F&I)(130 MPH)(56')	EA	1																				1		1		
649-31-999	STEEL MAST ARM ASSEMBLY(F&I)(CUSTOM)	EA	1																				1		1		
650-1-311	TRAFFIC SIGNAL (F&I) (3-SECT.) (1-WAY) (LED)	AS	5																				5		5		
650-1-511	TRAFFIC SIGNAL (F&I) (5-SECT.) (1-WAY) (LED)	AS	3																				3		3		
653-191	PEDESTRIAN SIGNAL (F&I) (LED COUNTDOWN) (1 WAY)	AS	4																				4		4		
663-74-15	VEHICLE DETECTOR ASSEMBLIES (F&I) (VIDEO)	EA	3																				3		3		
665-13	PEDESTRIAN DETECTOR (F&I) (WITH SIGN ONLY)	EA	4																				4		4		
670-5-310	TRAFFIC CONTROLLER ASSEMBLY (F&I) (NEMA)	AS	1																				1		1		
690-10	REMOVE SIGNAL HEAD ASSEMBLY	EA	6																				6		6		
690-34-1	REMOVE POLE (DEEP) (DIRECT BURIAL)	EA	4																				4		4		
690-50	REMOVE CONTROLLER ASSEMBLY	EA	1																				1		1		
690-60	REMOVE VEHICLE DETECTOR ASSEMBLY	EA	7																				7		7		
690-80	REMOVE SPAN WIRE ASSEMBLY	EA	3																				3		3		
690-90	REMOVE CONDUIT & CABLING	PI	1																				1		1		
690-100	REMOVE MISCELLANEOUS SIGNAL EQUIPMENT	PI	1																				1		1		
699-1-1	INTERNALLY ILLUMINATED SIGN (F&I)(EDGE LIT LED)	EA	3																				3		3		
700-20-11	SINGLE POST SIGN,F&I,LESS THAN 12 SF	AS			4																		4		4		
700-48-18	SIGN PANEL (F&I)	EA	4																				4		4		
700-48-60	SIGN PANEL (REMOVE)	AS			1																		1		1		
705-11-3	DELINEATOR,FLEXIBLE HIGH VISIBILITY(MEDIAN)(Y/G	EA			2																		2		2		
710-11-290	PAINT, STANDARD YELLOW, ISLAND NOSE	SF			20																		20		20		
711-11-123	THERMOPLASTIC PAVEMENT MARKING (12" WHITE)	LF			362																		362		362		
711-11-125	THERMOPLASTIC PAVEMENT MARKING (24" WHITE)	LF			125																		125		125		
711-11-151	THERMOPLASTIC PAVEMENT MARKING (6" WHITE SKIP)	LF			30																		30		30		
711-11-170	THERMOPLASTIC STANDARD, WHITE, MESSAGE	EA			4																		4		4		
711-11-251	THERMOPLASTIC PAVEMENT MARKING (6" YELLOW SKIP)	LF			100																		100		100		
711-17	THERMOPLASTIC (REMOVE)	SF			310																		310		310		
715-2-11	LIGHTING CONDUIT (F&I) (UNDERGROUND)	LF	110																				110		110		
715-11-111	LUMINAIRE(F&I)(ROADWAY)(COBRA HEAD)	EA	1																				1		1		
715-14-11	LIGHTING PULL BOX (F&I) (ROADSIDE)	EA	3																				3		3		
783-2-31	ITS FIBER OPTIC (INSTALL) (SPLICE)	EA	4																				4		4		
783-4-112	ITS CONDUIT (F&I) (UNDERGROUND)	LF	70																				70		70		
783-8-1	ITS MULTI CONDUCTOR COMMUNICATION CABLE	LF	1038																				1038		1038		

NO.	DESCRIPTION	BY	DATE

MANATEE COUNTY

US 41 & HABEN BOULEVARD IMPROVEMENTS

Cardno TBE
12481 Telecom Drive, Tampa, FL 33637
www.cardnotbe.com - 813.221.0048
Certificate of Authorization No. 3843

UPIK Y. SUWARNO LICENSE No. 62995 STATE OF FLORIDA PROFESSIONAL ENGINEER

5-18-12

UPIK Y. SUWARNO, PE
LIC. NO. 62995 DATE

DESIGNED UYS
DRAWN UYS
CHECKED DJA
APPROVED

SIGNALIZATION TABULATION OF QUANTITIES

PROJECT NO: 00193-008-014
DATE: 05-18-2012
SHEET NO: T-2

FILE: O:\JOB\0193\00193-008-14\ACADIS1_TABOSG01.dwg LAST SAVED: Thu, 05/17/12-5:26p PLOTTED: Fri, 05/18/12-8:36a BY: Upik.Suwarno

GENERAL NOTES

1. AT LEAST TWO (2) FULL BUSINESS DAYS PRIOR TO BEGINNING THE TRAFFIC SIGNAL INSTALLATION, PERMITTEE TO CONTACT THE ENGINEER AND THE TRAFFIC SIGNAL INSPECTOR/LIAISON:

   MR. CARLOS CABRERA — PH: 941-359-7317
   FLORIDA DEPARTMENT OF TRANSPORTATION
   SARASOTA OPERATIONS CENTER
   1840 61ST STREET
   SARASOTA, FLORIDA 34243

2. ONE WEEK PRIOR TO THE BEGINNING OF THE TRAFFIC SIGNAL INSTALLATION, LOOP CUTTING, OR TURN ON OF A NEW SIGNAL, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN CONJUNCTION WITH:

   MANATEE COUNTY
   PUBLIC WORKS DEPARTMENT
   PROJECT MANAGEMENT DIVISION
   1022 26TH AVENUE EAST
   BRADENTON, FLORIDA 34208
   PHONE: 941-708-7510

   MANATEE COUNTY
   PUBLIC WORKS DEPARTMENT
   TRAFFIC ENGINEERING DIVISION
   2101 47TH TERRACE EAST
   BRADENTON, FLORIDA 34203
   PHONE: 941-749-3502

3. TWO (2) FULL BUSINESS DAYS PRIOR TO BEGINNING CONSTRUCTION, CONTACT THE ENGINEER IN CONJUNCTION WITH THE F.D.O.T. OPERATIONS OPERATIONS CENTER, TELEPHONE 941-359-7317.

4. WHEN CONSTRUCTION IS COMPLETE, PROVIDE THREE (3) SETS OF "AS-BUILT" PLANS TO THE ENGINEER, IN CONJUNCTION WITH:

   MANATEE COUNTY
   TRAFFIC ENGINEERING DIVISION
   MICHAEL O'REILLY
   2101 47TH TERRACE EAST
   BRADENTON, FL 34203

   THE RECORD DRAWINGS SHALL BE RECEIVED 48 HOURS PRIOR TO SCHEDULING THE FINAL INSPECTION.

5. MAINTAINING AGENCY:

   MANATEE COUNTY
   TRAFFIC OPERATIONS DIVISION
   2404 12TH STREET COURT EAST
   BRADENTON, FLORIDA 34208

6. TRAFFIC SIGNAL ACCEPTANCE INSPECTIONS SHALL BE COORDINATED WITH THE ENGINEER, IN CONJUNCTION WITH THE F.D.O.T. TRAFFIC SIGNAL INSPECTOR/LIAISON A MINIMUM OF TWO FULL BUSINESS DAYS NOTICE.

   RESULTS OF FIELD TESTS SHALL BE MADE AVAILABLE TO THE PROJECT ENGINEER IN WRITTEN FORM. A QUALIFIED CONTRACTOR'S REPRESENTATIVE SHALL BE PRESENT AT THE CONDITIONAL ACCEPTANCE INSPECTION OF THE CONTROLLER ASSEMBLY. THE QUALIFICATIONS OF THE REPRESENTATIVE SHALL INCLUDE:

   A) COMPLETE FAMILIARITY WITH ALL SYSTEM ELEMENTS INCLUDING CONTROLLERS, COORDINATING UNITS, SYSTEM CLOCKS AND SYSTEM COMMUNICATIONS ELEMENTS. THE REPRESENTATIVE SHALL BE QUALIFIED TO INPUT AND RECALL ALL CONTROLLER AND SYSTEM TIMING FUNCTIONS.

7. WHEN CONSTRUCTION DEVIATES FROM APPROVED PERMIT PLANS INCLUDING POSSIBLE EASEMENTS, PERMITTEE TO FURNISH THE THE ENGINEER, IN CONJUNCTION WITH THE DEPARTMENT OF TRANSPORTATION ONE SET OF "AS BUILT" PLANS FOR FDOT RECORDS:

   DEPARTMENT OF TRANSPORTATION
   P.O. BOX 1249
   (STREET ADDRESS: 801 N. BROADWAY AVE)
   BARTOW, FLORIDA 33831
   ATTENTION: TRAFFIC OPERATIONS - SIGNAL DESIGN

8. THE CONTRACTOR IS TO COORDINATE WITH THE POWER COMPANY PERFORMING ALL NECESSARY WORK UNDER THEIR POWER LINES, SUCH AS THE INSTALLATION OF SPAN WIRE, SIGNAL CABLE, FIBERGLASS INSULATORS AND SIGNAL POLES. CONTRACTOR SHALL NOTIFY THE POWER COMPANY AT LEAST THREE (3) FULL BUSINESS DAYS PRIOR TO INSTALLATION OF THIS EQUIPMENT.

9. THE CONTRACTOR IS RESPONSIBLE TO CONTACT MANATEE COUNTY AT 941-749-3502, FOR THE ASSIGNMENT OF THE PHYSICAL ADDRESS ONCE THE SERVICE DROP LOCATION HAS BEEN ESTABLISHED.

10. EXTREME CARE TO BE TAKEN TO INSURE THAT ALL SIGNAL EQUIPMENT IS INSTALLED AS SHOWN IN PLANS WITHIN EXISTING RIGHT-OF-WAY.

11. THE ENGINEER IN CONJUNCTION WITH THE MAINTAINING AGENCY TO COORDINATE UTILITY RELOCATION IF NECESSARY.

12. IN THE EVENT R/W OR IRRESOLVABLE UTILITY CONFLICTS PROHIBIT POLE PLACEMENT ACCORDING TO SECTION 2.11.4, PERMITTEE SHALL CONTACT TRAFFIC OPERATIONS ENGINEER AND/OR DISTRICT DESIGN ENGINEER TO OBTAIN A DESIGN VARIATION.

13. FOR REMOVED SIGNAL EQUIPMENT CLAIMED BY MAINTAINING AGENCY CONTACT:

   MANATEE COUNTY
   TRAFFIC OPERATIONS DIVISION
   2404 12TH STREET COURT EAST
   BRADENTON, FLORIDA 34208

14. WORK ZONE TRAFFIC CONTROL

   A. THE CRITERIA AS OUTLINED IN THE "MINIMUM SPECIFICATIONS FOR TRAFFIC CONTROL SIGNALS AND DEVICES", SHALL BE ADHERED TO FOR SIGNAL WORK. MAINTAIN TRAFFIC BY USE OF TRAFFIC CONTROL INDEXES IN THE F.D.O.T. ROADWAY TRAFFIC DESIGN STANDARDS BOOKLET DATED JANUARY 2010. NO LANE CLOSURES WILL BE ALLOWED BETWEEN 6:00 A.M. AND 9:00 P.M.

   B. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING SAFE AND EFFICIENT OPERATION DURING SIGNAL INSTALLATION.

15. THE LOCATION OF UTILITIES SHOWN ON THE PLANS ARE BASED ON LIMITED INVESTIGATION TECHNIQUES AND SHOULD BE CONSIDERED APPROXIMATE ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATIONS OF ALL UTILITIES.

16. EXISTING UTILITIES ARE TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.

17. THE CONTRACTOR TO NOTIFY UTILITY OWNERS OF ANY EXCAVATION OR DEMOLITION ACTIVITY THROUGH SUNSHINE ONE CALL OF FLORIDA INC. (1-800-432-4770) AND SHALL ALSO NOTIFY THOSE UTILITY OWNERS/ AGENCIES LISTED WITHIN OR IMPACTED BY THESE PLANS, NOT LESS THAN TWO (2) FULL BUSINESS DAYS IN ADVANCE OF BEGINNING CONSTRUCTION ON THE JOB SITE.

18. THE CONTRACTOR SHALL HAND DIG THE FIRST 48 INCHES (4 FEET) OF THE HOLE FOR THE POLE FOUNDATION OR CONDUIT RUN WHERE UTILITIES ARE IN CLOSE PROXIMITY.

19. IT SHOULD BE NOTED THAT NO TEST BORINGS WERE MADE WHERE CONDUIT RUNS ARE TO BE INSTALLED BY JACKING OR BORING.

20. THE TYPE OF EQUIPMENT USED IN THE INSTALLATION OF MAST ARMS/ FOUNDATIONS, OVERHEAD CANTILEVER SIGNS/ FOUNDATIONS, AND THE MOVEMENT/INSTALLATION OF STRAIN POLES SHALL MEET THE FOLLOWING REQUIREMENTS: 1) OVERHEAD LINES SHALL STAY IN PLACE BOTH VERTICALLY AND HORIZONTALLY

21. THE CONTRACTOR SHALL COORDINATE WITH THE ENGINEER IN CONJUNCTION WITH MANATEE COUNTY TRAFFIC ENGINEERING DIVISION ABOUT THE EXISTING MANATEE ATMS THAT INCLUDES THIS INTERSECTION PRIOR TO START OF CONSTRUCTION AND ORDERING OF MATERIAL.

22. THE CONTRACTOR SHALL FIELD VERIFY ALL CRITICAL ELEVATIONS PRIOR TO ORDERING MAST ARMS.

23. DETECTION MUST BE MAINTAINED FOR PEDESTRIANS AND THE SIDE STREETS FOR THE LIFE OF THE PROJECT.

24. UNLESS OTHERWISE NOTED, ALL REMOVED EQUIPMENT SHALL BE DELIVERED TO MANATEE COUNTY SIGNAL SHOP IN EXISTING CONDITION, EXCEPT FOR POLES AND SPAN WIRES WHICH SHALL BE DISPOSED OF BY THE CONTRACTOR IN AREAS PROVIDED BY COUNTY. COST OF DELIVERY SHALL BE INCLUDED IN THE REMOVAL PAY ITEM FOR THE EQUIPMENT TYPE TO BE REMOVED.

25. THE CONTRACTOR SHALL COORDINATE WITH MANATEE COUNTY FOR THE ACCEPTABLE AND COMPATIBLE VIDEO DETECTION SYSTEM TO INSTALL PRIOR TO SHOP DRAWING SUBMITTAL. INSTALL THE ITERIS VANTAGE RZ4 ADVANCED WIDE DYNAMIC RANGE COLOR CAMERA MOUNTED ON PELCO MAST ARM CAMERA BRACKET. INSTALL THE DETECTION SYSTEM IN STRICT ACCORDANCE WITH THE VIDEO DETECTION SYSTEM'S INSTALLATION MANUALS. THE CONTRACTOR SHALL ONLY USE MANUFACTURER APPROVED CABLING CONNECTORS AND COMPONENTS FOR THE VIDEO DETECTION SYSTEM. THE SIGNAL CONTRACTOR SHALL CONSULT WITH THE TECHNICAL REPRESENTATIVES PRIOR TO INSTALLATION. THE CONTRACTOR SHALL REQUEST A SYSTEM CRITIQUE FROM THE VIDEO DETECTION EQUIPMENT SUPPLY MANUFACTURER WHEN INSTALLATION IS COMPLETE. THE RESULTS OF THE SYSTEM CRITIQUE SHALL BE PROVIDED IN WRITING TO MANATEE COUNTY TRAFFIC ENGINEERING DIVISION PRIOR TO SCHEDULING THE FINAL INSPECTION.

CONDUIT LEGEND
LV = SIGNAL LOW VOLTAGE CONDUIT (INCLUDES VID CABLE)
HV = SIGNAL HIGH VOLTAGE CONDUIT
SP = SPARE CONDUIT
PS = POWER SOURCE
LIGHT = LIGHTING CONDUIT

NO.	DESCRIPTION	BY	DATE

MANATEE COUNTY

US 41 & HABEN BOULEVARD IMPROVEMENTS

Cardno TBE
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Certificate of Authorization No. 3843

UPIK Y. SUWARNO LICENSE No. 62995 STATE OF FLORIDA PROFESSIONAL ENGINEER
5-18-12
UPIK Y. SUWARNO
LICENSE NO. 62995 STATE OF FLORIDA

DESIGNED	UYS
DRAWN	UYS
CHECKED	DJA
APPROVED	

SIGNALIZATION GENERAL NOTES

PROJECT NO:	00193-008-014
DATE:	05-18-2012
SHEET NO:	T-3

FILE: O:\JOB\193\00193-008-14\ACAD\S2_GN193000911_ISIG.dwg LAST SAVED: Wed, 05/16/12-10:55a PLOTTED: Fri, 05/18/12-8:37a BY: Upik.Suwarno

PAY ITEM FOOTNOTES :

1. 555-1-3:
USE A MINIMUM OF 3" DIAMETER HDPE CONDUIT FOR FIBER OPTIC INTERCONNECT CABLE.
USE A MINIMUM 2" DIAMETER HDPE CONDUIT FOR ALL SIGNAL, PEDESTRIAN, AND DETECTION FUNCTIONS.

2. 630-1-11: INCLUDES THE COST OF WEATHERHEAD.

3. 630-1-12:
USE A MINIMUM OF 3" DIAMETER PVC CONDUIT FOR FIBER OPTIC INTERCONNECT CABLE.
USE A MINIMUM 2" DIAMETER SCHEDULE 40 PVC CONDUIT FOR ALL SIGNAL, PEDESTRIAN, AND DETECTION FUNCTIONS.

4. 632-7-1:
VERIFY THE COLOR CODE OF SIGNAL CABLE WITH THE MAINTAINING AGENCY PRIOR TO WIRING INTERSECTION. USE A MINIMUM OF 7 CONDUCTOR SIGNAL CABLE FOR SIGNAL HEADS AND PEDESTRIAN HEADS.

CONTACT MAINTAINING AGENCY FOR CABLING DESIGN AND CABLING CONSTRUCTION OPTIONS PRIOR TO DESIGNING AND CONSTRUCTING YOUR CABLING PLAN.

5. 635-1-11:
ALL PULL BOXES AND LIDS SHALL BE OF TRAFFIC BEARING, POLYMER CONCRETE CONSTRUCTION.

PULL BOXES ARE TO BE PLACED BEHIND CURB AND GUTTER. IF THERE IS NO CURB AND GUTTER, PULL BOXES SHALL BE PLACED A MINIMUM OF 7 FEET FROM EDGE OF THE PAVEMENT. THE TOP OF THE LID SHALL HAVE THE FOLLOWING IDENTIFICATION PERMANENTLY CAST INTO THEIR TOP SURFACE IN STAMPED RAISED LETTERS, ACCORDING TO THE APPLICATION FOR WHICH IT IS TO BE USED:
"MANATEE COUNTY TRAFFIC SIGNAL" FOR SIGNALIZED INTERSECTION APPLICATIONS
"MANATEE COUNTY FIBER OPTIC" FOR FIBER OPTIC CABLE ITS APPLICATIONS
"ELECTRICAL" FOR OTHER ELECTRICAL APPLICATIONS
"LIGHTING" FOR LIGHTING APPLICATIONS
"TRAFFIC MONITORING" FOR TRAFFIC MONITORING APPLICATIONS.

USE POLYMER CONCRETE PULL BOX WITH A POLYMER CONCRETE COVER MARKED "MANATEE COUNTY FIBER OPTIC" FOR FIBER COMMUNICATION AND/OR INTERCONNECT CABLE.
USE 24" X 36" PULL BOXES PLACED A MINIMUM OF 800' APART.
APPROPRIATELY SIZE EACH PULL BOX SO THE FIBER COMMUNICATION AND/OR INTERCONNECT CABLE DOES NOT EXCEED MANUFACTURER'S RECOMMENDED BENDING RADIUS.

6. 639-1-22 AND 639-3-11:
THE BREAKERS SHALL BE CLEARLY MARKED. THE ELECTRICAL SERVICE DISCONNECT IS 100 AMP, COMPRISING OF A SIX (6) CIRCUIT DISCONNECT BOX WITH FIVE CIRCUIT BREAKERS - ONE 40 AMP/120 VOLT FOR CONTROLLER, ONE 15 AMP FOR INTERNALLY ILLUMINATED STREET NAME SIGNS, ONE 15 AMP/120 VOLT FOR LIGHTING LUMINAIRE, ONE 30 AMP FOR CCTV CABINET, AND ONE 15 AMP/120 VOLT FOR FUTURE USE.

USE ALUMINUM RIGID ABOVE GROUND CONDUIT FOR ELECTRICAL POWER SERVICE.

THIS PAY ITEM INCLUDES PHOTO CELL FOR THE INTERNALLY ILLUMINATED SIGNS AND LUMINAIRE. PROVIDE A SEPARATE CIRCUIT FROM THE MAIN DISCONNECT TO SUPPLY POWER TO THE LIGHTING AND LIGHTING CONTROL EQUIPMENT IN THE SIGNAL CABINET. LIGHTING LOAD SHALL BE WIRED SEPARATELY FROM ANY EMERGENCY POWER BACK-UP SYSTEMS.

7. 639-2-1:
PAYMENT SHALL BE BASED ON THE LINEAR FOOT OF A SINGLE CONDUCTOR.
USE A BONDING WIRE FROM ELECTRICAL SERVICE POINT TO CONTROLLER.

8. 649-31-203 AND 649-31-999:
USE THREE 2" AND ONE 3/4" CONDUITS STUBBED OUT THROUGH THE MAST ARM POLE FOUNDATION AND TEMPORARILY SEAL.

9. 650-1-311 & 650-1-511:
USE SIGNAL HEAD SUPPORTING TUBE THAT IS CAPABLE OF ADJUSTING VERTICALLY A MINIMUM OF 1.5 FEET.
DO NOT USE PLASTIC GARBAGE BAGS AS A COVERING FOR CONCEALING SIGNAL HEADS.
INCLUDES THE COST OF TUNNEL VISORS AND BACK PLATES. USE LOUVERED ALUMINUM SIGNAL HEAD BACK PLATES WITH A 2 INCH YELLOW REFLECTORIZED (TYPE III REFLECTIVITY) OUTER EDGE BORDER.

10. 653-191:
PEDESTRIAN SIGNAL HEADS TO BE 16" INTERNATIONAL SYMBOL, FDOT LED COUNTDOWN TYPE.

11. 646-1-11:
USE BREAKAWAY ALUMINUM SQUARE BASE ASSEMBLIES WITH ALUMINUM DOORS FOR PEDESTRIAN PEDESTALS. INSIDE DIAMETER OF PEDESTALS SHALL BE FOUR INCHES (4").
USE LOCKING COLLARS WHEN MOUNTING PEDESTRIAN SIGNAL HEADS TO PEDESTRIAN PEDESTALS. USE LOCKING COLLARS WHEN MOUNTING ALUMINUM PEDESTRIAN POLES TO PEDESTRIAN PEDESTAL BASES.

12. 663-74-15:
INSTALL SYSTEM IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

USE A 72" LONG GUSSET TUBE FOR VIDEO DETECTION CAMERA ATTACHMENT BRACKET. VIDEO DETECTION TO BE COMPATIBLE WITH MAINTAINING AGENCY'S EXISTING VIDEO DETECTION SYSTEM. THE CAMERA SHALL BE ITERIS VANTAGE R24 ADVANCED WIDE DYNAMIC RANGE COLOR CAMERA OR EQUIPMENT.

SEE PLAN SHEET FOR NUMBER OF VIDEO CAMERAS INCLUDED IN THE VIDEO DETECTION ASSEMBLY.

13. 665-13:
USE PEDESTRIAN BUTTON SIGNAL FTP-68B-06. STREET NAME SHALL BE IN ACCORDANCE WITH THE STREET NAMES SHOWN ON THE SIGNALIZATION PLAN SHEETS.

14. 670-5-310:
TOP OF CONTROLLER BASE TO BE SAME ELEVATION AS CROWN OF ROADWAY OR GREATER.

THIS ITEM SHALL INCLUDE THE COST OF INSTALLING A NEW FOUNDATION WHERE THE EXISTING CONTROLLER CABINET IS TO BE RELOCATED. INCLUDES THE COST OF RELOCATION OF UPS WITH THE CONTROLLER CABINET.

CONTRACTOR SHALL REUSE ALL EXISTING COMPONENTS WITHIN THE EXISTING CONTROLLER ASSEMBLY INCLUDING MVDS, CCTV, AND RELATED EQUIPMENT. CONTRACTOR SHALL RECONNECT ALL SYSTEM COMPONENTS HOUSED IN THE CONTROLLER CABINET AND ESTABLISH ALL SYSTEM FUNCTION/COMMUNICATION FOR MVDS & CCTV AND COORDINATE WITH MANATEE COUNTY.

THIS ITEM SHALL INCLUDE THE INSTALLATION OF CONCRETE BASES FOR THE CONTROLLER ASSEMBLY AND FOR MOUNTING OF AN EMERGENCY GENERATOR CABINET. THE CONTROLLER ASSEMBLY FOUNDATION SHALL HAVE A MINIMUM OF (4) - 2" CONDUIT SPARES. TWO OF THE SPARES SHALL BE TERMINATED IN THE NEAREST FIBER OPTIC PULL BOX AND FITTED WITH A WEATHERPROOF CAP. THE OTHER TWO SPARES SHALL BE TERMINATED IN THE SIGNAL CABLE AND LOW VOLTAGE PULL BOXES.

THE EMERGENCY GENERATOR CABINET (EGC) BASE SHALL HAVE DIMENSIONS OF 48" X 36" FOR CABINET MOUNTING WITH A FDOT STANDARD TECHNICIAN PAD OR STEPS. IT SHALL BE LOCATED ADJACENT TO THE CONTROLLER BASE WITH (2) - 2" CONDUITS AND (1) - 1/4" CONDUITS INSTALLED DIRECTLY TO THE CONTROLLER BASE. MANATEE COUNTY WILL FURNISH THE GENERATOR CABINET TO THE CONTRACTOR.

THE CONTRACTOR SHALL COORDINATE WITH MANATEE COUNTY TO PICK UP AND INSTALL THE GENERATOR CABINET ON THE NEW FOUNDATION.

ALL COSTS OF LABOR, CONCRETE AND OTHER MATERIALS FOR THE CONTROLLER ASSEMBLY AND EGC BASES, TECHNICIAN PADS, STEPS AS REQUIRED, AND INSTALLATION OF THE GENERATOR CABINET ARE INCLUDED IN THIS ITEM. THE CONTROLLER AND EGC BASE SHALL BE AT LEAST 2' HIGH OR THE SAME ELEVATION AS THE CROWN OF THE ROADWAY, WHICHEVER IS GREATER. THE MAXIMUM DISTANCE FROM THE TECHNICIAN PAD OR STEP TO THE FOUNDATION TOP IS 24". THE CABINET DOORS SHALL OPEN TOWARDS OR PARALLEL TO THE RIGHT-OF-WAY LINE AND AWAY FROM TRAFFIC.

15. 699-1-2:
USE LED ILLUMINATED STREET NAME SIGNS.
INSTALL PHOTOELECTRIC CELL FOR INTERNALLY ILLUMINATED STREET NAME SIGNS ON TRAFFIC SIGNAL ELECTRIC SERVICE DISCONNECT AT THE POWER SERVICE.

ALL INTERNALLY ILLUMINATED STREET NAME SIGNS TO BE MOUNTED RIGIDLY ON MAST ARM.

16. 715-11-111:
THE CONTRACTOR SHALL FURNISH AND INSTALL ALL CONDUCTORS AS NECESSARY FROM THE PHOTOCELL TO THE LUMINAIRES AS PART OF THIS PAY ITEM. INSIDE THE MAST ARM HAND HOLE THE CONTRACTOR SHALL INSTALL A WEATHER-PROOF FUSE HOLDER.

THE CONTRACTOR SHALL INSTALL THE LUMINAIRE ON THE MAST ARM AS SHOWN IN THE PLANS. THE COBRA HEAD TYPE LUMINAIRE SHALL BE A 400 W HPS GE M-400A POWR/DOOR WITH CUT OFF OPTICS, TYPE III DISTRIBUTION AUTO REGULATED TYPE BALLAST WIRED FOR 120 VOLT OPERATION AND ONE (1) PHOTO ELECTRIC CELL TO BE INSTALLED ON SERVICE DISCONNECT AND A PHOTOMETRIC CURVE NUMBER GE451002 OR EQUIVALENT.

CONDUIT LEGEND
LV = SIGNAL LOW VOLTAGE CONDUIT (INCLUDES VID CABLE)
HV = SIGNAL HIGH VOLTAGE CONDUIT
SP = SPARE CONDUIT
PS = POWER SOURCE
LIGHT = LIGHTING CONDUIT

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UPIK Y. SUWARNO LICENSE No. 62995 STATE OF FLORIDA PROFESSIONAL ENGINEER

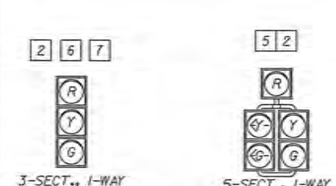
UPIK C. SUWARNO, PE
LIC. NO. 62995
DATE

DESIGNED	UYS
DRAWN	UYS
CHK.	DJA
APPROVED	

SIGNALIZATION PAY ITEM NOTES

PROJECT NO: 00193-008-014
DATE: 05-16-2012
SHEET NO: T-4

FILE: G:\JOB\01930\00193-008-HWACAD\S2_GN193000811_ISIG.dwg LAST SAVED: Fri, 05/18/12-8:37a PLOTTED: Fri, 05/18/12-8:38a BY: Ujak.Suwarno



3-SECT., 1-WAY | 650-1-311 | 5 AS

5-SECT., 1-WAY | 650-1-511 | 1 AS

5-SECT., 1-WAY | 650-1-511 | 2 AS

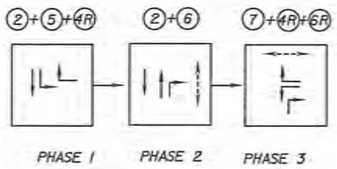
PED. SIGNAL COUNT-DOWN 1-SECT., 1-WAY | 653-191 | 4 AS

NOTE: USE LOUVERED ALUMINUM SIGNAL HEAD BACK PLATES WITH A 2" YELLOW REFLECTORIZED (TYPE III REFLECTIVITY) OUTER EDGE BORDER.

CONTROLLER NOTES:

1. MAJOR STREET IS US 41/301. (MOVEMENTS 2, 5 AND 6). MINOR STREET IS HABEN BLVD. (MOVEMENTS 7 AND 4).
2. THE CONTROLLER CABINET SHALL BE WIRED FOR SOP 10. THE CONTROLLER SHALL OPERATE AS INDICATED.
3. FLASHING OPERATION IS YELLOW FOR MOVEMENTS 2 AND 6 AND RED FOR ALL OTHER MOVEMENTS.
4. CONCURRENT/ ACTUATED PEDESTRIAN TIMING FOR MOVEMENTS P4 AND P6.
5. EACH PHASE/ MOVEMENT SHALL BE WIRED FROM THE SIGNAL DISPLAY TO THE CONTROLLER AS A SEPARATE PHASE/ MOVEMENT. THIS INCLUDES LEFT TURN MOVEMENTS. EACH LEFT TURN MOVEMENT SHALL HAVE CONDUCTORS AVAILABLE FOR PROTECTED AND PERMISSIVE OPERATION.
6. FOUNDATION ELEVATION SHOWN ON THE PLANS INCLUDE THE REQUIRED 6 INCHES ABOVE GRADE WHEN NOT ADJACENT TO A SIDEWALK.

SOP 12 (MODIFIED)



REMOVAL ITEMS:

690-10	6 EA
690-34-1	4 EA
690-50	1 EA
690-60	7 EA
690-80	3 EA
690-90	1 PI
690-100	1 PI

FTP-68B-06 9" X 18" | R3-4 36" X 36" | R3-5R 30" X 36" ONLY

F — 700-48-18 | 3 EA

G — 700-48-18 | 1 EA

A — SINGLE FACE | 699-1-1 | 1 EA

B — SINGLE FACE | 699-1-1 | 1 EA

C — SINGLE FACE | 699-1-1 | 1 EA

EXISTING FIBER OPTIC (ATMS LINE)

FURNISH & INSTALL ITS COMM. CABLE (MVDS)
130 LF | 783-8-1
(6 RUNS: PS, HV, LV, LIGHT, 2 SP)
120 LF | 555-1-3

EXISTING SPLICE VAULT TO REMAIN (CONTAINS 100' SLACK)

2 LF ITS COMM. CABLE SLACK (MVDS)
2 LF | 783-8-1
3 EA | 635-1-11
1 EA | 715-14-11
20 LF | 630-1-12 (2 RUNS)
1 EA | 646-1-11
1 EA | 665-13

(4 RUNS: PS, HV, LV, LIGHT)
360 LF | 630-1-12
110 LF | 715-2-11

EL 6.0' (2)
POLE LOCATION= STA. 231+5.68 59.71' LT
1 EA | 663-74-15 CAMERA NO.3
(3 RUNS) | 630-1-12 | 18 LF
649-31-999 | 1 EA
715-11-111 | 1 EA
715-14-11 | 1 EA
3 EA | 635-1-11

ARM B
ARM A

EXISTING FIBER OPTIC CONDUIT TO REMAIN.

EXISTING FIBER OPTIC PULL BOXES TO REMAIN.
2 LF | 783-8-1
2 LF ITS COMM. CABLE SLACK (MVDS)
20 LF | 783-4-112
2 LF | 783-8-1

EL 8.53'

1 EA | 663-74-15 CAMERA NO.1

DZ-4D
DZ-7
DZ-7
DZ-5

EXISTING CB RIM EL = 7.14 S INV = 2.17 N INV = 2.17

EXISTING CB RIM EL = 7.08 N INV = 2.98

EL 8.09'

1 EA | 663-74-15 CAMERA NO.2

DZ-6D
DZ6
DZ6

30 LF | 630-1-12 (5 RUNS)
1 PI | 632-7-1
3 EA | 635-1-11
1 EA | 639-3-11 INSTALL ADDITIONAL DISCONNECT ON SERVICE POLE.
1 EA | 641-2-12 (12')
1 AS | 670-5-310 INSTALL EXISTING COMPLETE CABINET ASSEMBLY
4 EA | 783-2-31 WITH UPS.
20 LF | 783-4-112

RELOCATE EXISTING CABINET TO THIS LOCATION.

(1) EL 7.64'
POLE LOCATION= STA. 231+97.63 65.38' RT
30 LF | 630-1-12 (3 RUNS)
1 EA | 649-31-203
1 EA | 715-14-11
3 EA | 635-1-11
20 LF | 630-1-12 (2 RUNS)
1 EA | 646-1-11
1 EA | 665-13

EXISTING CCTV TO REMAIN.
120 LF | 639-2-1 3 WIRE
30 LF | 783-4-112
40 LF | 783-8-1
40 LF | 630-1-12 (2 RUNS)
1 EA | 665-13
1 EA | 646-1-11

ADJUST EXISTING VERIZON PULL BOX AS NECESSARY. SHALL BE FLUSH WITH S/W IF TO REMAIN NEAR S/W RAMP.

555-1-3 | 145 LF (4 RUNS, HV, LV, 2 SP)

(2 RUNS) | 630-1-12 | 10 LF
635-1-11 | 2 EA
665-13 | 1 EA
646-1-11 | 1 EA

40 LF | 630-1-11
25 LF | 630-1-12
1 EA | 635-1-11
990 LF | 639-2-1 3 WIRE
1 AS | 639-1-22
1 EA | 641-2-12 (12')

FURNISH & INSTALL ITS COMM. CABLE (MVDS) TO CONTROLLER CABINET (USE EXISTING ITS CONDUIT)
860 LF | 783-8-1
2 LF ITS COMM. CABLE SLACK (MVDS)
2 LF | 783-8-1

EXISTING MVDS COMM. CABLE

VDS POLE LOCATED APPROXIMATELY 780' S. OF INTERSECTION. SEE VDS POLE DETAILS SHEET FOR MORE INFORMATION.

6' X 40' DETECTION ZONES POSITIONED 2' BEYOND STOP BAR (TYP.)

6' X 6' DETECTION ZONES POSITIONED 25' BEHIND STOP BAR (TYP.)

UTILITY POLE

CONTRACTOR SHALL RUN A LINE FROM THE PROPOSED POWER SERVICE PEDESTAL UNDERGROUND TO THE FPL SOURCE POLE AND THEN RUN THE LINE UP THE FP&L SOURCE POLE WITH A 20 FT RISER PIPE WITH WEATHERHEAD AND COIL 20 FT AT THE TOP TO BE CONNECTED BY FP&L. POWER LINES AND NEUTRAL LINE TO BE RAISED. CONTRACTOR TO COORDINATE WITH FP&L IN ADVANCE AND DURING CONSTRUCTION REGARDING OVERHEAD UTILITIES NEAR POLE NO. 2. OVERHEAD FACILITIES TO REMAIN ENERGIZED AND IN PLACE. TABLE "A" MINIMUM CLEARANCE DISTANCES SPECIFIED IN SUBPART CC OF OSHA RULE 1926 (AS THEY PERTAIN TO CRANE/DERRICK OPERATIONS, AND/OR THOSE MINIMUM DISTANCES SPECIFIED IN 29 CFR 1910.333 (C)(3)(IX)(A) AND (III)(A) FOR WORK IN PROXIMITY TO POWER LINES NOT COVERED BY THIS SUBPART CC, ARE TO BE MAINTAINED.

CONTROLLER TIMINGS

TIMING FUNCTION								
MOVEMENT NUMBER	1	2	3	4	5	6	7	8
MINIMUM GREEN		20		10	7.0	20	10	
EXTENSION		5.0		3.5	3.0	5.0	3.5	
MAXIMUM GREEN 1		90		40	15	90	40	
MAXIMUM GREEN 2								
YELLOW CLEARANCE		4.5		4.0	4.5	4.5	4.0	
ALL RED		2.5		5.0	4.5	2.5	5.0	
PEDESTRIAN WALK				7		7		
PED. CLEARANCE				29		32		
RECALL		MIN				MIN		

TIMING FUNCTION

TIMINGS ARE INITIAL AND MAY REQUIRE FIELD ADJUSTING AS DIRECTED BY PROJECT ENGINEER.

VIDEO DETECTOR ZONES

ZONE LOCATION NO.	VIDEO CAMERA NO.	NO. OF DETECTION ZONES	DELAY TIME (SEC)
DZ-2	2	2	0
DZ-4D	3	1	8
DZ-5	2	1	0
DZ-6	1	2	0
DZ-6D	1	1	8
DZ-7	3	2	0

DELAY TIME IS INITIAL AND MAY REQUIRE FIELD ADJUSTING AS DIRECTED BY PROJECT ENGINEER.

NOTES:

1. CONTRACTOR SHALL USE EXISTING FIBER OPTIC SPLICE VAULT ENCLOSURE TO REROUTE AND CONNECT THE EXISTING 12-COUNT DROP LINE TO THE PROPOSED CABINET.
2. THE CONTRACTOR SHALL REMOVE THE EXISTING LED LUMINAIRES FROM THE STRAIN POLES PRIOR TO POLE REMOVAL AND DELIVER THEM TO THE MANATEE SIGNAL SHOP. THE COST FOR REMOVAL AND DELIVER IS INCLUDED UNDER THE STRAIN POLE REMOVAL PAY ITEM NUMBER.
3. THE CONTRACTOR SHALL UTILIZE THE EXISTING MANATEE ATMS 12 COUNT FIBER BY DISCONNECTING FROM THE EXISTING CABINET AND REROUTE THE CABLE TO THE PROPOSED CABINET. THERE IS 100 FEET OF FIBER OPTIC CABLE SLACK LOCATED AT THE EXISTING FIBER OPTIC PULL BOX LOCATED ON THE WEST SIDE OF THE INTERSECTION AS SHOWN IN THE PLANS, IF NEEDED.
4. CONTRACTOR SHALL EXERCISE EXTRA CARE WHEN REMOVING SOUTHERN STRAIN POLES DUE TO CLOSE PROXIMITY TO FORCE MAIN AND RECLAIM WATER.
5. CONTRACTOR SHALL CONTACT BRIGHT HOUSE NETWORKS REGARDING ANY CONFLICTING BHN UG NEAR POLE 2.

NO.	DESCRIPTION	BY	DATE

MANATEE COUNTY

US 41 & HABEN BOULEVARD IMPROVEMENTS

UPIK Y. SUWARNO LICENSE No. 62995 STATE OF FLORIDA PROFESSIONAL ENGINEER

Cardno TBE
12481 Telecom Drive, Tampa, FL 33637
www.cardnotbe.com - 813.221.0048
Certificate of Authorization No. 3843

UPIK Y. SUWARNO, PE
LIC. NO.: 62995 DATE 5/18/12

DESIGNED UYS
DRAWN UYS
Q.C. DJA
APPROVED

SIGNALIZATION PLAN

PROJECT NO: 00193-008-014
DATE: 05-18-2012
SHEET NO: T-5

SPECIAL NOTES:

A. EACH POLE AND MAST ARM SHALL BE IDENTIFIED WITH A PERMANENT ONE INCH (1") HIGH ENGRAVED OR IMPRESSED MARK WHICH BEARS THE POLE IDENTIFICATION NUMBER SHOWN ON THE PLANS.

B. ANCHOR BOLT COVERS (ORNAMENTAL, NON-ORNAMENTAL, AND/OR PAINTED) SHALL BE GALVANIZED STEEL OR CAST ALUMINUM AND SHALL BE SECURED BY A MINIMUM OF TWO (2) THREADED FASTENERS. THE BOLT COVERS SHALL BE OF SUFFICIENT SIZE SO THAT THERE IS NO GAP BETWEEN ITSELF AND THE POLE SHAFT.

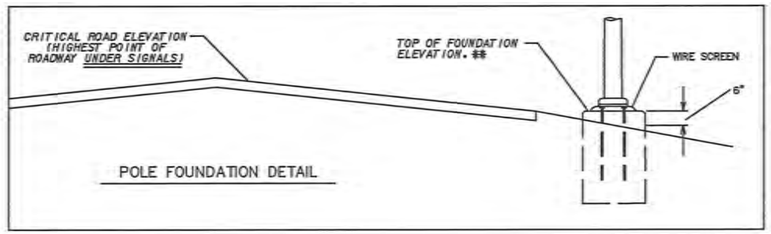
C. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO FIELD VERIFY ALL ELEVATIONS LISTED HEREIN.

D. INFORMATION BELOW IS FOR DESIGN PURPOSES ONLY. FIELD ADJUSTMENTS MAY BE REQUIRED.

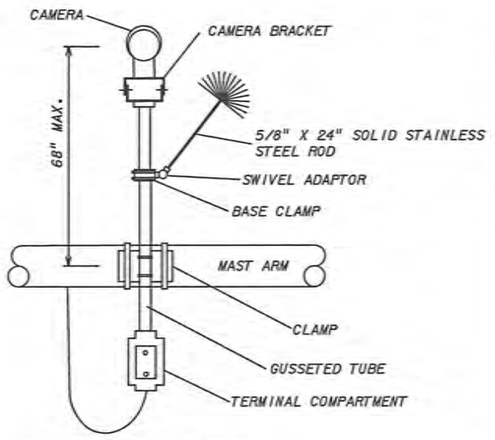
E. SEE APPROPRIATE PLAN SHEET FOR PROPOSED SIGNAL HEAD ALIGNMENTS AND SIGN CONFIGURATION/LOCATION.

F. BACKPLATES REQUIRED FOR ALL SIGNALS HEADS.

G. CONTRACTOR SHALL COORDINATE WITH MANATEE COUNTY FOR THE ACCEPTABLE AND COMPATIBLE VIDEO DETECTION BRACKET TO USE.

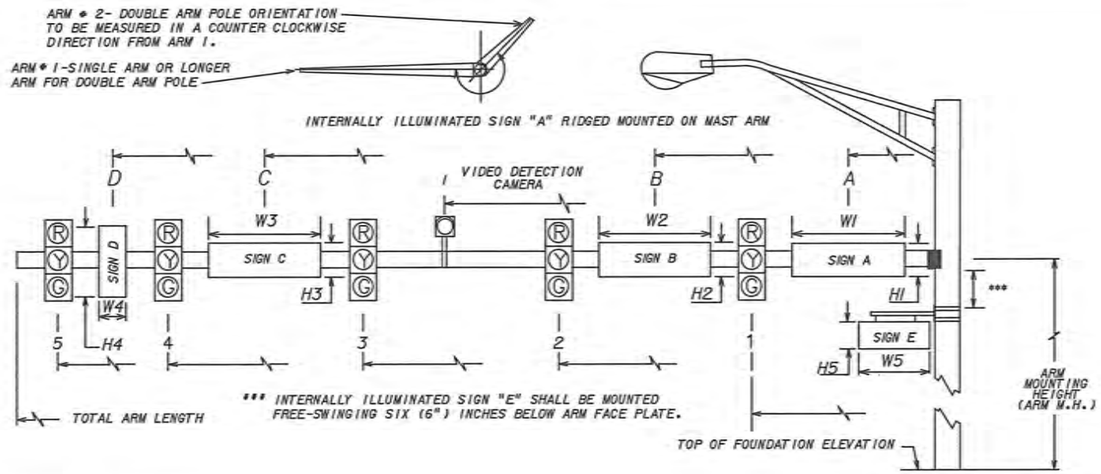


POLE FOUNDATION DETAIL



CAMERA MOUNTING DETAIL (CONTACT MAINTAINING AGENCY FOR MOUNTING PREFERENCES.)

SPECIAL INSTRUCTIONS					
ID NO.	PED. BUTTON		PED. SIGNALS		HANDHOLE LOCATION



* DENOTES NUMBER OF SECTIONS IN SIGNAL HEAD ASSEMBLY

STRUCT. ID. NO.	POLE ID. NO.	SHEET NO.	LOCATION BY STA.	CRITICAL ROAD EL.	# FOUNDATION OUT OF GROUND	## TOP OF FOUNDATION ELEVATION	RDWY ARM NO.	SIGNAL DATA: SIGNAL V/H	BACK PLATES Y/N	PED. SIGNAL Y/N	DISTANCE FROM POLE: 1	*	2	*	3	*	4	*	5	*	6	*	7	*	8	*	TOTAL ARM LENGTH	ARM M.H.	∠ BETWEEN DUAL ARMS 90/270
-	1	T-5	231+97.63, 65.38' RT	8.53'	0.5	7.64'	A	V	Y	N	30.0	5	40.0	3	50.0	3											56	21.5	
							B	V	Y	N																			
-	2	T-5	231+5.68, 59.71' LT	8.09'	0.5	6.0'	A	V	Y	N	29.5	3	39.5	3	49.5	5											64	22.5	90
							B	V	Y	N	20.0	3	38.0	5													52		
-							A	V	Y	N																			
							B	V	Y	N																			
-							A	V	Y	N																			
							B	-	-	-																			
-							A	V	Y	N																			
							B	V	Y	N																			
-							A	V	Y	N																			
							B	-	-	-																			
-					-	-	A	V	Y	N																			
							B	V	Y	N																			
					-	-	A	V	Y	N																			
							B	V	Y	N																			

SIGN DATA: DISTANCE FROM POLE / HEIGHT AND WIDTH OF SIGN																		VIDEO DISTANCE FROM POLE		LUM	LUM ROTATION	LUM
A	HI	WI	B	H2	W2	C	H3	W3	D	H4	W4	E	H5	W5				1	2	Y/N	(DEG)	WATTS
10.0	2.5	8	25.0	3.0	2.5				55.0	3.0	3.0							35.0		N		
19.0	2.5	8							55.5	3.0	3.0							45.0		Y	0	400
7.0	2.5	8	15.5	3.0	3.0													33.0				

NO.	DESCRIPTION	BY	DATE

MANATEE COUNTY

US 41 & HABEN BOULEVARD IMPROVEMENTS

Cardno TBE
12481 Telecom Drive, Tampa, FL 33637
www.cardnotbe.com - 813.221.0048
Certificate of Authorization No. 3843

UPIK Y. SUWARNO, P.E. LIC. NO. 57872 DATE

DESIGNED	UYS
DRAWN	UYS
CHECKED	DJA
APPROVED	

MAST ARM TABULATION

PROJECT NO:	00193-008-014
DATE:	05-18-2012
SHEET NO:	T-6

FILE: O:\JOB\0193\00193-008-14\ACAD\S6_MastTab.dwg LAST SAVED: Fifi, 05/18/12-8:12a PLOTTED: Fifi, 05/18/12-8:12a BY: Upik.Suwarno

SPECIAL NOTES:

A. EACH POLE AND MAST ARM SHALL BE IDENTIFIED WITH A PERMANENT ONE INCH (1") HIGH ENGRAVED OR IMPRESSED MARK WHICH BEARS THE POLE IDENTIFICATION NUMBER SHOWN ON THE PLANS.

B. ANCHOR BOLT COVERS (ORNAMENTAL, NON-ORNAMENTAL, AND/OR PAINTED) SHALL BE GALVANIZED STEEL OR CAST ALUMINUM AND SHALL BE SECURED BY A MINIMUM OF TWO (2) THREADED FASTENERS. THE BOLT COVERS SHALL BE OF SUFFICIENT SIZE SO THAT THERE IS NO GAP BETWEEN ITSELF AND THE POLE SHAFT.

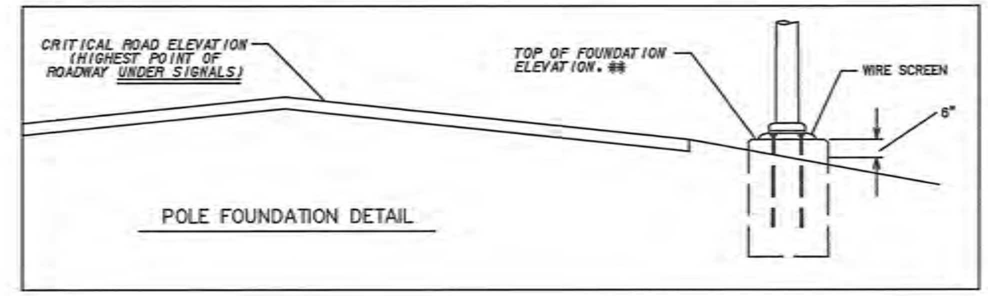
C. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO FIELD VERIFY ALL ELEVATIONS LISTED HEREIN.

D. INFORMATION BELOW IS FOR DESIGN PURPOSES ONLY. FIELD ADJUSTMENTS MAY BE REQUIRED.

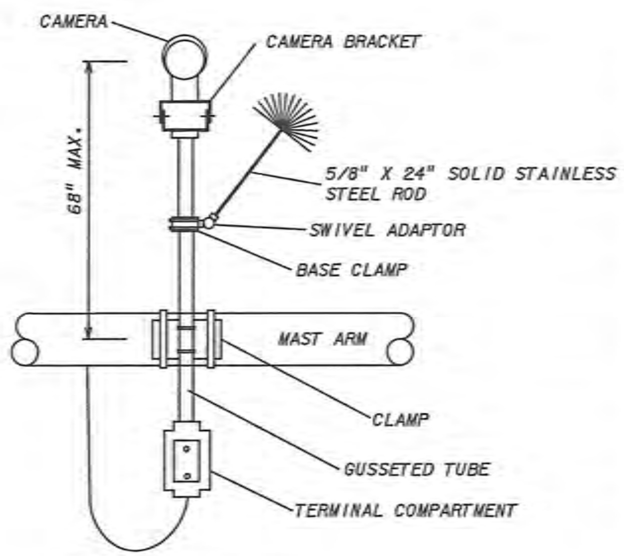
E. SEE APPROPRIATE PLAN SHEET FOR PROPOSED SIGNAL HEAD ALIGNMENTS AND SIGN CONFIGURATION/LOCATION.

F. BACKPLATES REQUIRED FOR ALL SIGNALS HEADS.

G. CONTRACTOR SHALL COORDINATE WITH MANATEE COUNTY FOR THE ACCEPTABLE AND COMPATIBLE VIDEO DETECTION BRACKET TO USE.



POLE FOUNDATION DETAIL



CAMERA MOUNTING DETAIL
(CONTACT MAINTAINING AGENCY FOR MOUNTING PREFERENCES.)

SPECIAL INSTRUCTIONS					
ID NO.	PED. BUTTON		PED. SIGNALS		HANDHOLE LOCATION
___	___	___	___	___	
___	___	___	___	___	
___	___	___	___	___	
___	___	___	___	___	
___	___	___	___	___	
___	___	___	___	___	
___	___	___	___	___	
___	___	___	___	___	
___	___	___	___	___	
___	___	___	___	___	
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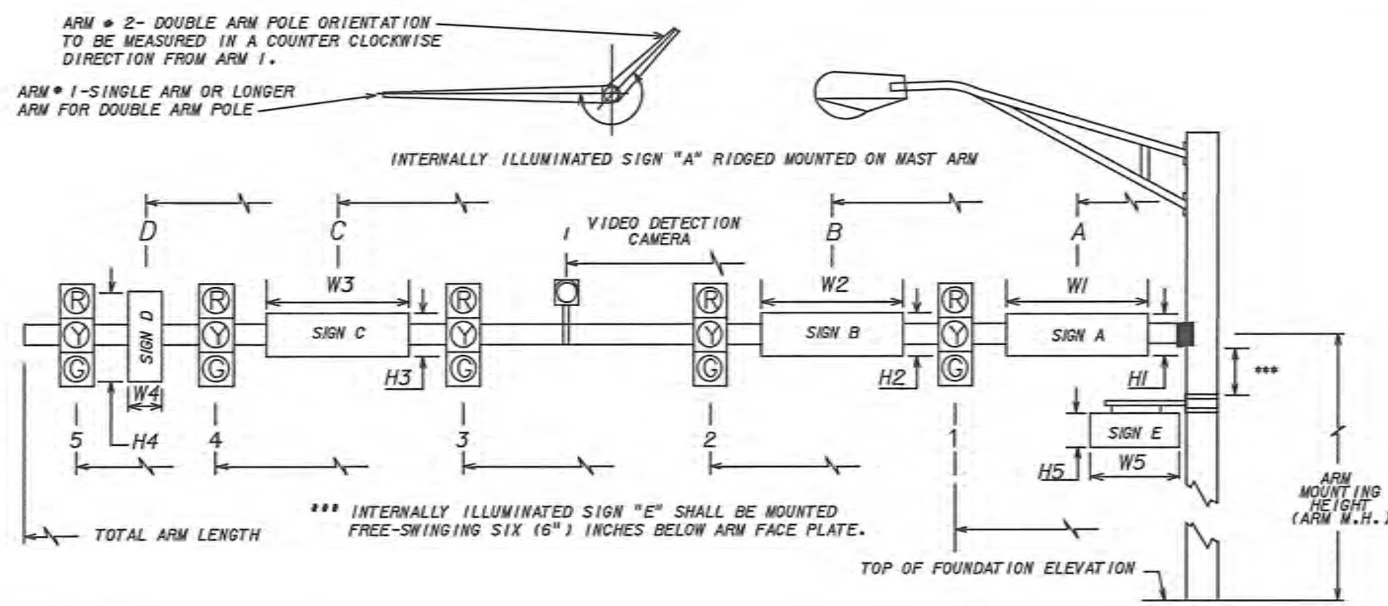
___	___	___	___	___	
___	___	___	___	___	



* DENOTES NUMBER OF SECTIONS IN SIGNAL HEAD ASSEMBLY

STRUCT. ID. NO.	POLE ID. NO.	SHEET NO.	LOCATION BY STA.	CRITICAL ROAD EL.	# FOUNDATION OUT OF GROUND	** TOP OF FOUNDATION ELEVATION	RDWY ARM NO.	SIGNAL DATA: SIGNAL V/H	BACK PLATES Y/N	PED. SIGNAL Y/N	DISTANCE FROM POLE: 1	*	2	*	3	*	4	*	5	*	6	*	7	*	8	*	TOTAL ARM LENGTH	ARM M.H.	∠ BETWEEN DUAL ARMS 90/270	SIGN DATA: DISTANCE FROM POLE / HEIGHT AND WIDTH OF SIGN: A	H1	W1	B	H2	W2	C	H3	W3	D	H4	W4	E	H5	W5	VIDEO DISTANCE FROM POLE: 1	2	LUM Y/N	LUM ROTATION (DEG)	LUM WATTS
	1	T-5	231+97.63, 65.38' RT	8.53'	0.5	7.64'	A	V	Y	N	24.0	4	36.0	3	48.0	3											56	21.5		10.0	2.5	8	19.0	3.0	2.5				53.0	3.0	3.0				30.0		N		
							B	V	Y	N																																							
	2	T-5	231+5.68, 59.71' LT	8.09'	0.5	6.0'	A	V	Y	N	31.5	3	43.5	3	55.5	4											64	22.5	90	19.0	2.5	8							60.5	3.0	3.0				49.5		Y	0	400
							B	V	Y	N	20.0	3	32.0	3	44.0	4											52			7.0	2.5	8	15.5	3.0	3.0				49.0	3.0	3.0				38.0				
							A	V	Y	N																																							
							B	V	Y	N																																							
							A	V	Y	N																																							
							B	V	Y	N																																							
–					–	–	A	V	Y	N																																							
							B	V	Y	N																																							
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							B	V	Y	N																																							

*** THIS SHEET IS FOR DESIGN PURPOSES ONLY! THE CONTRACTOR SHALL NOT USE THIS SHEET IN PLACEMENT OF THE SIGNALS AND/OR SIGNS. SEE THE "MAST ARM TABULATION" SHEET FOR ACTUAL SIGNAL INSTALLATION.

NO.	DESCRIPTION	BY	DATE

MANATEE COUNTY

US 41 & HABEN BOULEVARD IMPROVEMENTS

Cardno TBE
12481 Telecom Drive, Tampa, FL 33637
www.cardnotbe.com - 813.221.0048
Certificate of Authorization No. 3843

UPIK Y. SUWARNO LICENSE No. 62995 STATE OF FLORIDA PROFESSIONAL ENGINEER
UPIK Y. SUWARNO, PE 5-18-12
LIC. NO. 62995 DATE

DESIGNED UYS
DRAWN UYS
Q.C. DJA
APPROVED

MAST ARM TABULATION (CALCULATION CONFIGURATION)

PROJECT NO: 00193-008-014
DATE: 05-18-2012
SHEET NO: T-7

FILE: O:\JOB\0193\00193-008-14\ACAD\S6_MastTab.dwg LAST SAVED: Fri, 05/18/12-8:54a PLOTTED: Fri, 05/18/12-8:54a BY: Upik.Suwarno

STANDARD MAST ARM ASSEMBLIES DATA TABLE																				Table Date 01-01-12
STRUCTURE ID NUMBERS	ASSIGNED MAST ARM NUMBER	ASSEMBLY NUMBERS (1)	FIRST ARM			SECOND ARM			UF (deg)	LL (deg)	POLE				SPECIAL DRILLED SHAFT (4)					
			ARM TYPE	FAA (2) (ft.)	FBA (2) (in.)	ARM TYPE	FAA (2) (ft.)	FBA (2) (in.)			POLE TYPE	UAA (3) (ft.)	UB (ft.)	UCA (3) (in.)	DA (ft.)	DB (ft.)	RA	RB	RC	RD (in.)
T-5, ID. NO. 1	13M131	E5-T3	E5	32.0	6.66	–	–	–	–	–	T3	23.0	21.5	15.78	14.5	4.5	11	16	9	12

– NOT APPLICABLE.

TABLE NOTES:

1. Assembly Number Legend

   Single Arm:
   Arm Type – Pole Type = D# – S#
   = E# – T#

   Double Arm:
   First Arm Type – Second Arm Type – Pole Type = D# – D# – S#
   = E# – E# – T#

2. If an entry appears in columns "FAA" and "FBA", a shorter arm is required. This is obtained by removing length from the arm tip. For these cases the mast arm length shall be shortened from "FA" to "FAA" and the tip diameter shall be increased from "FB" to "FBA".

3. If an entry appears in columns "UAA" and "UCA", a shorter pole is required. This is obtained by removing length from the pole tip. For these cases the pole height shall be shortened from "UA" to "UAA" and the pole tip diameter shall be increased from "UC" to "UCA".

4. The foundations for Standard Mast Arm Assemblies are based on the report of core borings from Dunkelberger Engineering & Testing, Inc., dated August, 2011. Engineer of record is Scott N. Parrish, P.E.
   The following soil parameters were used in design:

   Classification = Sand
   Internal Angle of Friction = 28 Degrees (28°)
   Unit Weight = 40.0 pcf (Assumed Submerged)

GENERAL NOTES:

1. Work this sheet with the Signal Designer's "Mast Arm Tabulation" sheet. See "Mast Arm Tabulation" for special instructions that include non-standard Handhole location, paint color, terminal compartment requirement, and pedestrian features.

2. Work with Index Nos. 17743 and 17745.

3. Design wind speed is 130 mph.

MIGUEL A. VILLEGAS LICENSE No. 68768 STATE OF FLORIDA PROFESSIONAL ENGINEER

5/16/12

NO.	DESCRIPTION	BY	DATE

MANATEE COUNTY

US 41 & HABEN BOULEVARD IMPROVEMENTS

Cardno TBE
380 Park Place Blvd., Suite 300, Clearwater, Florida 33759
www.cardnotbe.com - 727.531.3505
Certificate of Authorization No. 3843

MIGUEL A. VILLEGAS, PE
LIC. NO.: 68768 DATE

DESIGNED MAV
DRAWN JGH
Q.C.
APPROVED

STANDARD MAST ARM ASSEMBLIES DATA TABLE

PROJECT NO: 00193-008-014
DATE: 5-16-2012
SHEET NO: T-8

SPECIAL MAST ARM ASSEMBLIES DATA TABLE

Table Date 01-01-12

Pole No.	STRUCTURE NUMBER	ASSIGNED MAST ARM NUMBER	FIRST ARM				FIRST ARM EXTENSION				SECOND ARM				SECOND ARM EXTENSION				POLE						
			FA(ft)	FB(in)	FC(in)	FD(in)	FE(ft)	FF(in)	FG(in)	FH(in)	SA(ft)	SB(in)	SC(in)	SD(in)	SE(ft)	SF(in)	SG(in)	SH(in)	UA(ft)	UB(ft)	UC(in)	UD(in)	UE(in)	UF(deg)	UG(ft)
2	T-5, ID No. 2 (E6-E5-T24 LUM)	13M131	32.9	7.54	12.15	0.25	33.1	11.37	16	0.375	28	7.22	11.14	0.25	26	10.36	14	0.375	39	22.5	16.54	22	0.375	90	36.25

SPECIAL MAST ARM ASSEMBLIES DATA TABLE (CONT.)

Table Date 01-01-12

STRUCTURE NUMBER	ASSIGNED MAST ARM NUMBER	FIRST ARM CONNECTION (in) First Arm Camber Angle = 2 Degrees											SECOND ARM CONNECTION (in) Second Arm Camber Angle = 2 Degrees										
		#Bolts	HT	FJ	FK	FL	FN	FO	FP	FR	FS	FT	#Bolts	HT	SJ	SK	SL	SN	SO	SP	SR	SS	ST
T-5, ID No. 2 (E6-E5-T24 LUM)	13M131	6	30	32	2.75	0.75	0.375	19.43	1.25	2	12.5	0.375	6	30	32	2.75	0.75	0.375	19.43	1.25	2	12.5	0.375

SPECIAL MAST ARM ASSEMBLIES DATA TABLE (CONT.)

Table Date 01-01-12

STRUCTURE NUMBER	ASSIGNED MAST ARM NUMBER	POLE BASE CONNECTION (in)					SHAFT AND REINF.						LUMINAIRE AND LUMINAIRE CONNECTION										
		#Bolts	BA	BB	BC	BF	DA(ft)	DB(ft)	RA	RB	RC	RD(in)	LA(ft)	LB(ft)	LC(in)	LD(in)	LE	LF(ft)	LG(in)	LH(in)	LJ(in)	LK(in)	LL(deg)
T-5, ID No. 2 (E6-E5-T24 LUM)	13M131	6	38	2.5	2	40	15.5	4.5	11	16	15	8	40	15	3	0.174	0.5	8	0.5	0.75	0.313	0.313	0

NOTES:

1. Work with Index 17745.
2. Design Wind Speed = 130 mph.
3. Contractor shall coordinate anchor bolt requirements with fabricator.
4. Contractor shall identify Structures Numbers and submit detailed shop drawings.

FOUNDATION NOTES:

1. Design based on borings dated August 2011, signed and sealed by Scott Parrish, P.E. with Dunkelberger Engineering & Testing, Inc.
2. Assumptions and values used in design:
   Soil Type = Sand
   Soil Layer Thickness = 25 ft.
   Soil Friction Angle = 28 deg.
   Soil Weight = 50 pcf.
   Design Water Table is 3.5 ft. below surface.

MIGUEL A. VILLEGAS LICENSE No. 68768 STATE OF FLORIDA PROFESSIONAL ENGINEER

NO.	DESCRIPTION	BY	DATE

MANATEE COUNTY

US 41 & HABEN BOULEVARD IMPROVEMENTS

Cardno TBE
380 Park Place Blvd., Suite 300, Clearwater, Florida 33759
www.cardnotbe.com - 727.531.3505
Certificate of Authorization No. 3843

MIGUEL A. VILLEGAS, PE
LIC. NO.: 68768 DATE 5/16/12

DESIGNED MAV
DRAWN JGH
Q.C.
APPROVED

SPECIAL MAST ARM ASSEMBLIES DATA TABLE

PROJECT NO: 00193-008-014
DATE: 5-16-2012
SHEET NO: T-9

FILE: J:\00193\00193008.14\DOC\Calcs\US301-Haben_Mast Arms\MastArmsTable_301-haben.dwg LAST SAVED: Wed, 05/16/12-11:38a PLOTTED: Wed, 05/16/12-11:45a BY: jose.hernandez

NOTES:

1. THE CONTRACTOR SHALL REMOVE ALL THE EXISTING MARKINGS BEING REPLACED, INCLUDING THE MARKINGS IN AREAS AFFECTED BY THE MEDIAN RECONSTRUCTION. THE CONTRACTOR SHALL REMOVE ALL CONFLICTING MARKING WITHIN THE PROPOSED CROSSWALKS.

310 SF 711-17 (THIS SHEET)

1 EA 711-11-170

REMOVE EXISTING DIRECTIONAL ARROW

24" WHITE

1 EA 705-11-3 Y/G DELINEATOR
5 SF 710-11-290 YELLOW REFLECTIVE PAINT

REMOVE CONFLICTING EXISTING PAVEMENT MARKINGS BETWEEN CROSSWALK AND NEW STOP BAR LOCATION.

REMOVE ALL CONFLICTING PAVEMENT MARKINGS WITHIN CROSSWALK LINES.

12" WHITE

REMOVE STOP BAR

6" YELLOW
2'-4' SKIP
100 LF 711-11-251

10 FT WIDE CROSSWALK (TYP)

R6-1
54" X 18"
ONE WAY

700-20-11 3 AS
OMI-1
YELLOW

1 AS 700-20-11

6" WHITE
2'-4' SKIP
30 LF 711-11-151

(R3-4 SIGN AND OMI-3 YELLOW OBJECT MARKER TO REMAIN)

R3-4
24" X 30"

OMI-3
YELLOW

R3-4
36" X 36"

(REMOVE EXISTING NO U-TURN SIGN PANEL)
700-48-60 1 EA

125 LF 711-11-125 (THIS SHEET)

24" WHITE

362 LF 711-11-123 (THIS SHEET)

REMOVE ALL CONFLICTING PAVEMENT MARKINGS WITHIN CROSSWALK LINES.

REMOVE EXISTING DIRECTIONAL ARROWS

REMOVE EXISTING STOP BAR

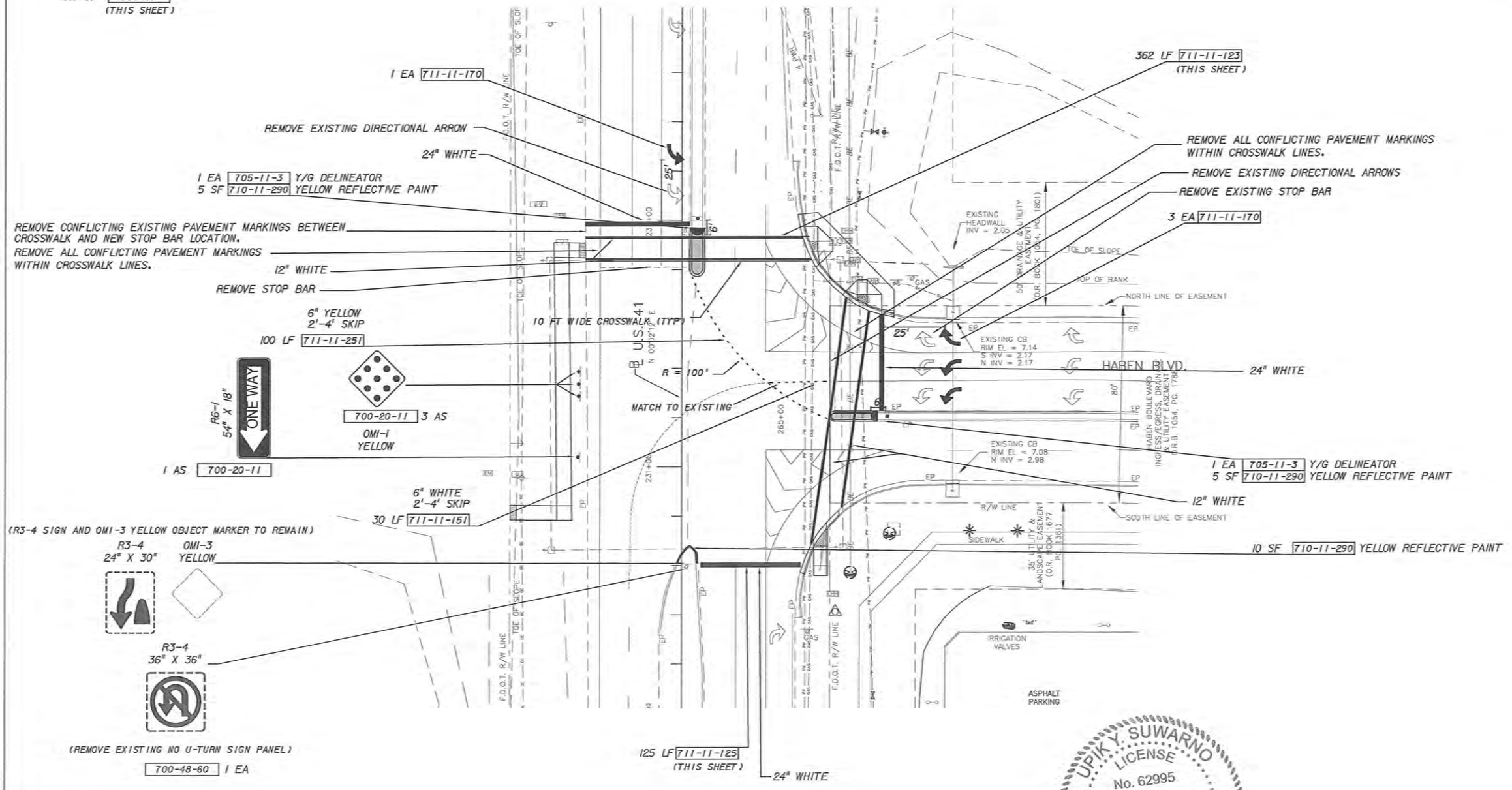
3 EA 711-11-170

24" WHITE

1 EA 705-11-3 Y/G DELINEATOR
5 SF 710-11-290 YELLOW REFLECTIVE PAINT

12" WHITE

10 SF 710-11-290 YELLOW REFLECTIVE PAINT



20'

NO.	DESCRIPTION	BY	DATE

MANATEE COUNTY

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UPIK Y. SUWARNO LICENSE No. 62995 STATE OF FLORIDA PROFESSIONAL ENGINEER

UPIK Y. SUWARNO, PE
LIC. NO. 62995

DESIGNED UYS
DRAWN BYS
CHECKED DJA
APPROVED

SIGNING AND PAVEMENT MARKING PLAN

PROJECT NO: 00193-008-014
DATE: 05-18-2012
SHEET NO: T-10

20'

RECONSTRUCT MEDIAN

110-4	13 SY
285-712	13 SY
334-1-14	2.86 TN
337-7-5	0.55 TN
520-1-10	15 LF
520-5-12	3 LF

AREA OF CONCRETE TRAFFIC SEPARATOR TO BE REMOVED AND REPLACED WITH PAVEMENT CONSISTENT WITH EXISTING PAVEMENT DESIGN.

MEDIAN REMOVAL

522-2	92 SY
120-6	55 CY

CR 24

110-4	6.1 SY
522-2	11 SY
520-1-10	30 LF

CR 1

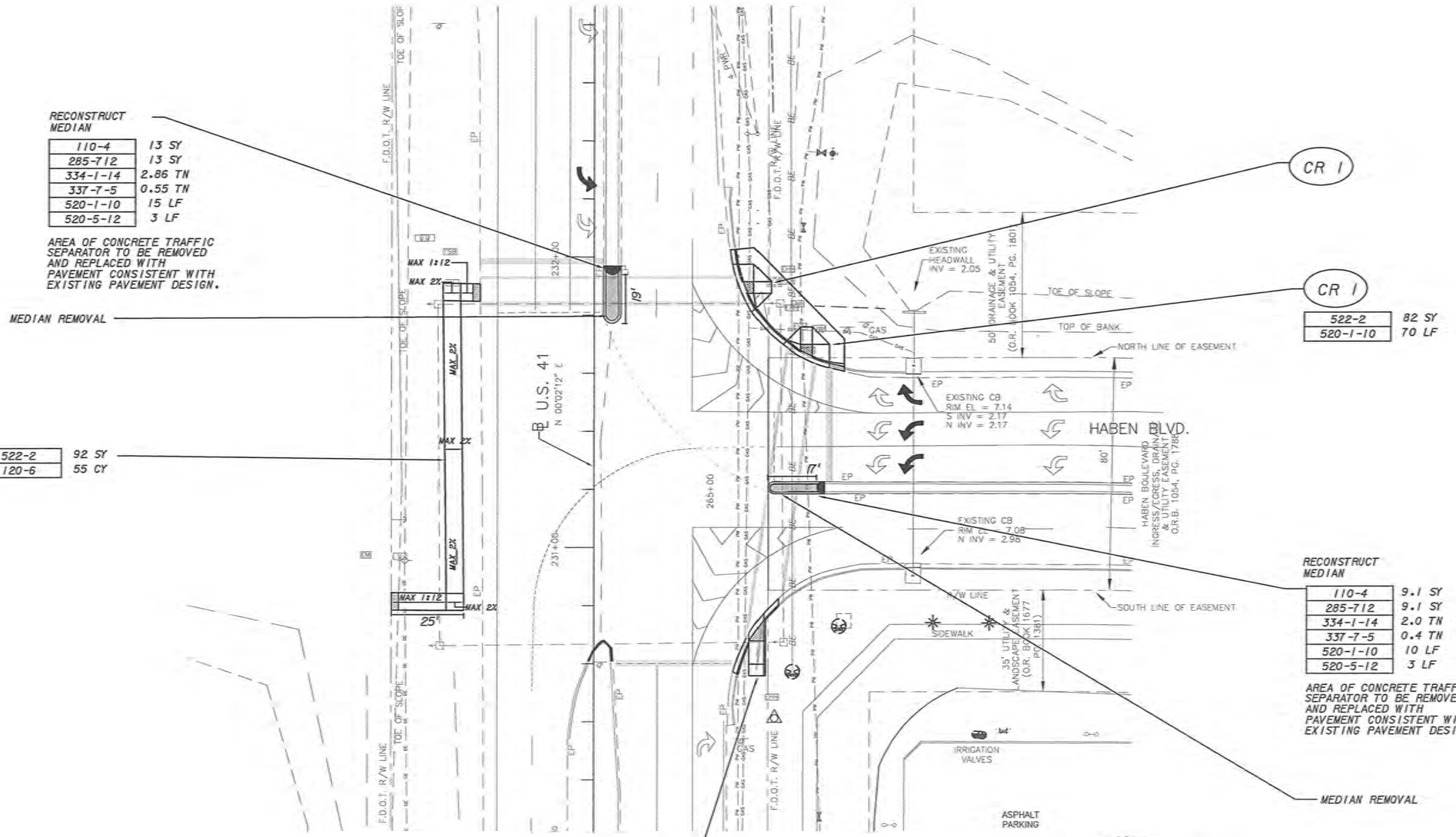
522-2	82 SY
520-1-10	70 LF

RECONSTRUCT MEDIAN

110-4	9.1 SY
285-712	9.1 SY
334-1-14	2.0 TN
337-7-5	0.4 TN
520-1-10	10 LF
520-5-12	3 LF

AREA OF CONCRETE TRAFFIC SEPARATOR TO BE REMOVED AND REPLACED WITH PAVEMENT CONSISTENT WITH EXISTING PAVEMENT DESIGN.

MEDIAN REMOVAL



UPIK Y. SUWARNO LICENSE No. 62995 STATE OF FLORIDA PROFESSIONAL ENGINEER

NO.	DESCRIPTION	BY	DATE

MANATEE COUNTY

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Certificate of Authorization No. 3843

UPIK Y. SUWARNO, PE
LIC. NO. 62995

DESIGNED UYS
DRAWN UYS
CHECKED DJA
APPROVED
DATE

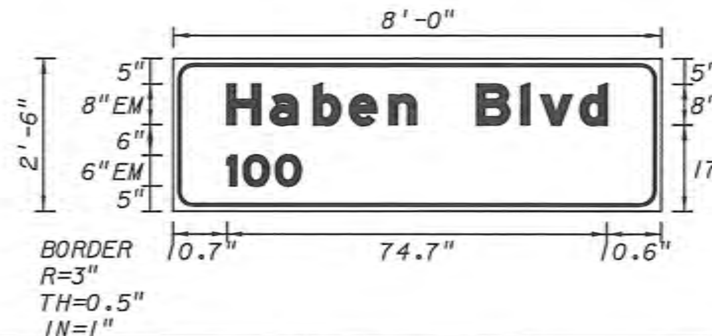
ROADWAY CONSTRUCTION DETAILS

PROJECT NO: 00193-008-014
DATE: 05-18-2012
SHEET NO: T-11

SIGN NAME	A	QTY	1	SIGN NUMBER	STATION(S)
PANEL		BORDER			none
WIDTH	8'-0"	WIDTH	0.5"		
HEIGHT	2'-6"	RADII	3"		
LEGEND	RGB[255,255,255] White				
COLOR	Green				

SYMBOL(S)	ANGLE	X	Y	WID	HT

SIGN NUMBER	NUMBER OF POSTS	CLEARANCE Edge Of Lane	COLUMN SIZE		AVERAGE LENGTH



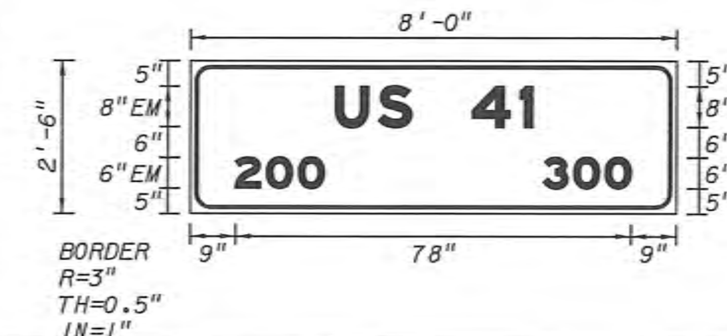
NO. OF LIGHT FIXTURES		FIXTURE SPACING		PHOTOMETRIC CURVE		WATT		VOLTAGE	

COPY		H	a	b	e	n		B	l	v	d		L
SPACE	10.7	8.5	8.5	7	7.8	5.3	12	8.7	3.9	7.8	5.3	10.6	74.7
COPY		1	0	0		L							
SPACE	10.7	3.2	6.2	5	70.8	14.5							
COPY													
SPACE													
COPY													
SPACE													
COPY													
SPACE													
COPY													
SPACE													

SIGN NAME	B	QTY	1	SIGN NUMBER	STATION(S)
PANEL		BORDER			none
WIDTH	8'-0"	WIDTH	0.5"		
HEIGHT	2'-6"	RADII	3"		
LEGEND	RGB[255,255,255] White				
COLOR	Green				

SYMBOL(S)	ANGLE	X	Y	WID	HT

SIGN NUMBER	NUMBER OF POSTS	CLEARANCE Edge Of Lane	COLUMN SIZE		AVERAGE LENGTH



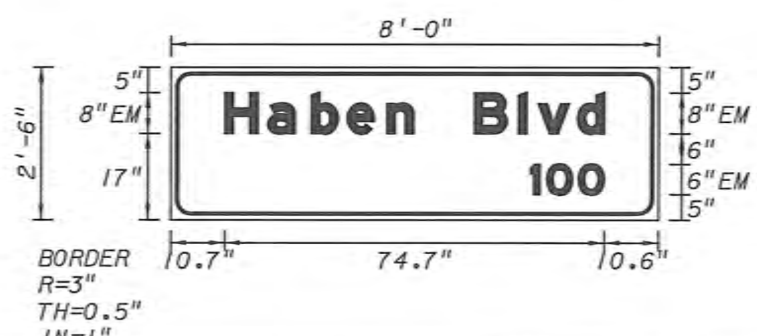
NO. OF LIGHT FIXTURES		FIXTURE SPACING		PHOTOMETRIC CURVE		WATT		VOLTAGE	

COPY		U	S		4	1		L					
SPACE	28.6	8.5	6.5	12	9.5	2.4	28.6	38.9					
COPY		2	0	0		3	0	0		L			
SPACE	9	6.1	6.2	5	43.3	6.1	6.2	5	9	78			
COPY													
SPACE													
COPY													
SPACE													
COPY													
SPACE													
COPY													
SPACE													

SIGN NAME	C	QTY	1	SIGN NUMBER	STATION(S)
PANEL		BORDER			none
WIDTH	8'-0"	WIDTH	0.5"		
HEIGHT	2'-6"	RADII	3"		
LEGEND	RGB[255,255,255] White				
COLOR	Green				

SYMBOL(S)	ANGLE	X	Y	WID	HT

SIGN NUMBER	NUMBER OF POSTS	CLEARANCE Edge Of Lane	COLUMN SIZE		AVERAGE LENGTH



NO. OF LIGHT FIXTURES		FIXTURE SPACING		PHOTOMETRIC CURVE		WATT		VOLTAGE	

COPY		H	a	b	e	n		B	l	v	d		L
SPACE	10.7	8.5	8.5	7	7.8	5.3	12	8.7	3.9	7.8	5.3	10.6	74.7
COPY		1	0	0		L							
SPACE	70.8	3.2	6.2	5	10.6	14.5							
COPY													
SPACE													
COPY													
SPACE													
COPY													
SPACE													
COPY													
SPACE													

SIGN NAME		QTY		SIGN NUMBER	STATION(S)
PANEL		BORDER			
WIDTH		WIDTH			
HEIGHT		RADII			
LEGEND		COLOR			
COLOR					

SYMBOL(S)	ANGLE	X	Y	WID	HT

SIGN NUMBER	NUMBER OF POSTS	CLEARANCE Edge Of Lane	COLUMN SIZE		AVERAGE LENGTH

NO. OF LIGHT FIXTURES		FIXTURE SPACING		PHOTOMETRIC CURVE		WATT		VOLTAGE	

COPY													
SPACE													
COPY													
SPACE													
COPY													
SPACE													
COPY													
SPACE													
COPY													
SPACE													
COPY													
SPACE													

NO.	DESCRIPTION	BY	DATE

MANATEE COUNTY

US 41 & HABEN BOULEVARD IMPROVEMENTS

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UPIK Y. SUWARNO LICENSE No. 62995 STATE OF FLORIDA PROFESSIONAL ENGINEER

5-18-12
UPIK Y. SUWARNO, PE
LIC. NO. 62995 DATE

DESIGNED	UYS
DRAWN	UYS
Q.C.	DJA
APPROVED	

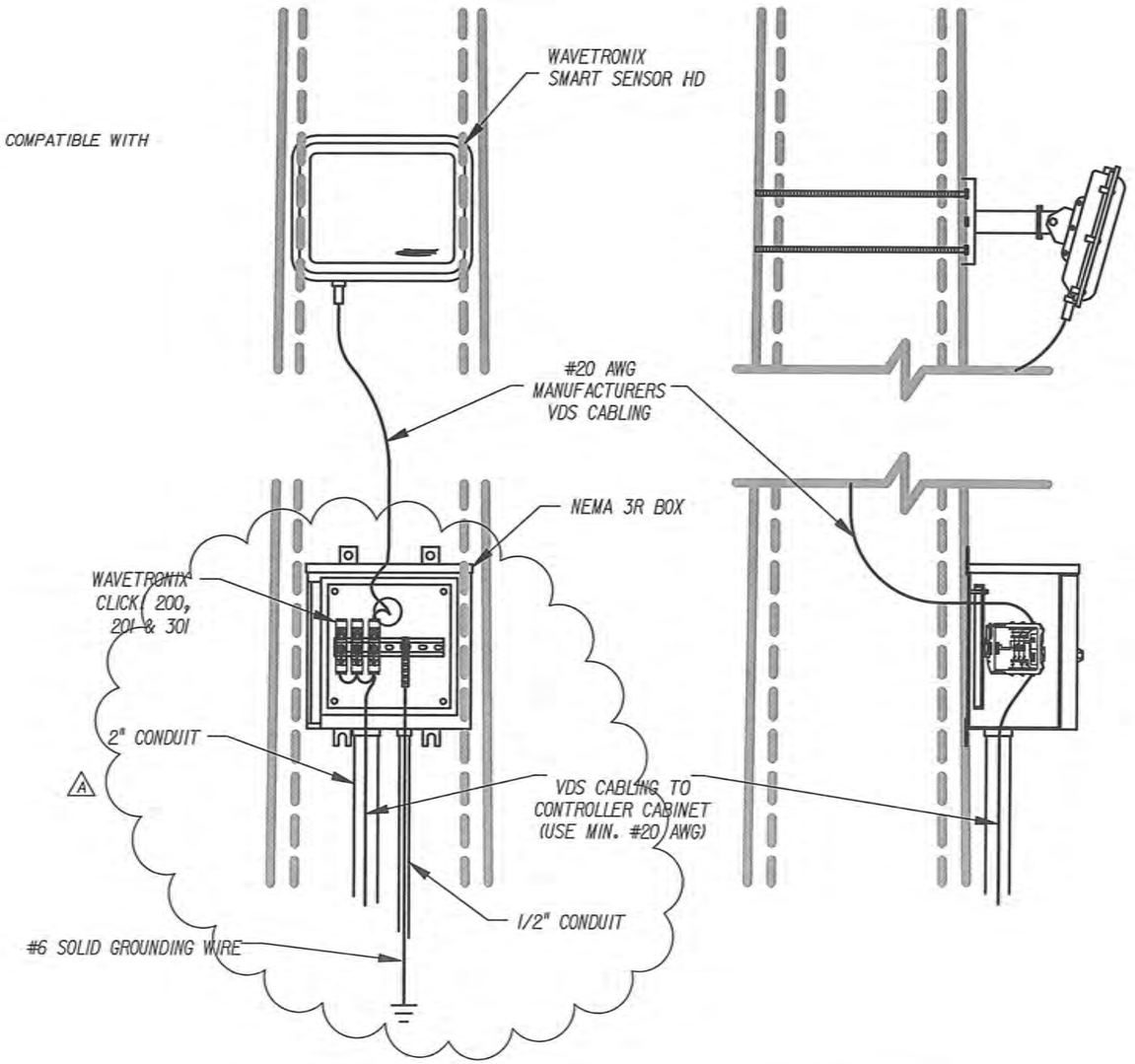
SIGNALIZATION GUIDE SIGN WORKSHEET

PROJECT NO: 00193-008-014
DATE: 05-18-2012
SHEET NO: T-12

FILE: O:\JOB\0193\00193-008-14\ACAD\S8_GSWKSG03.dwg LAST SAVED: Wed, 04/11/12-4:00p PLOTTED: Fri, 05/18/12-9:00a BY: Upik.Suwarno

NOTES:

1. CABLING FROM VDS POLE TO CABINET SHALL BE COMPATIBLE WITH WAVETRONIX SMART SENSOR HD MODEL 125.



FRONT VIEW
N.T.S.

SIDE VIEW
N.T.S.

UPIK Y. SUWARNO LICENSE No. 62995 STATE OF FLORIDA PROFESSIONAL ENGINEER

NO.	DESCRIPTION	BY	DATE

MANATEE COUNTY

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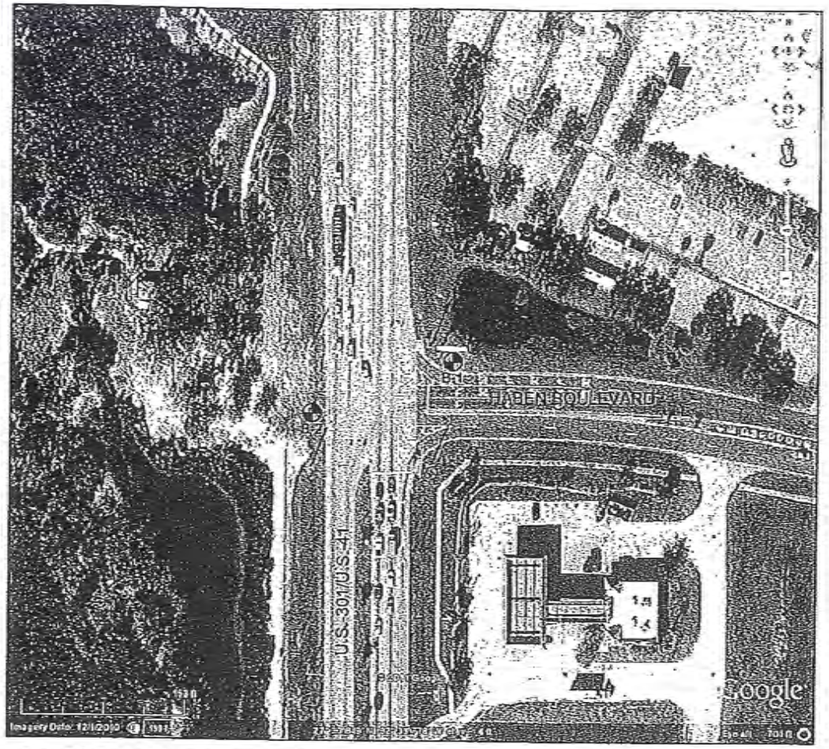
UPIK Y. SUWARNO, PE
Lic. No. 62995
DATE: 5/18/12

DESIGNED	UYS
DRAWN	UYS
CHK	DJA
APPROVED	

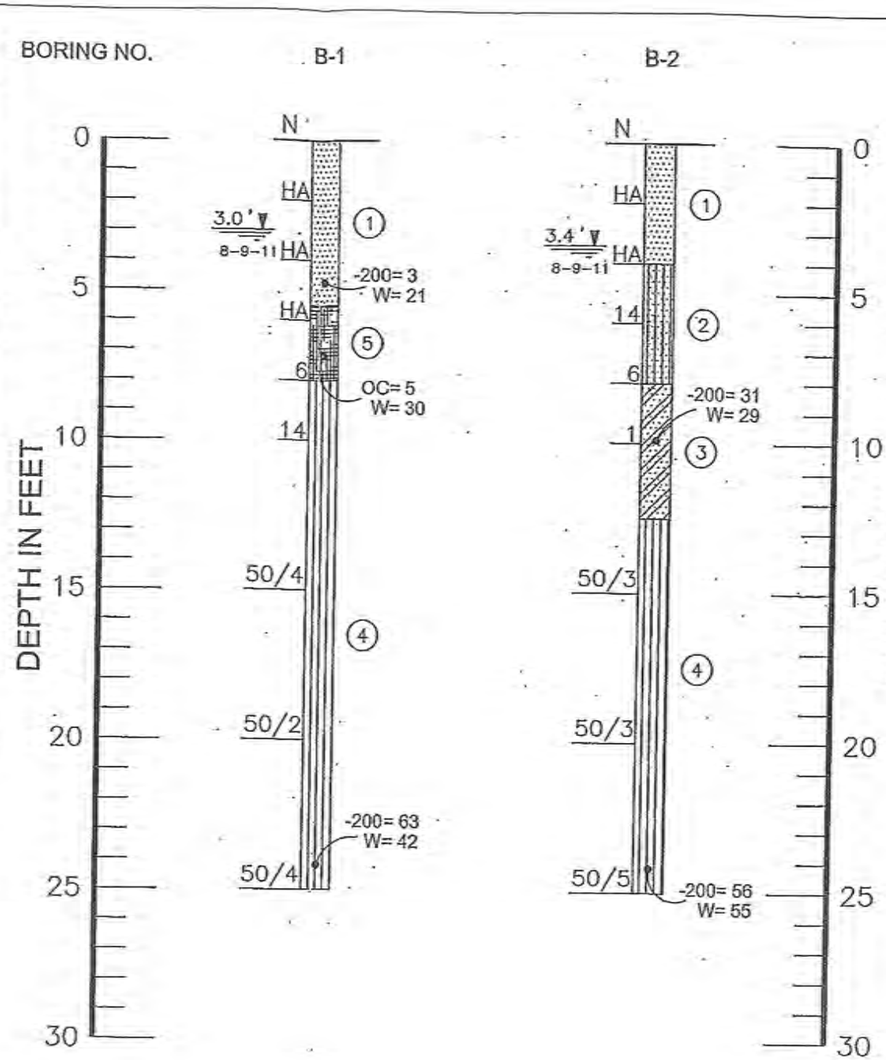
VDS POLE DETAILS

PROJECT NO:	00193-008-014
DATE:	05-18-2012
SHEET NO:	T-13

FILE: O:\UOB\0193\00193-008-14\ACAD\S12_SPLICING.dwg LAST SAVED: Thu, 04/12/12-3:09a PLOTTED: Fri, 05/18/12-0:02a BY: Upik.Suwarno



SOURCE: GOOGLE EARTH.COM



GENERAL LEGEND

1. Light to dark brown fine SAND with trace silt to slightly silty (SP, SP-SM)
2. Brown silty fine SAND with shell fragments (SM)
3. Dark gray clayey fine SAND (SC)
4. Light gray calcareous SILT with cementation layers (ML)
5. Black organic SAND (Pt)

N – Indicates the number of blows of a 140 pound hammer, freely falling a distance of 30 inches, required to drive a 2-inch diameter sampler 12 inches (ASTM D 1586)

-200 – Amount Passing U.S. Standard No. 200 Sieve (%)

W – Moisture Content (%)

OC – Organics Content (%)

B-1 – Standard Penetration Test (SPT) Boring and number

SP – Unified Soil Classification System Group Symbol (ASTM D 2487)

3.0' ▽ 8-9-11 – Depth of groundwater (feet) & date measured

NOTES

(1) Borings were drilled on August 9, 2011 using a Central Mine Equipment Model 55 (CME 55) drilling rig.

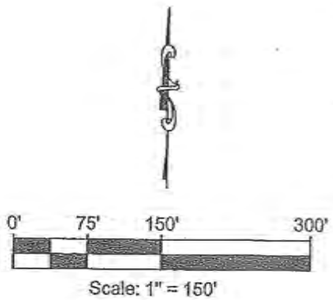
(2) Strata boundaries are approximate and represent soil strata at each test hole location only. Soil transitions may be more gradual than implied.

STANDARD PENETRATION TEST DATA

SPOON INSIDE DIA.	1.375 inch
SPOON OUTSIDE DIA.	2.00 inches
AVG. HAMMER DROP	30 inches
HAMMER WEIGHT	140 pounds

SPT DENSITY CHART

GRANULAR MATERIALS- RELATIVE DENSITY	SPT (BLOWS/FOOT)
VERY LOOSE	LESS THAN 4
LOOSE	4 - 10
MEDIUM	10 - 30
DENSE	30 - 50
VERY DENSE	GREATER THAN 50



⊕ STANDARD PENETRATION TEST
B-1 BORING LOCATION AND NUMBER

SUMMARY OF FOUNDATION DESIGN PARAMETERS

Boring No.	Depth (feet)	Range of SPT - N	Unit Weights (PCF) Moist	Unit Weights (PCF) Submerged	Angle of Interval Friction (degrees)	Effective Cohesion (PSF)	Earth Pressure Coefficients Ka	Earth Pressure Coefficients Kp
B-1	0-5.5	---	110	50	30	0	0.333	3.00
	5.5-8	6	100	40	N/A	N/A	N/A	N/A
	8-12.5	14	120	60	28	0	0.361	2.77
	12.5-25	50+	125	65	35	0	0.271	3.69
B-2	0-4	---	110	50	30	0	0.333	3.00
	4-12.5	1-14	115	55	28	0	0.361	2.77
	12.5-25	50+	125	65	35	0	0.271	3.69

REVISIONS								
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION		NAME	DATE
						DRAWN BY	JS	8-16-11
						CHECKED BY	SNP	8-16-11
						APPROVED BY	SCOTT PARRISH, P.E.	

SCOTT H. PARRISH, P.E.
FLORIDA LICENSE NO. 69091

FLORIDA ENGINEERING CERTIFICATE OF AUTHORIZATION NO. 6870

DUNKELBERGER engineering & testing, inc.

ROAD NO.	COUNTY	PROJECT No.
-	MANATEE	SAR-11-1326

REPORT OF CORE BORINGS FOR MAST LIGHTING

PROJECT NAME: U.S.-301/U.S.-41 AND HABEN BOULEVARD - MAST ARM MANATEE COUNTY, FLORIDA

SHEET No. T-14

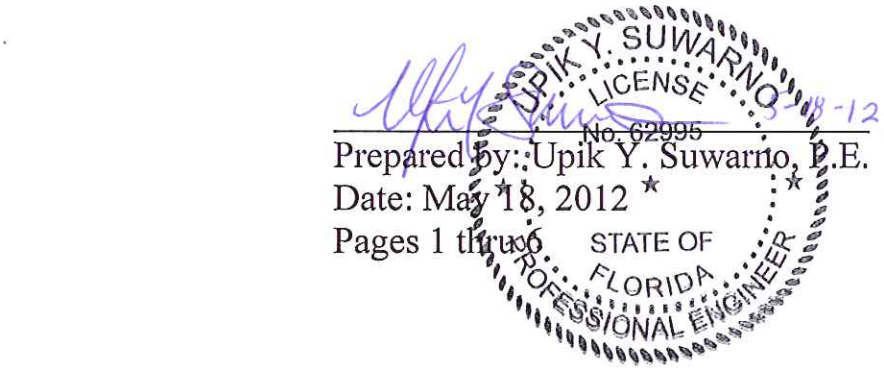
DET Project No. SAR-11-1326

TECHNICAL SPECIAL PROVISION

FOR
SECTION 685
UNINTERRUPTIBLE POWER SOURCE

Financial Project ID: 429873-1-58-01

The official record of this package is the electronic file signed and sealed under Rule 61G 15-23.003, F.A.C.



5-18-12

Prepared by: Upik Y. Suwarno, P.E.
Date: May 18, 2012
Pages 1 thru 6

SECTION 685

Uninterruptible Power Source (UPS) with Battery Charger/Battery Eliminator.

The following section is added after Section 678 (page 772).

685 -1 Product

These are the minimum requirements for an Uninterruptible Power Source (UPS) with an external battery charger/battery eliminator. It is to provide battery backup when commercial power is lost and to smooth the power when operating on a generator.

The UPS shall be on the Florida Department of Transportation's Approved Products List (APL).

The unit shall be comprised of but not limited to; UPS, cabinet enclosure, inverter/charger/controller and an external power converter/charger, power transfer switch with a manually operated, non-electronic bypass switch, and all necessary hardware and interconnect wiring.

UPS equipment shall be compatible with maintaining agency existing system and shall include Ethernet connection and SNMP V3 Support.

685-2 Function

The UPS shall provide a minimum of 8 hours battery back-up time under a 450 watt load @ 25ºF. Battery balancer and equalizer shall be included. While operating on generator power, the external battery charger shall charge the batteries and operate the intersection. The UPS shall have lightning surge protection compliant with IEEE/ANSI C.62.41 for 2000 Volts AC.

The UPS shall be field programmable from a touch pad on the unit and from a computer interface. They must be user friendly, in menu driven formats and must not require external or proprietary software. The DB-9 connector for the RS-232 interface must be installed on the front panel of the UPS. The UPS shall have a battery connector on the front panel. The battery connector shall be an Anderson p/n SB50 or equivalent. The UPS shall have an external battery temperature probe connector on the front panel.

The UPS shall be capable of performing a SELF-TEST from the UPS front panel LCD and remotely via an RS-232 interface. The duration of the SELF-TEST shall be programmable in 1-minute increments from 1 min. to 255 minutes.

The operation of the flash mode shall be field programmable to activate at various times depending on remaining battery capacities.

The batteries shall be Absorbed Glass Matt/Valve Regulated Lead Acid (AGM/VRLA) type specifically designed for UPS's and outdoor use. The batteries shall be designed for "Float Service" to provide 100% out-of-box runtime capacity.

The maximum transfer time allowed, from disruption of normal utility line voltage to stabilized inverter line voltage from batteries, shall be less than 65 milliseconds. The same maximum allowable transfer time shall also apply when switching from inverter line voltage to utility line voltage. The transfer from utility power to battery power, and vice versa, shall not interfere with the normal operation of the traffic controller, conflict monitor or any other peripheral devices within the traffic controller assembly.

When utilizing battery power, the UPS output voltage shall be between 110VAC and 125VAC, pure sine wave output with THD < 3% at 60 Hz +/- 3 Hz.

The UPS shall be capable of providing power for all of the following: full run-time operation, flashing mode operation, or a combination of both full and flash mode operation of an intersection. The batteries shall not be charged when battery temperature exceeds 50ºC +/- 3ºC.

The temperature sensor shall be external to the UPS unit. The sensor output will be used to regulate the charge rate at high ambient cabinet temperature.

The batteries shall be approved for both float and/or standby applications. The batteries shall charge whether on generator power or on commercial power. The UPS shall have a user configurable low battery warning. The UPS shall have a low battery shutdown and a low battery alarm. The UPS low battery shutdown will shut down the UPS unit to prevent battery deep-discharge. The programmable LOW BATTERY alarm shall be user definable and available for local access and via the RS-232 for remote access.

The UPS shall be equipped with an event log that stores at a minimum the last 100 events. The events shall be time and date stamped. The event log shall be retrievable from the RS-232 and from the UPS LCD screen. The RS-232 communication to the PC shall display events in a Text message format with the use of HyperTerminal. The UPS LCD Screen shall display the events in a Binary message format.

The UPS shall have six (6) independently programmable control relays for control and report functions. The UPS shall have two (2) 0 to 8 hour, independently programmable timers with two (2) time-of-day restrictions on each timer.

The UPS shall have six (6) sets of normally open (NO) and normally closed (NC) single pole double-throw (SPDT) dry contact relays rated for 120VAC @ 1A.

1. ON BATTERY. The relay is energized whenever the UPS switches to battery power.
2. LOW BATTERY. The relay is energized when the battery has reached a user defined low battery level of remaining useful capacity. This alarm is latched when a qualified line returns or the inverter shuts down.
3. TIMER 1. The relay is energized after being in backup mode for a given amount of time. This timer is adjustable from 0 to 8hr. The default setting is two (2)

hours.

4. ALARM- relay activates after a specific after a specific or general alarm is detected. These alarm conditions include: line frequency, low output voltage, no temperature probe, overload, batteries not connected, high temperature, and low temperature. The relay can be programmed to activate when any of these alarm conditions are met, or when a specific condition is met.
5. FAULT- relay activates after a specific or general fault is detected. These fault conditions include: short circuit, low battery voltage, high battery voltage, high internal temperature, and excessive overload. The relay can be programmed to activate when any of these fault conditions are met, or when a specific condition is met.

6. AC/DC FAN CONTROL. The relay is activated when the battery ambient temperature is greater than 35ºC or at a user programmable threshold from 25 to 55ºC @ 5ºC increment.

The operating temperature for the UPS, power transfer switch, and manual bypass switch shall be -37ºC to +74ºC @ 1500 Watts.

The operating temperature range of the external inverter/charger shall be 0º to 40ºC with the capability of operating output amperage of 15 Amps @ 54.4 Volts. The external inverter/charger shall shut down for temperatures over 80ºC.

The UPS shall be compatible with all of the following for full phase, flash operation mode, or a combination of both full and flash mode operation:

- Type 332 cabinets,
- Type 170 controllers,
- Type 2070 controllers,
- NEMA TS1 Controllers,
- NEMA TS2 Controllers,
- Electrical Service Pedestals

The UPS shall be easily replaced and installed (complete turnkey system with all necessary hardware). UPS shall not require any special tools for installation.

The UPS shall be equipped to prevent a malfunction feedback to the cabinet and from feeding back to the utility service per UL 1778, Section 48 “Back-feed Protection Test”. The upstream back feed voltage from UPS system shall be less than 1 Volts AC.

In the event the UPS senses the utility line voltage is outside the Hi and Low Limits (100 & 130VAC respectively set as default), the UPS shall transfer the load to battery power. The user can change the Hi and Low limits to suit NEMA Hi and Low Limit Specifications.

A low profile, red LED light shall indicate loss of commercial power. It shall be mounted on the top of the cabinet.

The UPS shall return to line mode when the utility power has been restored to above 105VAC and below 125VAC for more than 30 seconds and when the utility power is back to nominal.

This line qualification time will be adjustable to 3, 10 to 30 seconds. The operator will have the option of making the adjustments locally, using the touch pad or remotely, using the RD-232 interface.

The power transfer switch (PTS) shall be activated during BUCK and BOOST operation. The power transfer time shall be 10 milliseconds or less. The BUCK and BOOST mode shall be provided in case of extended power variations. The UPS shall have the ability to BUCK and BOOST at least 10% +/-.

In the event of UPS failure, battery failure, or complete battery discharge, the power transfer switch shall revert to the Utility or Line Mode (in a de-energized state).

The PTS shall automatically remove power to the intersection's illuminated street name signs when the UPS is operating on battery back-up.

685-3 Assembly

The piggy-back cabinet shall be manufactured from H5052 0.125 aluminum and house the UPS system, including batteries, switches, charger, inverter and mounting kit. The cabinet must meet the requirements for NEMA 3R enclosures. The door shall have a 3-point locking system with ¾ inch ball bearing nylon rollers and a number 2 lock. The door shall have louvered vents with a 9" X 14" replaceable filter. The door shall be attached to the cabinet with a 316 stainless steel continuous hinge and be riveted to the cabinet with stainless steel rivets. The door shall seal with neoprene gasket. The handle shall be ¾ inch 316 stainless steel with pad lock hasp. The roof of the cabinet shall slant from back to front to allow rain to shed away from the mounting cabinet. The cabinet shall have a separate shelf for the UPS and adjustable shelves for batteries.

The cabinet shall have a generator access compartment with a ¼ turn twist lock receptacle inside to allow the cabinet to be powered by a generator. The generator access door shall be flush mounted with a number 2 lock. The door shall be bolted on with six 1/32 stainless steel pem studs. The door shall be capable of closing and locking while the generator cord is plugged into the ¼ turn twist lock receptacle. A fan must be mounted in the air baffle at the top of the cabinet with an air outlet built into the overhang. The fan must be thermostatically controlled. The bottom of the door must be louvered to allow airflow. A removable dust filter must be located behind the vent. The UPS shall be cooled by a variable speed fan that is microprocessor and PWM controlled. The fan shall be OFF when the ambient temperature is less than 40ºC.

A fluorescent light shall be provided and be turned on through a cabinet door switch

One mounting kit and wiring kit shall be included with each UPS cabinet assembly. The mounting kit shall include twelve 5/16 inch, stainless steel bolts with nuts, washers, and lock washers. A 1 ½ inch by ¼ inch rubber grommet shall be provided for the cabinet through hole protection.

The wiring kit shall include six, 12 foot, color coded AWG 10 wires with the following color code and point of termination:

Black with red stripe	incoming commercial A/C power
Black	incoming generator A/C power
White	A/C neutral
Green	A/C ground
Blue	main circuit breaker in controller cabinet
Red	auxiliary circuit breaker in controller cabinet

The enclosure will include built-in transfer switches for both bypassing the UPS for maintenance and to manually transfer to generator power when a generator is connected during power outages.

The batteries shall be provided with appropriate interconnect wiring harnesses with 75 amp quick disconnects with oxlic grease that prevents oxidation and improved conductivity. Battery terminals shall be sprayed with a protective spray that prevents corrosion buildup and neutralizes battery acid.

685-4 Warranty

The UPS shall have a two (2) year full replacement, non-prorated manufacturer's warranty.

Shipping, handling, and all costs associated with repairing or replacing faulty equipment shall be covered by the vendor.

The manufacturer shall provide trouble-shooting via a toll free customer service number.

The manufacturer shall make field maintenance available via a toll free customer service number.

685-5 Method of Measurement

General: Measurement for payment will be in accordance with the following task.

Furnish and Install: The Contract unit price per each for Uninterruptible Power Source (UPS), furnished and installed, will include all equipment, materials, as specified in the Contract Documents and as specified in this Section, and all labor, equipment, and miscellaneous material necessary for a complete and accepted installation.

685-6 Basis of Payment

Basis of Payment: Price and payment will be full compensation for all work specified in this Section. Payment will be made under:
Item No. 685-106 Uninterruptible Power Source (UPS)-each.

TECHNICAL SPECIAL PROVISION

FOR

VIDEO VEHICLE DETECTOR ASSEMBLY

FINANCIAL PROJECT ID: 429873-1-58-01

The official record of this package is the electronic file signed and sealed under Rule 61G 15-23.003, F.A.C.

Name: Upik Y. Suwarno
Page(s): 1 - 11

VIDEO VEHICLE DETECTOR

663-1 Description

Install video vehicle detectors as shown in plans. The system shall be capable of providing presence vehicle detection at signalized intersections. The video detection system shall be expandable without removing or replacing existing units.

Using standard image sensor optics and in the absence of occlusion, the system shall be able to detect vehicle presence with 98% accuracy under normal conditions (days and nights), and 96% accuracy under adverse conditions (fog, rain, etc).

663-2 Materials

663-2.1 General: Use only video vehicle detectors currently listed on the Department's Approved Product List (APL). Ensure that all equipment is marked in accordance with Section 603 and the markings are visible after installation.

All items and materials furnished shall be new, current production models installed and operational in a user environment, and shall be items currently in distribution.

The system shall be capable of monitoring all vehicles on the roadway, providing video-based vehicle detection and have the capability of being programmed via a CRT display and a mouse. As a minimum, the video detection system shall consist of the following materials:

(1) Video Image Processing unit(s)
(2) Video Detection Module(s)
(3) Video Camera(s) with IR filter, enclosure, and sun shield
(4) Camera lens
(5) Camera housing
(6) Surge suppressor
(7) Sensor Bracket(s)
(8) Programming Devices and software
(9) Coaxial/Power Cable
(10) Point Discharge Dissipation Terminals
(11) Coax Line Protectors
(12) Camera Power Protectors
(13) Mounting System
(14) Detector programming device
(15) Software
(16) All other necessary equipment for operation

These devices must comply with any applicable FCC regulations. Operation and Maintenance Manuals shall be supplied with each unit. These manuals shall include the following information:

(1) General description
(2) General characteristics
(3) Installation procedure

(4) Theory of operation
(5) Schematic and logic diagram
(6) Parts list (to include part type, part number manufacturer and ratings)

The manufacturer shall provide the following technical data for all materials where applicable:

(1) Model number
(2) Power and Current requirements/consumption
(3) Temperature range
(4) Weight and Dimensions
(5) Mechanical Construction
(6) Mounting equipment necessary
(7) Operating frequency (FCC approved)
(8) Detection Range, Angle, and Pattern (horizontal and vertical)
(9) Response time and Sensitivity
(10) Software for operation of device
(11) Device capabilities as claimed by manufacturer.
(12) Any limitations, requirements, or potential hazards associated with the operation or maintenance of the device.

The manufacturer will test all video units to ensure compliance to all FCC and department specifications.

The manufacturer will be required to supply a medical statement as to the safety of the unit to the general public (example: pacemakers, etc.).

All product documentation shall be written in the English language.

663-2.2 Video Image Processor: The Video Image Processor (VIP) shall be modular by design and housed in either a self-contained stand-alone unit or fit directly into NEMA TS1 & TS2 type racks mount installation without replacing or modifying the existing VIP units. The VIP module shall be able to connect to a camera.

A video system communication board shall control from 1 to 6 VIP boards allowing for 1 to 12 image sensors.

The system shall be designed to operate reliably in the adverse environment of roadside cabinets and shall meet or exceed all NEMA TS1 and TS2, as well as ATC environmental specifications.

The VIP Video inputs shall be 75 ohms impedance with High Z option.

Ambient operating temperature shall be from -34 to +74 degrees Centigrade at 0 to 95% relative humidity non-condensing.

The system shall be powered by a self contained power supply. Power consumption shall not exceed 135 Watts.

Surge ratings shall be set forth in the NEMA TS1 and TS2 specifications.

Serial communications shall be via an RS232 serial port, modem and Ethernet communication port (RJ-45 connection). The Ethernet communications port shall meet the latest applicable IEEE Ethernet Protocol standards and shall be capable of communicating at 10/100 mbps. These ports can be used for communications to a laptop, modem or fiber modem for

upload/download detector configurations, count, turning movement, queue length data, technical events, send firmware upgrades and carryout remote setup of detectors. A standard Internet browser shall connect to Ethernet IP addressable port (RJ-45 connection) to monitor and set-up the VIP boards. RS485 on the front panel shall facilitate communications to other VIP boards.

Each VIP board shall have 4 opto-isolated open collector outputs. Twenty (20) additional outputs shall be available via the expansion port. The outputs shall be programmed for signaling the presence, the arrival or the departure of vehicles in a minimum of 24 detection zones per video image.

Each VIP board shall allow for twenty (20) digital inputs via the I/O Expansion port.

Each VIP board shall have error detection. An output contact will provide a constant call if the video signal is bad or the VIP board is not functioning properly. A user defined quality level will automatically put the VIP into a recall state in cases of severe degraded visibility (i.e., fog, blizzard, etc.). Normal detection resumes when visibility improves above the user defined quality level.

Operator selectable recall shall be available via the VIP front panel. The operator shall have the ability to assign selectable outputs for recall.

A video select button on the VIP front panel will switch between camera images of the VIP.

The VIP board shall have one (VIP3.1) or two (VIP3.2) video inputs (RS-170 NTSC or CCIR composite video) and one video out.

The VIP board shall have a reset button on the front panel to reset video detectors to “relearn”, the roadway image. During “relearn”, selectable recall can be enabled or disabled for immediate operation. Learning time of video detectors shall be less than 6 minutes.

External surge suppression, independent of the VIP board shall separate the VIP from the image sensor.

The VIP board shall have separate light emitting diodes (LEDs) that indicate:

Power	Red to verify power supply.
1/1 Comm	Green to indicate communications to expansion boards.
Video 1 & 2	Green to verify the presence of video input 75 ohm.
TS & RX	Green to indicate communications via the RS485 and Ethernet communication.
Out1 – Out4	Green if the corresponding detection group is active.

The VIP board shall have 2 separate buttons for Video Select:

Recall	Manually places call or selects video on detectors.
Reset	Manually reset detectors to “learn” new background.

The VIP board shall have a: a) video out female RCA style connector b) DB9 female Service port c) DB9 I/O Expansion port.

The VIP Expansion board shall have separate LEDs that indicate:

Power	Red to verify power supply.
Comm	Green to indicate communications to VIP board.
I/O1-I/O4	Green if the corresponding detection group is active.

The VIP Expansion board shall have 8 dipswitches that define which inputs and outputs are to be used.

663-2.3 Functional Capabilities: Video vehicle detector system shall provide real time detection.

Each VIP board shall be capable of processing the video signal of a minimum of four cameras. The video signal shall be analyzed in real time. It shall provide software MPEG-2 video compression at 30 frames per second.

The system shall be expandable up to 12 cameras that may be connected to different VIP units and programmed independently.

The system shall be capable of displaying detectors on the video image with associated outputs. Outputs/Inputs status will be indicated on the screen. Selectable text overlay will also include the ability to view raw video without any verbiage and/or detectors for monitoring purposes.

Each VIP board will detect within the view of the connected camera the presence of vehicles in user-defined zones. Detectors available shall be presence, count, queue length, turning movement, delay, extension, or pulse mode of either arrival or departure of vehicles. Delay and extension shall be defined between 0.1 - 99 seconds and pulse mode between 0 – 165ms in 33ms increments. Queue length detector thresholds can be programmed to generate an output when the threshold is exceeded.

The VIP board shall be programmed with a standard CCTV monitor and keypad plugged into the VIP serial port to facilitate detector programming.

The VIP board shall store up to 8 detector configurations. It shall be possible to switch between detector configurations manually or automatically by time of day or input from the traffic controller.

Via the serial port, detector configurations can be uploaded to a laptop and stored on disk.

Detectors may be linked to 24 outputs and 20 inputs using Boolean Logic features: AND, OR, NOT.

It shall be possible to make a detector directional sensitive. Options will include an omni-directional detector or a detector that only senses movement: from right to left, left to right, up to down or down to up as you look at the monitor.

To facilitate “fine tuning” of detection zones, a maximum of 10 lines and a minimum of 4 lines shall be adjustable within the confines of the detector.

All detectors and parameters can be changed without interrupting detection. For example: when one detector is modified all existing detectors continue to operate, including the one that is being modified. When the new position is confirmed, the new detector will enter a learning phase. Once the new detector is fully functional, it will take over the job of the old one. In this way, the detector is always fully operational with no interruption on any detector, even during modification. Learning phases for new detectors shall not exceed 6 minutes.

Six detectors per input may be used as count, turning movement and queue length detectors. These detectors will detect and store data at user-defined intervals of 1,2,3,4,5,6,10, 15, 30 & 60 minutes. It shall be possible for each VIP board to store up to 14226 intervals of data in non-volatile memory.

Associated software may be used with a PC to download data and export to a spreadsheet. Software will also be used to upload/download detector configurations, count, turning movement and queue length data, technical events, send software version upgrades and do remote setup of detectors.

The VIP board shall have an internal clock with daylight saving time system, which can be enabled or disabled.

The VIP board shall have a security password embedded, which may be enabled or disabled by the supervisor.

The VIP board shall monitor the 120 VAC green outputs of each movement and provide Delay Detection and Stretch Detection Program capability with Green Overrides programmable for each detection zone. Intervals shall be programmed in whole second increments from 0" to 60".

663-2.4 Video Camera: The unit shall be a high resolution (horizontal resolution 460 TV Lines), 1/3" image format CCD camera, designed for professional video detection systems to capture images of vehicles under all weather and lighting conditions. Incorporating the latest in CCD technology, the video camera shall provide detailed video without lag, image retention, or geometric distortion. The VIP board shall work with monochrome and/or color cameras as the video source for real-time vehicle detection.

The Camera must be in an enclosed assembly with the following minimum specifications:

Temperature range	-34 to +74 degrees C
Humidity	0% to 95% relative, non-condensing
Dimensions	47mm X 47mm X 83mm
Weight	200g (max)
Camera mounting slots	¼-20, top and bottom
Connectors	BNC for video out
Lens mount	CS Power-in/pressure screw Lens/4-square connector
Finish	Off-white, semi-gloss polyurethane
Construction	All metal housing
Rated input voltage	12VDC or 24VAC +/-10%@60Hz
Nominal power	10 Watts maximum
Imager	Interline transfer CCD 1/3"format
Imager spectral response	100% @ 550nm: 30% @ 400nm and 800nm
Sync system	EIA RS-170
Active picture elements	768 H X 494 V
Horizontal resolution	580 TVL

Sensitivity (2856 K)		Usable Picture	Full Video
Scene Illumination	fc	0.012	0.08
	lx	0.12	0.8
Imager Illumination	fc	0.0015	0.01
	lx	0.015	0.1
F1.2 lens @ 75% highlight			
Signal to noise ratio	54 dB minimum 58 dB typical		
AGC	18 dB		
Light range (AGC on)	1,000,000:1 min. with f/1.4 to 360 auto-iris lens		
Video out	1.0 volts peak-to-peak +/- 0.1 Volt @ 75 Ohms		
Gray scale	At least 10 steps		

663-2.5 Camera Lens: The camera lens shall be a motorized vari-focal 6.5-39mm with auto iris, including:

Image format	1/3 inch
Focal length	6X zoom (6.5-39mm)
Iris range	f 1.0 – Approx. 1200
Back focus distance	10.05mm (0.4in.) in air
Weight	500g
Size	60mm X 70mm X 89.9mm
Lens mount	CS
Iris control	DC or Video 4-pin square
Focus control	Motorized
Zoom	Motorized

663-2.6 Camera Housing: The camera assembly shall include a weatherproof housing and an integral sunshield for outdoor installation.

The weatherproof housing shall incorporate a mounting bracket to allow proper positioning of the camera. The mounting bracket shall be pre-drilled to allow attachment to standard brackets for mounting on mast arms or on Luminaire arms. Separate connectors at the back of the housing for both video and power cables shall be provided to make the camera assembly field-replaceable if service is required. A heater shall be mounted near the faceplate of the housing to minimize condensation.

The sunshield shall minimize the heating of the housing during hot weather. The sunshield shall extend beyond the ends of the weatherproof housing to minimize rain on the faceplate or body of the housing to eliminate dripping water in the line of sight of the camera.

The weatherproof housing shall be an aluminum enclosure and as a minimum, shall meet the following specifications:

Temperature range	-34 to +74 degrees C
Dimensions	449mm x 97mm x 112mm
Weight	1.4kg
Housing mounting	Three ¼-20 tapped holes

Camera mounting	Removable cradle assembly
Cable entry	Three liquid-tight fittings that will accept cable diameters of: One fitting – 2 to 7 mm Two fittings – 3 to 10 mm
Finish	Off-white semi-gloss polyurethane
Construction	Extruded aluminum housing, Aluminum rear-end cap, Aluminum front cap with glass faceplate, and aluminum cradle A sunshield shall be included
Window	3 mm thick glass, that includes a Thermostatically controlled window Heater/defogger strip
Rated input voltage	115 VAC 60 Hertz
Voltage range	108 VAC to 132 VAC
Output voltage	24 VAC 60 Hertz
Nominal power	30 Watts (Includes 20 Watts max for heater)
Enclosure protection	Waterproof and dust-tight in a NEMA-4, IP65, enclosure Type 3

663-2.7 Surge Suppressor: The video surge suppressor shall provide coaxial cable connection points to a transient suppressor for each image sensor and as a minimum shall include the following:

Peak Surge Current (8x20 us)	5KA
Technology	Hybrid, Solid State
Attenuation	0.1db @ 10Mhz
Response Time	<1 nanosecond
Protection	Line to Ground
Shield to Ground	(isolated shield modules)
Clamp Voltage	6 volts
Connectors	BNC
Impedance	75 Ohms
Temperature	-34 to +74 degrees C
Humidity	0-95% non-condensing
Dimensions	4.5” x 1.5” x 1.25”
UL Listed	UL 497B

Point Discharge Dissipation Terminal and Camera Power Protectors shall be provided for each camera. An Uninterruptible Power Source of at least 350 VA capacity shall be provided for the VIP and cameras.

663-2.8 Sensor Bracket: Camera brackets for mast arm installations shall provide adjustments for both vertical and horizontal positioning for the camera. Camera attachments shall be designed to securely fasten the camera to prevent the camera assembly from falling into the path of vehicles and/or becoming loose. Miscellaneous hardware shall be stainless steel or galvanized steel.

Camera brackets for luminaire arm installations shall provide adjustments for both vertical and horizontal positioning of the camera. Camera attachments shall be designed to securely fasten the camera to the luminaire arm. Miscellaneous hardware shall be stainless steel or galvanized steel.

663-2.9 Coaxial and Power Cable: Coaxial & Power cable (Hybrid) shall be suitable for exterior use and in direct sunlight. Power cable shall have a minimum of 5 conductors. Coaxial cable will be used for zooming and, focusing of the image sensor from the controller cabinet.

663-2.10 Programming Device: In an effort to upload/download detector configurations, count, turning movement and queue length data, technical events, send software versions upgrades and to setup detectors, the product supplier of the video detection system shall provide one (1) laptop devices with the following minimum configuration:

Central Processor (1.5GHz) with the following:
32MB Video, 14.1 XGA
USB Optical Mouse with Scroll feature
512MB Memory, 2DIMM
24X CDRW/DVD Drive
40 GB Ultra ATA Hard Drive
Internal 56K Modem
3.5” 1.44HD Floppy Drive
Windows XP Operating System (professional)
48WHr Additional Modular Battery for Dual Battery Support
Microsoft Office “Standard”

663-2.11 Software: The manufacturer software shall be provided for detection zone programming and operation. One software package shall be provided for each detection system. Software updates/revisions shall be provided to the FDOT as updated by the manufacturer at no additional charge.

All setup, controller program and diagnostic software shall be provided and run on the latest version of Windows based-operating systems. Software updates shall be provided free of charge during the warranty period.

All on-line help shall be provided as an integral part of the system software.

The operator shall be able to perform the following functions through the setup program.

(1) View a detection output from the detection unit.
(2) View a low signal from the detector unit.
(3) Program the presence timeout parameters in one minute increments from zero to thirty minutes.
(4) Provide a quick tune feature for re-tuning in an expedited fashion under ideal background condition.
(5) Select and program a new ID number for each detector unit.
(6) Program a response time for the detector unit.
(7) Program a hysterics value from a selection of low, medium, or high.
(8) Program a profile number for each detector unit.

The system shall include software that detects vehicles in multiple lanes using only the video image. Detection zones shall be defined using only an on board video menu and a pointing device the zones on a video image. Up to 24 detection zones per camera view shall be available. A separate computer shall not be required to program the detection zones.

663-3 Installation

663-3.1 General: Take all precautions necessary for the protection of all personnel and meet all requirements of OSHA regulations and FDOT Specifications Section 7-1.5 for the Occupational Safety and Health Requirements associated with this work.

Use manufacturer recommended tools and equipment to install all video detection equipment, retaining/mounting devices and software. All special installation and maintenance equipment must be provided by the vendor/manufacturer and should allow for adjustments without lane closure.

A factory certified representative from the manufacturer should be on-site during installation to supervise the installation and testing of the video equipment by maintaining agency personnel.

663-3.2 Mounting: Video detectors work in either a side-fire or overhead position. They should be mounted at a height that enables distinction between vehicles. Special instructions for mounting must be provided by the manufacturer.

Consider the location of the installed video detectors on the plans as sufficiently flexible as to allow for unanticipated field conditions at the site. The Engineer will direct any variations from the locations shown.

663-3.2 Powering: The manufacturer must provide required amplifiers for installation.

663-3.3 Calibrations and Aiming: All calibration and aiming shall be done with the device mounted in place, without interruption of traffic. Adjustments will be made according to manufacturer's recommendations.

The operator shall be able to set up, monitor lane status and retrieve data from the detector through the RS 232 serial port with any IBM compatible laptop or desktop computer. Also, the detector shall be compatible with a standard phone modem for remote data retrieval.

The sensor shall be able to hold the detection until the zone is cleared. Additionally, the sensor shall be able to tune-out stationary targets that remain within the detection zone for a minimum of 15 minutes.

The sensor shall self-tune to its detection zone with no external adjustments other than physical alignment. There will be no external tuning controls of any kind, which will require an operator.

The detector output must be directly compatible with the controller cabinet detector input.

663-4 Method of Measurement

663-4.1 General: Measurement for payment will be in accordance with the following task.

663-4.2 Furnish and Install: The Contract unit price per each for Vehicle Detector Assembly, furnished and installed, will include all equipment, materials as specified in the Contract Documents and as specified in this Section, and all labor, equipment, and miscellaneous materials necessary for a complete and accepted installation.

663-5 Basis of Payment

Price and payment will be full compensation for all work specified in this Section. Payment will be made under:

Item No. 663-74-15 Vehicle Detector Assembly (Video) – each.

LIGHTING ANALYSIS

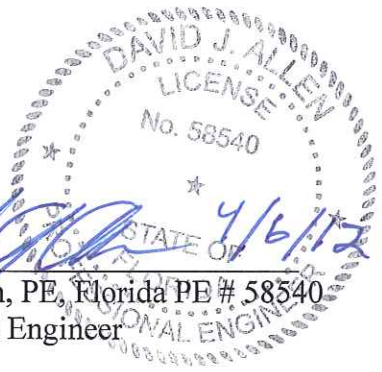
FOR

US 301 at Haben Boulevard
Manatee County, Florida

County Project Number:
0019901

Prepared For:

MANATEE COUNTY



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April 2012

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Executive Summary

Manatee County has requested a lighting analysis be conducted for the intersection of US 301 and Haben Boulevard. The County proposes to reconstruct the existing traffic signal. The existing traffic signal poles currently include luminaires. This analysis will develop mast arm mounted design lighting requirements to replace the existing signal pole mounted luminaires to maintain an acceptable roadway illumination. The segment of US 301 at the intersection has existing roadway lighting with 400 watt High Pressure Sodium luminaire at a mounting height of 40 feet and in a staggered arrangement.

Using a 400 watt (51000 lumens) High Pressure Sodium (HPS) GE M-400A POWR/DOOR luminaire with cutoff optics with a Type III throw and a photometric curve number GE 35-451002 provides an average initial intensity of 2.2 foot candles with an average to minimum uniformity ratio of 3.7 to 1 and a maximum to minimum uniformity ratio of 9.2 to 1. These results are similar to the existing lighting along US 301 and meet the FDOT and AASHTO lighting criteria.

Based on our analysis, a 400 watt High Pressure Sodium (GE M-400A POWR/DOOR) luminaire providing a Type III throw with cutoff optics and a photometric curve number GE 35-451002 provided the optimum illumination.

1.0 Introduction

Manatee County has requested a lighting analysis be conducted for the intersection of US 301 and Haben Boulevard. The County proposes to reconstruct the existing traffic signal. The existing traffic signal poles currently include luminaires. This analysis will develop mast arm mounted design lighting requirements to replace the existing signal pole mounted luminaires to maintain an acceptable roadway illumination. Power service for the mast arm mounted luminaires will be 120 volts and energized from the traffic signal circuit. The project intersection is indicated on Figure 1.

This segment of US 301 is designated as an arterial and includes existing roadway lighting with 400 watt High Pressure Sodium luminaires at a mounting height of 40 feet and in a staggered arrangement.

Figure 1: Project Location Map

2.0 Lighting Analysis

This lighting analysis complies with the following design criteria:

- Florida Department of Transportation Design Standards, January 2010
- Florida Department of Transportation Plans Preparation Manual, January 2010
- Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2010
- AASHTO – Roadway Design Guide, 3rd Edition, 2006
- AASHTO – Roadway Lighting Design Guide, October 2005
- AASHTO – Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition, 2010

The following criteria for the lighting analysis are from the FDOT Plans Preparation Manual.

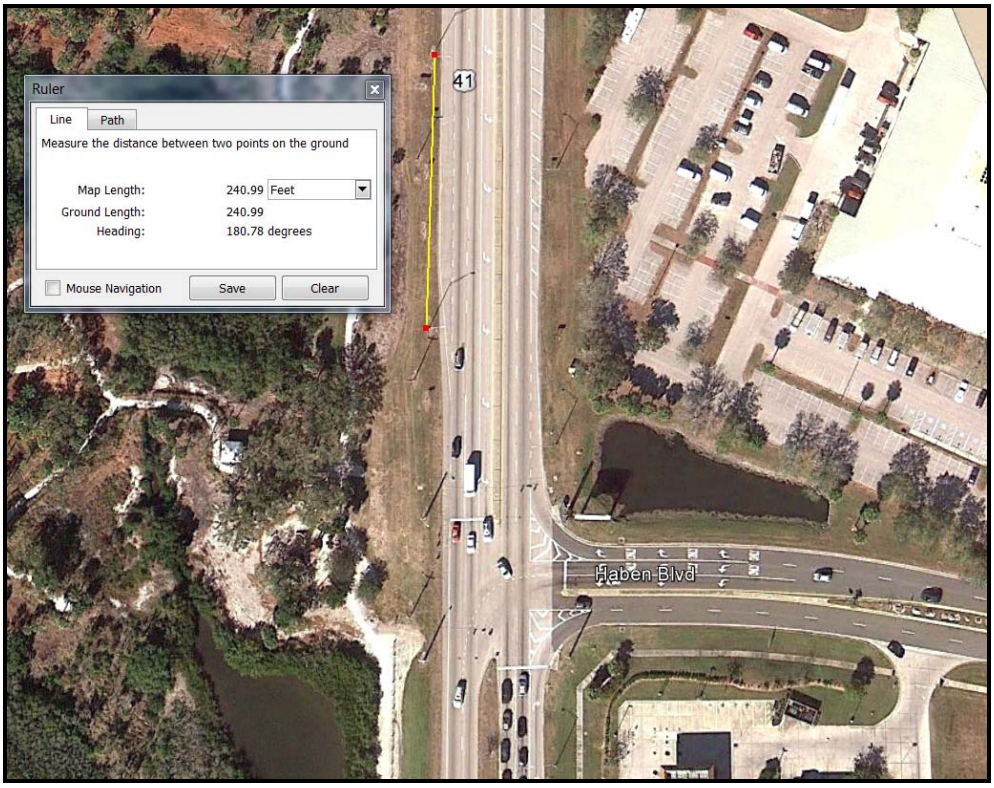
- Uniformity Ratios
  - Average/Minimum: 4:1 or Less
  - Maximum/Minimum: 10:1 or Less

The average initial intensity foot candles will be determined using the existing design lighting conditions

2.1 Existing Lighting Conditions

This segment of US 301 is designated as an arterial and includes existing roadway lighting using 400 watt High Pressure Sodium with a mounting height of 40 feet in a staggered arrangement. Poles are spaced on 240 feet centers as measured along one side of the road as shown in Figure 2.

Figure 2: Existing Lighting Conditions on US 301



The existing roadway lighting is supplemented by additional strain pole mounted luminaires at the intersection. The Visual Roadway Lighting tool was used to model the existing conditions excluding the strain pole luminaires. Our analysis indicates the average initial intensity is 2.3 foot candles north of the intersection and 1.9 foot candles south of the intersection. The Visual output sheets for the existing lighting along US 301 are located in Appendix A. US 301 is a major arterial and per FDOT Plans preparation Manual, the lighting criteria state the average initial intensity should be 1.5 foot candles with a maximum of 1.5 times the average (2.25) to improve the uniformity ratios. Therefore, the analysis will use the range of 1.9 to 2.25 foot candles as an acceptable result in the lighting analysis.

2.2 Lighting Analysis for the Intersection of US 301 and Haben Boulevard

The proposed intersection geometry and the existing light pole locations along US 301was modeled in the Visual software to determine the necessary luminaire type and wattage needed for the signal design. The proposed mast arm a location is at the approximate location consistent with the corridor-wide 240 feet staggered spacing. Using a 40 foot mounting height and the luminaire orientated over US 301, it was determined that a 400 watt High Pressure Sodium (GE M-400A POWR/DOOR) luminaire providing a Type III throw with cutoff optics and a photometric curve number GE 35-451002 provided the best illumination yielding the following results within acceptable limits as indicated in parenthesis.

- Average foot candle: 2.2 ***(1.9 to 2.25)***
- Minimum foot candle: 0.6
- Maximum foot candle: 5.5
- Maximum/minimum uniformity ratio: 9.2:1 ***(<10:1)***
- Average/minimum uniformity ratio: 3.7:1 ***(<4:1)***

The Visual software printout is included in Appendix B. For additional information on the luminaire mentioned above, see Appendix C.

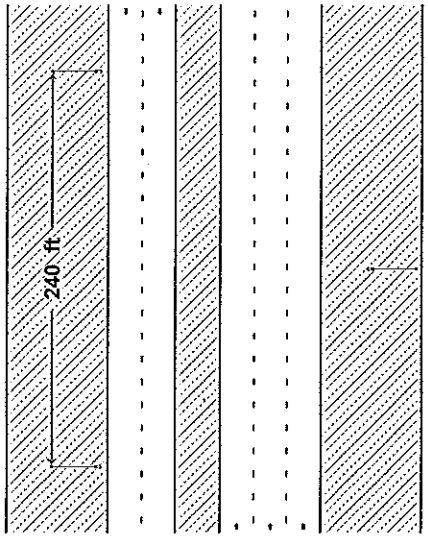
3.0 Conclusion

Based on our analysis, a 400 watt High Pressure Sodium (GE M-400A POWR/DOOR) luminaire providing a Type III throw with cutoff optics and a photometric curve number GE 35-451002 provided the optimum illumination.

APPENDIX A
EXISTING LIGHTING CONDITIONS CALCULATIONS

Design Information

Project	US 301 and Haben Boulevard Intersection Improvement
Number	Cardno TBE Project Number 00193-008-14
Name	David Allen, PE
Company	Cardno TBE



Roadway Information

Number Left Lanes	2
Left Lane Width	12 ft
Median Width	16 ft
Number Right Lanes	3
Right Lane Width	12 ft
Calculation Method	IES RP8-2000
Pavement Reflectance	Asphalt - R3
Roadway Classification	Major
Pedestrian Conflict	Medium

Luminaire Information

Left Side

Label	A
Catalog Number	M*CL40S****FMC2*
Photometric File	ge451001.IES
Lamp Lumens	51000
Light Loss Factor	1.00
Input Power	468 W
Tilt	0°
Arm Length	15 ft
Mounting Height	40 ft
Setback	20 ft
Quantity	5

Right Side

Label	A
Catalog Number	M*CL40S****FMC2*
Photometric File	ge451001.IES
Lamp Lumens	51000
Light Loss Factor	1.00
Input Power	468 W
Tilt	0°
Arm Length	15 ft
Mounting Height	40 ft
Setback	34 ft
Quantity	4

Calculation Results - Left Side

Luminance

Average	1.5	cd/m²
Max	2.6	cd/m²
Min	0.7	cd/m²
Max/Min	3.7	
Avg/Min	2.1	

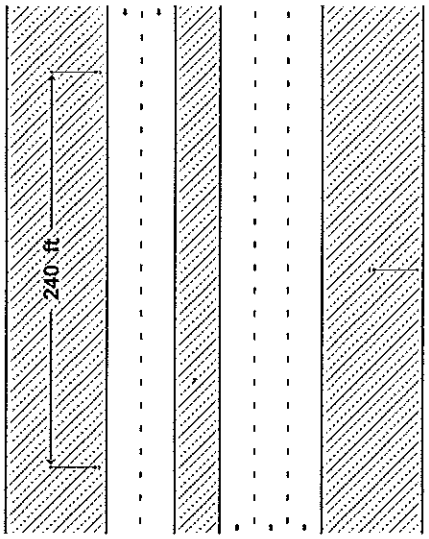
Illuminance

Average	2.1	fc
Max	5.2	fc
Min	0.7	fc
Max/Min	7.4	
Avg/Min	3.0	

Lv Ratio	0.2
STV	5.2
Spacing	240 ft
Length	1000 ft
Quantity	9

Design Information

Project	US 301 and Haben Boulevard Intersection Improvement
Number	Cardno TBE Project Number 00193-008-14
Name	David Allen, PE
Company	Cardno TBE



Roadway Information

Number Left Lanes	2
Left Lane Width	12 ft
Median Width	16 ft
Number Right Lanes	3
Right Lane Width	12 ft
Calculation Method	IES RP8-2000
Pavement Reflectance	Asphalt - R3
Roadway Classification	Major
Pedestrian Conflict	Medium

Luminaire Information

Left Side

Label	A
Catalog Number	M*CL40S****FMC2*
Photometric File	ge451001.IES
Lamp Lumens	51000
Light Loss Factor	1.00
Input Power	468 W
Tilt	0°
Arm Length	15 ft
Mounting Height	40 ft
Setback	20 ft
Quantity	5

Right Side

Label	A
Catalog Number	M*CL40S****FMC2*
Photometric File	ge451001.IES
Lamp Lumens	51000
Light Loss Factor	1.00
Input Power	468 W
Tilt	0°
Arm Length	15 ft
Mounting Height	40 ft
Setback	34 ft
Quantity	4

Calculation Results - Right Side

Luminance

Average	1.0	cd/m²
Max	1.8	cd/m²
Min	0.7	cd/m²
Max/Min	2.6	
Avg/Min	1.4	

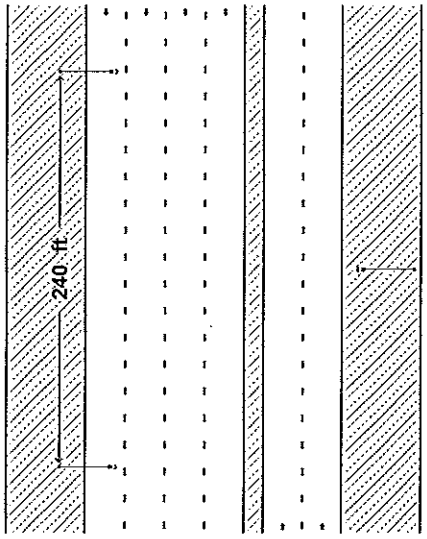
Illuminance

Average	1.7	fc
Max	4.0	fc
Min	0.9	fc
Max/Min	4.4	
Avg/Min	1.9	

Lv Ratio	0.4	
STV	4.1	
Spacing	240	ft
Length	1000	ft
Quantity	9	

Design Information

Project	US 301 and Haben Boulevard Intersection Improvement
Number	Cardno TBE Project Number 00193-008-14
Name	David Allen, PE
Company	Cardno TBE



Roadway Information

Number Left Lanes	4
Left Lane Width	12 ft
Median Width	6 ft
Number Right Lanes	2
Right Lane Width	12 ft
Calculation Method	IES RP8-2000
Pavement Reflectance	Asphalt - R3
Roadway Classification	Major
Pedestrian Conflict	Medium

Luminaire Information

Left Side

Label	A
Catalog Number	M*CL40S****FMC2*
Photometric File	ge451001.IES
Lamp Lumens	51000
Light Loss Factor	1.00
Input Power	468 W
Tilt	0°
Arm Length	15 ft
Mounting Height	40 ft
Setback	8 ft
Quantity	5

Right Side

Label	A
Catalog Number	M*CL40S****FMC2*
Photometric File	ge451001.IES
Lamp Lumens	51000
Light Loss Factor	1.00
Input Power	468 W
Tilt	0°
Arm Length	15 ft
Mounting Height	40 ft
Setback	22 ft
Quantity	4

Calculation Results - Left Side

Luminance

Average	1.6	cd/m²
Max	2.9	cd/m²
Min	0.7	cd/m²
Max/Min	4.1	
Avg/Min	2.3	

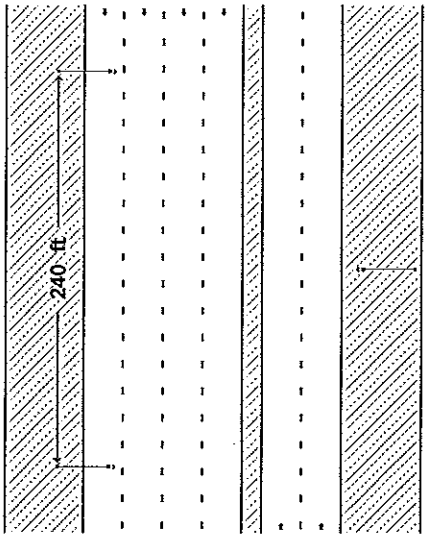
Illuminance

Average	2.3	fc
Max	5.4	fc
Min	0.7	fc
Max/Min	7.7	
Avg/Min	3.3	

Lv Ratio	0.2	
STV	4.1	
Spacing	240	ft
Length	1000	ft
Quantity	9	

Design Information

Project	US 301 and Haben Boulevard Intersection Improvement
Number	Cardno TBE Project Number 00193-008-14
Name	David Allen, PE
Company	Cardno TBE



Roadway Information

Number Left Lanes	4
Left Lane Width	12 ft
Median Width	6 ft
Number Right Lanes	2
Right Lane Width	12 ft
Calculation Method	IES RP8-2000
Pavement Reflectance	Asphalt - R3
Roadway Classification	Major
Pedestrian Conflict	Medium

Luminaire Information

Left Side

Label	A
Catalog Number	M*CL40S****FMC2*
Photometric File	ge451001.IES
Lamp Lumens	51000
Light Loss Factor	1.00
Input Power	468 W
Tilt	0°
Arm Length	15 ft
Mounting Height	40 ft
Setback	8 ft
Quantity	5

Right Side

Label	A
Catalog Number	M*CL40S****FMC2*
Photometric File	ge451001.IES
Lamp Lumens	51000
Light Loss Factor	1.00
Input Power	468 W
Tilt	0°
Arm Length	15 ft
Mounting Height	40 ft
Setback	22 ft
Quantity	4

Calculation Results - Right Side

Luminance

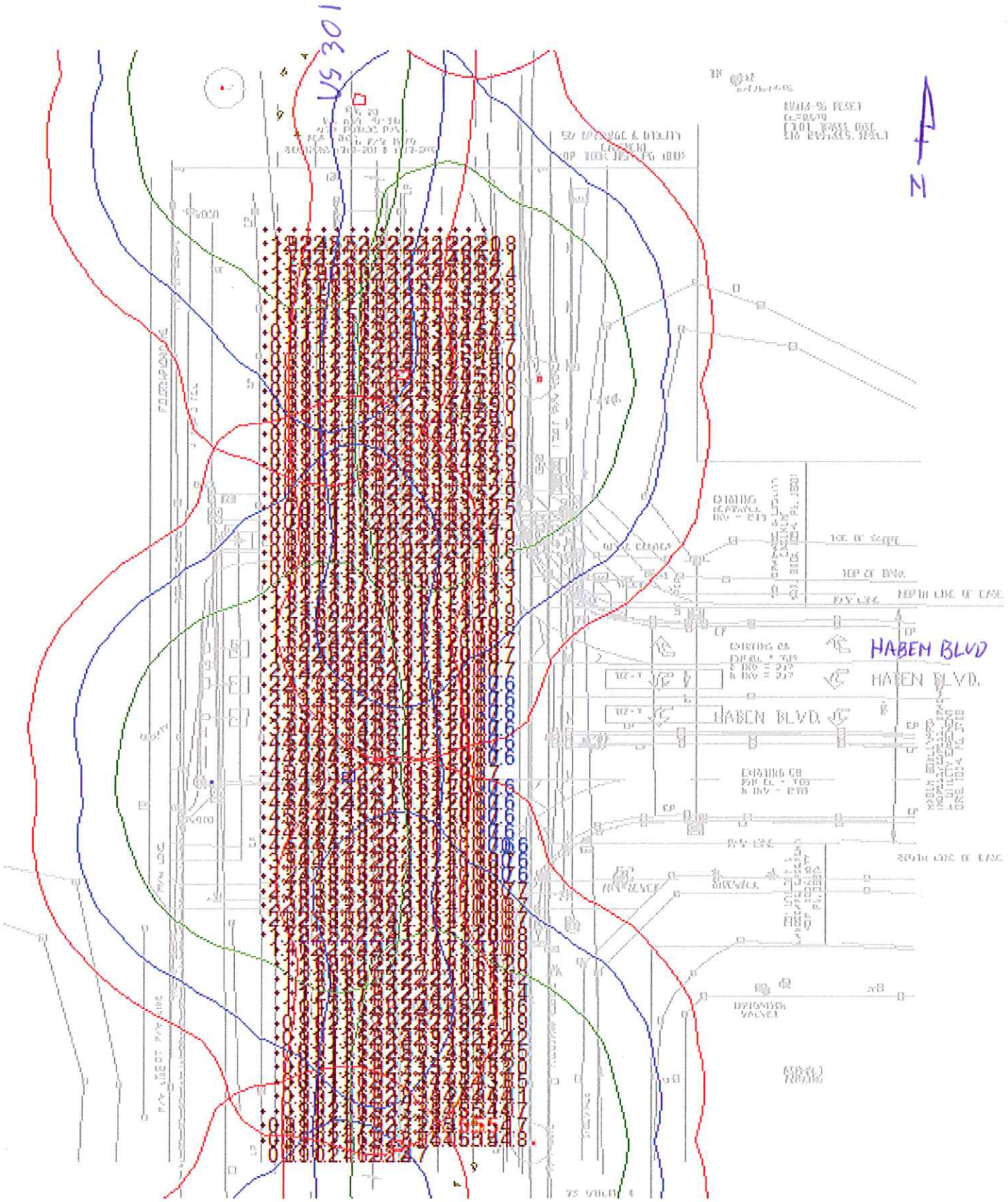
Average	1.6	cd/m²
Max	2.6	cd/m²
Min	0.9	cd/m²
Max/Min	2.9	
Avg/Min	1.8	

Illuminance

Average	2.4	fc
Max	5.3	fc
Min	0.9	fc
Max/Min	5.9	
Avg/Min	2.7	

Lv Ratio	0.2
STV	3.6
Spacing	240 ft
Length	1000 ft
Quantity	9

APPENDIX B
ROADWAY LIGHTING ANALYSIS RESULTS


US 301
N
HABEN BLVD
HABEN BLVD.
HABEN BLVD

400 WATT LUMINAIRE ON THE MAST ARM ON THE WEST SIDE AT US 301 AND HABEN BOULEVARD.

LUMINAIRE SCHEDULE

Symbol	Label	Qty	Catalog Number	Description	Lamp	File	Lumens	LLF	Watts
· ·	A	6	M*CL40S****FMC2*	M-400 CUTOFF	1; 400W HPS, CLEAR ED18, HORZ	ge451001.IES	51000	1.00	468
· ·	mast	1	M*CL40S****FMC3*	M-400 CUTOFF	1; 400W HPS, CLEAR ED18, HORZ	ge451002.IES	51000	1.00	468

STATISTICS

Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min
Intersection	+	2.2 fc	5.5 fc	0.6 fc	9.2:1	3.7:1

APPENDIX C
MAST ARM LUMINAIRE INFORMATION

M-400A POWR/DOOR® LUMINAIRE WITH CUTOFF OPTICS

APPLICATIONS

- For street, highway and parking lot lighting

SPECIFICATION FEATURES

- Powr/Module ballast assembly
- Filtered optics
- Universal two or four-bolt slipfitter
- Standardized reflector
- "Dead back" tunnel type, FRP terminal board
- 2 in. pipe mounting only with MDCA
- Die-cast aluminum housing with polyester powder gray paint finish
- Adjustable mogul base socket (house side) – E39 standard
- ALGLAS® finish on reflector
- No-tool PE receptacle
- Plug-in ignitor available
- External paddle type stainless steel bail latch
- UL/cUL listed unit available—See Options
- True 90° cutoff—no light above 90° (meets RP8-2000 for full cutoff) with flat glass

ORDERING NUMBER LOGIC

MDCL	40	S	1	A	2	1	F	MC3	1	F
PRODUCT IDENT	WATTAGE	LIGHT SOURCE	VOLTAGE	BALLAST TYPE	PE FUNCTION	IGNITOR MOUNTING	LENS TYPE	IES DISTRIBUTION TYPE	FILTER	OPTIONS
XXXX	XX	X	X	X	X	X	X	XXX	X	XXX
MDCA = M-400A with Cutoff ★ Optics 4-Bolt Slipfitter MDCL = M-400A with Cutoff ★ Optics 2-Bolt Slipfitter ★ = Previously IESNA Full Cutoff Optics	10 = 100 15 = 150 (55V) 17 = 175 20 = 200 24 = 250/400 25 = 250 31 = 310 32 = 320 35 = 350 40 = 400 NOTE: Dual wattage connected for lower wattage only	E = Energy Act Compliant Pulse MH (EPMH) S = HPS P = PMH Standard: Lamp not included.	60Hz 0 = 120/208/240/277 Multivolt 1 = 120 2 = 208 3 = 240 4 = 277 5 = 480 7 = 120X240 8 = 240V Ballast 120V PE Receptacle not reconnectable D = 347 F = 120X347 T = 220 W = 230 50Hz 6 = 220 R = 230 Y = 240 NOTE: Dual voltage connected for lower voltage	See Ballast Selection Table A = Autoreg H = HPF Reactor or Lag M = Mag-reg N = NPF Reactor or Lag P = CWI with Grounded Socket Shell	1 = None 2 = PE Receptacle NOTE: Receptacle connected same voltage as unit except as noted. Order PE Control separately.	1 = Non Plug-in/ None 2 = Plug-in base and Ignitor	A = Acrylic Clear Globe (250 watt Maximum) F = Flat Glass ★ G = Shallow Glass Globe L = Polycarbonate Clear Globe (250 watt) HPS only ★ = Previously IESNA Full Cutoff Optics	See Photometric Selection Table S = Short M = Medium C = Cutoff ★ 1 = Type I 2 = Type II 3 = Type III ★ = Previously IESNA Full Cutoff Optics	1 = Fiber gasket 2 = Charcoal with elastomer gasket	F = Fusing (Not available with multivolt or dual voltage) J = Line Surge Protector, Expulsion Type N = Meets ANSI C136.31 requirments for Bridge and Underpass Vibration U = UL Listed Glass Lens and (60Hz only)

R

ROADWAY LIGHTING

PHOTOMETRIC SELECTION TABLE

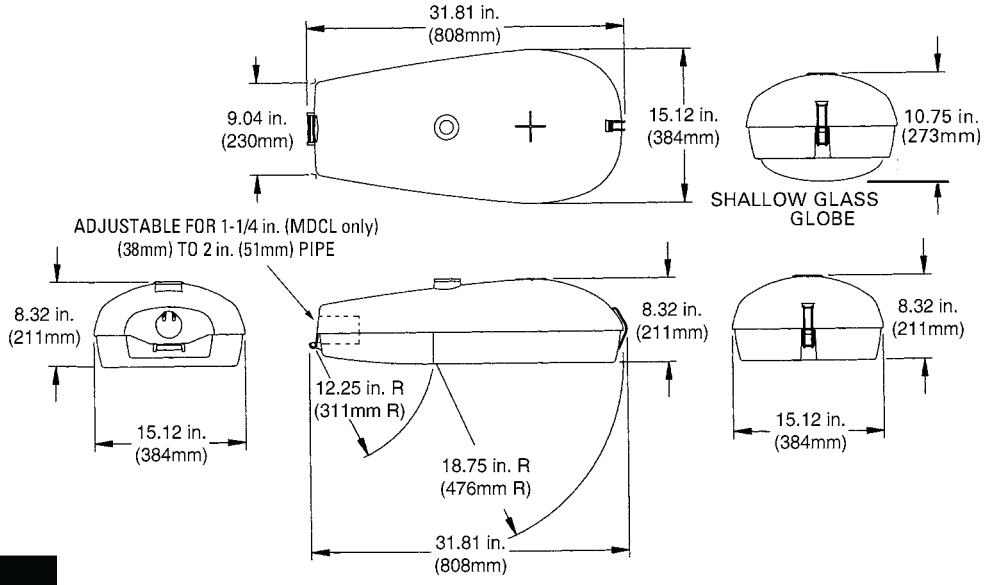
CLEAR REFRACTORS All light sources are clear.

Wattage	Light Source	IES Distribution Type Photometric Curve Number 35–45xxxx							
		Flat Glass "F"		SAG Glass Globe "G"					Polycarbonate
		MC2	MC3	MC1	SC2	SC3	MC2	MC3	
150 (55V)	HPS	0386	0387	N/A	N/A	N/A	0547	0546	C/F
200-400	HPS	1001	1002	N/A	0101	0102	1003	1004	1045** (MC3)
175, 250, 320, 350, 400	EPMH	0343	0342	N/A	N/A	N/A	0544	0545	C/F
	EPMH	*452880	*452882	0281	N/A	N/A	0280	N/A	N/A

NOTE: N/A = Not Available C/F = Contact Factory
PMH—Contact Factory
*Requires the use of ED-28 Lamp
**250 watts maximum

M-400A POWR/DOOR® LUMINAIRE WITH CUTOFF OPTICS & 4 BOLT SLIPFITTER

FIXTURE DIMENSIONS



DATA

Approximate Net Weight	**33-39 lbs**	**15-19 kgs**
Effective Projected Area	**1.1 sq. ft. max**	**.01 sq. M max**
Suggested Mounting Height	**30-50 ft.**	**9-15 M**

REFERENCES

See Page R-48 for start of Accessories.
See Page R-52 for Explanation of Options and Other Terms Used.
See Pole and Bracket Section Page P-2 for pole selection.

BALLAST SELECTION TABLE

Wattage	Light Source	Multi-volt	Ballast Type/Voltage 60Hz 120	208	240	277	480	120X 240	347, 120X347	240/120 PE R	220	230	50Hz 220	230	240
150 (55V)	HPS	**H,N,A**	**G,H,M,N**	**G,M**	**G,M**	**G,M**	**G,M**	**G,H,M,N**	**G*,H,M*,N**	**G,M**	N/A	N/A	N/A	N/A	N/A
200	HPS	**A,M,P**	**A,G,H,M,N,P**	**A,G,H,M,N,P**	**A,G,H,M,N,P**	**A,G,M,P**	**A,G,M**	**A,G,M,P**	N/A	**A,G,H,M,N**	N/A	**H**	N/A	N/A	N/A
250	HPS	**A,M,P**	**A,G,H,M,N,P**	**A,G,H,M,N,P**	**A,G,H,M,N,P**	**A,G,M,P**	**A,G,M,P**	**A,G,M,P**	**A,M,P**	**A,G,H,M,N**	**A,H**	**H**	**A,H,M,N**	**H**	**M**
250/400	HPS	**A**	**A**	**A**	**A**	**A**	**A**	**N/A**	N/A	N/A	N/A	N/A	N/A	N/A	N/A
310	HPS	**A,M**	**A,G,M**	**A,G,H,M,N**	**A,G,H,M,N**	**A,G,M**	**A,G,M**	**A,G,M**	N/A	**A,G,H,M,N**	N/A	**H**	N/A	N/A	N/A
400	HPS	**A,M**	**A,G,M**	**A,G,H,M,N**	**A,G,H,M,N**	**A,G,M**	**A,G,M**	**A,G,M**	**A,G,M**	**A,G,H,M,N**	**H,A,N**	**H**	**A,H,M,N**	N/A	**A,H,M**
175	EPMH	**A**	**A**	**A**	**A**	**A**	**A**	**A**	N/A	**A**	N/A	N/A	N/A	N/A	N/A
250	EPMH	**A**	**A**	**A**	**A**	**A**	**A**	**A**	N/A	**A**	N/A	N/A	N/A	N/A	N/A
320	EPMH	**A**	**A**	**A**	**A**	**A**	N/A	**A**	N/A	**A**	N/A	N/A	N/A	N/A	N/A
350	EPMH	**A**	**A**	**A**	**A**	**A**	N/A	**A**	N/A	**A**	N/A	N/A	N/A	N/A	N/A
400	EPMH	**A**	**A**	**A**	**A**	**A**	**A**	**A**	N/A	**A**	N/A	N/A	N/A	N/A	N/A

NOTE: N/A = Not Available
*Not available in 120X347 volt
C/F = Contact factory

MDCA — SUGGESTED CATALOG ORDERING NUMBERS

Catalog Number	Wattage	Light Source	Voltage (60 Hz)	Ballast Type	Refractor Type	Photometric Distribution
MDCA25S0A22FMC21	250	HPS	Multivolt	Auto-Regulator	Glass	MC2
MDCA40S0A22FMC31	400	HPS	Multivolt	Auto-Regulator	Glass	MC3

All GE suggested catalog ordering numbers come with PE receptacle. PE control must be ordered separately. Order and install SCCL-PECTL if no PE is desired.

Multivolt ballasts can be for either 120, 208, 240, or 277 volt incoming power supply.

NOVEMBER 14, 2011
PREPARED BY: MHD/UYS

SPECIFICATIONS PACKAGE

FOR

FINANCIAL PROJECT ID(S): 429873-1-58-01

FEDERAL FUNDS

A DISTRICT ONE ON-SYSTEM LOCAL AGENCY PROGRAM PROJECT
MANATEE COUNTY

The applicable Articles and Subarticles of the General Requirements & Covenants division (Division I) of the 2010 Edition of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction are added, and all of the Construction Details and Materials divisions (Division II & III) are revised, as follows:

I hereby certify that this specifications package has been properly prepared by me, or under my responsible charge, in accordance with procedures adopted by the Florida Department of Transportation.

Signature and Seal: _____
Upik Y. Suwarno, P.E.
No. 39995
STATE OF FLORIDA
PROFESSIONAL ENGINEER

Date: 5/18-12

Page(s): 1 – 427

SPECIAL PROVISIONS

DEFINITIONS AND TERMS

SECTION 1 language is added as follows:

1-3 Definitions.

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

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 pre-qualified Specialty Engineer. For items of the permanent work declared by the State Construction Office to be "major" or "structural", the work performed by a pre-qualified Specialty Engineer must be checked by another pre-qualified Specialty Engineer. An individual Engineer may become pre-qualified in the work groups listed in the Rules of the Department of Transportation, Chapter 14-75, if the requirements for the Professional Engineer are met for the individual work groups. Pre-qualified Specialty Engineers are listed on the State Construction Website. Pre-qualified Specialty Engineers will not be authorized to perform redesigns or Cost Savings Initiative Proposal designs of items fully detailed in the plans.

Department.

Manatee County.

Engineer.

The Professional Engineer, registered in the State of Florida, other than the Engineer of Record or his subcontracted consultant, acting as the project's Construction Engineering Inspection Manager. The Engineer may be County in-house staff or a consultant retained by the County.

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."

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 such as but not limited to pot bearing designs, non-standard expansion joints, MSE wall designs and other specialty items. The Specialty Engineer may also provide designs and details for items of the permanent work declared by the State Construction Office to be "minor" or "non-structural". The Specialty Engineer may be an employee or officer of the Contractor or a fabricator, an employee or officer of an entity providing components to a fabricator, or an independent consultant.

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.

SCOPE OF THE WORK

SECTION 4 language is added as follows:

4-3 Alteration of Plans or of Character of Work.

When the Department requires work that is not covered by a price in the Contract and such work does not constitute a "Significant Change" as defined in 4-3.1, and the Department finds that such work is essential to the satisfactory completion of the Contract within its intended scope, the Department will make an adjustment to the Contract. The Engineer will determine the basis of payment for such an adjustment in a fair and equitable amount.

The term "significant change" applies only when the Engineer determines that the character of the work, as altered, differs materially in kind or nature from that involved or included in the original proposed construction. The allowance due to the Contractor will be determined by the Department.

In the instance of an alleged "significant change", the determination by the Engineer shall be conclusive and shall not be subject to challenge by the Contractor in any forum, except upon the Contractor establishing by clear and convincing proof that the determination by the Engineer was without any reasonable and good-faith basis.

CONTROL OF THE WORK

SECTION 5 language is added as follows:

5-11 Final Acceptance.

When, upon completion of the final construction inspection of the entire project, the Engineer determines that the Contractor has satisfactorily completed the work, the Engineer will give the Contractor written notice of final acceptance.

CONTROL OF MATERIALS

SECTION 6 language is added as follows:

6-1 Acceptance Criteria.

6-1.1 General: Acceptance of materials is based on the following criteria. All requirements may not apply to all materials. Use only materials in the work that meet the requirements of these Specifications. The Engineer may inspect and test any material, at points of production, distribution and use.

6-1.2 Sampling and Testing: Use the Department's current sample identification and tracking system to provide related information and attach the information to each sample. Restore immediately any site from which material has been removed for sampling purposes to the pre-sampled condition with materials and construction methods used in the initial construction, at no additional cost to the Department.

Ensure when a material is delivered to the location as described in the Contract Documents, there is enough material delivered to take samples, at no expense to the Department.

6-1.2.1 Pretest by Manufacturers: Submit certified manufacturer's test results to the Engineer for qualification and use on Department projects. Testing will be as specified in the Contract Documents. The Department may require that manufacturers submit samples of materials for independent verification purposes.

6-1.2.2 Point of Production Test: Test the material during production as specified in the Contract Documents.

6-1.2.3 Point of Distribution Test: Test the material at Distribution facilities as specified in the Contract Documents.

6-1.2.4 Point of Use Test: Test the material immediately following placement as specified in the Specifications. After delivery to the project, the Department may require the retesting of materials that have been tested and accepted at the source of supply, or may require the testing of materials that are to be accepted by Producer Certification. The Department may reject all materials that, when retested, do not meet the requirements of these Specifications.

6-1.3 Certification:

6-1.3.1 Producer Certification: Provide complete certifications for materials as required. Furnish to the Engineer for approval, Producer Certifications for all products listed on the Qualified Products List and when required by the applicable material Specification(s). Do not incorporate any manufactured products or materials into the project without approval from the Engineer. Materials will not be considered for payment when not accompanied by Producer Certification. Producers may obtain sample certification forms through the Department's website. Ensure that the certification is provided on the producer's letterhead and is signed by a legally responsible person from the producer and notarized.

6-1.3.1.1 Qualified Products List: The Product Evaluation Section in the State Specifications and Estimates Office publishes and maintains a Qualified Products List. This list provides assurance to Contractors, consultants, designers, and Department personnel that specific products and materials are approved for use on Department facilities. The Department will limit the Contractor's use of products and materials that require pre-approval to items listed on the Qualified Products List effective at the time of placement.

Manufacturers seeking evaluation in accordance with Departmental procedures of an item must submit a Product Evaluation Application, available on the Department's website

www2.dot.state.fl.us/specificationsestimates/productevaluation/qpl/submittalprocess.aspx , with supporting documentation as defined and detailed by the applicable Specifications and Standards. This may include certified test reports from an independent test laboratory, certification that the material meets all applicable specifications, signed and sealed drawings and calculations, quality control plans, samples, infrared scans, or other technical data.

Manufacturers successfully completing the Department's evaluation are eligible for inclusion on the Qualified Products List. The Department will consider any marked variations from original test values for a material or any evidence of inadequate field performance of a material as sufficient evidence that the properties of the material have changed, and the Department will remove the material from the Qualified Products List.

6-1.3.1.2 Approved Products List: The State Traffic Operations Office maintains the Approved Products List of Traffic Control Signal Devices. Traffic Monitoring Site Equipment and Materials are also included on the Approved Products List. This list provides assurance to Maintaining Agencies, Contractors, consultants, designers, and Department personnel that the specific items listed are approved for use on Department facilities. The Department will limit the Contractor's procurement and use of Traffic Control Signal Devices, and Traffic Monitoring Site equipment and materials to only those items listed on the Approved Products List that is effective at the time of procurement, except as provided in Section 603.

The approval process is described in detail on the State Traffic Operation website, www.dot.state.fl.us/trafficoperations/terl/apl2.htm . Manufacturers seeking evaluation of a specific device must submit an application which can be obtained from the State Traffic Operations Office.

6-1.3.2 Contractor Installation Certification: Provide installation certifications as required by the Contract Documents.

6-2 Applicable Documented Authorities other than Specifications.

6-2.1 General: Details on individual materials are identified in various material specific Sections of the Specifications that may refer to other documented authorities for requirements. When specified, meet the requirements as defined in such references.

6-2.2 Test Methods: Methods of sampling and testing materials are in accordance with the Florida Methods (FM). If a Florida Method does not exist for a particular test, perform the testing in accordance with the method specified in the Specification. When test methods or other standards are referenced in the Specifications without identification of the specific time of issuance, use the most current issuance, including interims or addendums thereto, at the time of bid opening.

6-2.3 Construction Aggregates: Aggregates used on Department projects must be in accordance with Rule 14-103, FAC.

6-3 Storage of Materials and Samples.

6-3.1 Method of Storage: Store materials in such a manner as to preserve their quality and fitness for the work, to facilitate prompt inspection, and to minimize noise impacts on sensitive receivers. More detailed specifications concerning the storage of specific materials are prescribed under the applicable Specifications. The Department may reject improperly stored materials.

6-3.2 Use of Right-of-Way for Storage: If the Engineer allows, the Contractor may use a portion of the right-of-way for storage purposes and for placing the Contractor's plant and equipment. Use only the portion of the right-of-way that is outside the clear zone, which is the

portion not required for public vehicular or pedestrian travel. When used, restore the right-of-way to pre-construction condition at no additional cost to the Department or as specified in the Contract Documents. Provide any additional space required at no expense to the Department.

6-3.3 Responsibility for Stored Materials: Accept responsibility for the protection of stored materials. The Department is not liable for any loss of materials, by theft or otherwise, or for any damage to the stored materials.

6-3.4 Storage Facilities For Samples: Provide facilities for storage of samples as described in the Contract Documents and warranted by the test methods and Specifications.

6-4 Defective Materials.

Materials not meeting the requirements of these Specifications will be considered defective. The Engineer will reject all such materials, whether in place or not. Remove all rejected material immediately from the site of the work and from storage areas, at no expense to the Department.

Do not use material that has been rejected and the defects corrected, until the Engineer has approved the material's use. Upon failure to comply promptly with any order of the Engineer made under the provisions of this Article, the Engineer has the authority to have the defective material removed and replaced by other forces and deduct the cost of removal and replacement from any moneys due or to become due the Contractor.

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 a proposed scope of work to the Engineer for an engineering or independent laboratory (as approved by the Engineer) analysis to determine the disposition of the material. 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. Upon the Engineer's approval of the scope of work submitted by the Contractor, the engineering analysis must be completed and the report must be submitted to the Engineer within 45 calendar days, or other time frame as approved by the Engineer. The report must be signed and sealed by the Specialty Engineer. The Engineer will determine the final disposition of the material after review of the information submitted by the Contractor. No additional monetary compensation or time extension will be granted for the impact of any such analysis or review.

6-5 Products and Source of Supply.

6-5.3 Contaminated, Unfit, Hazardous, and Dangerous Materials: Do not use any material that, after approval and/or placement, has in any way become unfit for use. Do not use materials containing any substance that has been determined to be hazardous by the State of Florida Department of Environmental Protection or the U.S. Department of Environmental Protection. Provide workplaces free from serious recognized hazards and to comply with occupational safety and health standards, as determined by the U.S. Department of Labor Occupational Safety and Heath Administration.

LEGAL REQUIREMENTS AND RESPONSIBILITIES TO THE PUBLIC

SECTION 7 language is added as follows:

7-1.3 Introduction or Release of Prohibited Aquatic Plants, Plant Pests, or Noxious Weeds: Do not introduce or release prohibited aquatic plants, plant pests, or noxious weeds into the project limits as a result of clearing and grubbing, earthwork, grassing and mulching, sodding, landscaping, or other such activities. Immediately notify the Engineer upon discovery of all prohibited aquatic plants, plant pests, or noxious weeds within the project limits. Do not move prohibited aquatic plants, plant pests, or noxious weeds within the project limits or to locations outside of the project limits without the Engineer's permission. Maintain all borrow material brought onto the project site free of prohibited aquatic plants, plant pests, noxious weeds, and their reproductive parts. Refer to Rule 16C-52 and Rule 5B-57, of the Florida Administrative Code for the definition of prohibited aquatic plants, plant pests, and noxious weeds.

Furnish the Engineer, prior to incorporation into the project, with a certification from the Florida Department of Agriculture and Consumer Services, Division of Plant Industry, stating that the sod, hay, straw, and mulch materials are free of noxious weeds, including Tropical Soda Apple.

7-1.7 Insecticides and Herbicides. Use products found on the following website, www.flpesticide.us/ , approved by the Florida Department of Agriculture for the State of Florida. The use of restricted products is prohibited. Do not use any products in the sulfonylurea family of chemicals. Herbicide application by broadcast spraying is not allowed.

Procure any necessary licenses, pay all charges and fees, and give all notices necessary for lawful performance of the work.

Ensure that all employees applying insecticides and herbicides possess a current Florida Department of Agriculture Commercial Applicator license with the categories of licensure in Right-of-Way Pest Control and Aquatic Pest Control. Provide a copy of current certificates upon request, to the Engineer.

Ensure that employees who work with herbicides comply with all applicable Federal, State, and local regulations.

Comply with all regulations and permits issued by any regulatory agency within whose jurisdiction work is being performed. Post all permit placards in a protected, conspicuous location at the work site.

Acquire any permits required for work performed on the rights-of-way within the jurisdiction of National Forests in Florida. Contact the Local National Forest Ranger District, or the United States Department of Agriculture (USDA) office for the proper permits and subsequent approval.

Acquire all permits required for aquatic plant control as outlined in Chapter 62C-20, Florida Administrative Code, Rules of the Florida Department of Environmental Protection. Contact the Regional Field Office of Bureau of Invasive Plant Management of the Florida Department of Environmental Protection for proper permits and subsequent approval. If application of synthetic organo-auxin herbicides is necessary, meet the requirements of Chapter 5E-2, Florida Administrative Code.

7-7.2 Overloaded Equipment. Do not operate on any road or street any hauling unit or equipment loaded in excess of (1) the maximum weights specified in the Florida Uniform Traffic Control Law, or (2) lower weights legally established for any section of road or bridge by the Department or local authorities. The governmental unit having jurisdiction over a particular road or bridge may provide exceptions by special permit under the provisions of 7.0. This restriction applies to all roads and bridges inside and outside the Contract limits as long as these roads and bridges are open for public use. The Contractor may overload roads and bridges which are to be demolished after they are permanently closed to the public. The Contractor is responsible for all loss or damages resulting from equipment operated on a structure permanently closed to the public.

7-7.5 Contractor's Equipment on Bridge Structures. The Specialty Engineer shall analyze the effect of imposed loads on bridge structures, within the limits of a construction contract, resulting from the following operations:

(1) Overloaded Equipment as defined 6.0:
  (a) Operating on or crossing over completed bridge structures.
  (b) Operating on or crossing over partially completed bridge structures.
(2) Equipment within legal load limits:
  (a) Operating on or crossing over partially completed bridge structures.
(3) Construction cranes:
  (a) Operating on completed bridge structures.
  (b) Operating on partially completed bridge structures.

Any pipe culvert(s) or box culvert(s) qualifying as a bridge under 1-3 is excluded from the requirements above.

A completed bridge structure is a bridge structure in which all elemental components comprising the load carrying assembly have been completed, assembled, and connected in their final position. The components to be considered shall also include any related members transferring load to any bridge structure.

The Specialty Engineer shall determine the effect that equipment loads have on the bridge structure and develop the procedures for using the loaded equipment without exceeding the structure's design load capacity.

Submit to the Department for approval eight copies of design calculations, layout drawings, and erection drawings showing how the equipment is to be used so that the bridge structure will not be overstressed. The Specialty Engineer shall sign and seal one set of the eight copies of the drawings and the cover sheet of one of the eight copies of the calculations for the Department's Record Set.

MEASUREMENT AND PAYMENT

SECTION 9 language is added as follows:

9-1.3 Determination of Pay Areas:

9-1.3.1 Final Calculation: When measuring items paid for on the basis of area of finished work, where the pay quantity is designated to be determined by calculation, the Engineer will use lengths and widths in the calculations based on the station to station dimensions shown on the plans; the station to station dimensions actually constructed within the limits designated by the Engineer; or the final dimensions measured along the surface of the

completed work within the neat lines shown on the plans or designated by the Engineer. The Engineer will use the method or combination of methods of measurement that reflect, with reasonable accuracy, the actual surface area of the finished work as the Engineer determines.

9-1.3.2 Plan Quantity: When measuring items paid for on the basis of area of finished work, where the pay quantity is designated to be the plan quantity, the Engineer will determine the final pay quantity based on the plan quantity subject to the provisions of 9-3.2. Generally, the Engineer will calculate the plan quantity using lengths based on station to station dimensions and widths based on neat lines shown in the plans.

9-3 Compensation for Altered Quantities.

9-3.1 General: When alteration in plans or quantities of work not requiring a supplemental agreement as hereinbefore provided for are offered and performed, the Contractor shall accept payment in full at Contract unit bid prices for the actual quantities of work done, and no allowance will be made for increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor, resulting either directly from such alterations, or indirectly from unbalanced allocation among the Contract items of overhead expense on the part of the bidder and subsequent loss of expected reimbursement therefore, or from any other cause.

Compensation for alterations in plans or quantities of work requiring supplemental agreements shall be stipulated in such agreement, except when the Contractor proceeds with the work without change of price being agreed upon, the Contractor shall be paid for such increased or decreased quantities at the Contract unit prices bid in the Proposal for the items of work. If no Contract unit price is provided in the Contract, and the parties cannot agree as to a price for the work, the Contractor agrees to do the work in accordance with 4-3.2.

9-3.2 Payment Based on Plan Quantity:

9-3.2.1 Error in Plan Quantity: As used in this Article, the term "substantial error" is defined as the smaller of (a) or (b) below:

(a) a difference between the original plan quantity and final quantity of more than 5%,

(b) a change in quantity which causes a change in the amount payable of more than $5,000.

On multiple job Contracts, changes made to an individual pay item due to substantial errors will be based on the entire Contract quantity for that pay item.

Where the pay quantity for any item is designated to be the original plan quantity, the Department will revise such quantity only in the event that the Department determines it is in substantial error. In general, the Department will determine such revisions by final measurement, plan calculations, or both, as additions to or deductions from plan quantities.

In the event that either the Department or the Contractor contends that the plan quantity for any item is in error and additional or less compensation is thereby due, the claimant shall submit, at their own expense, evidence of such in the form of acceptable and verifiable measurements or calculations. The Department will not revise the plan quantity solely on the basis of a particular method of construction that the Contractor selects. For earthwork items, the claimant must note any differences in the original ground surfaces from that shown in the original plan cross-sections that would result in a substantial error to the plan quantity, and must be properly documented by appropriate verifiable level notes, acceptable to both the Contractor and the Department, prior to disturbance of the original ground surface by

construction operations. The claimant shall support any claim based upon a substantial error for differences in the original ground surface by documentation as provided above.

9-3.2.2 Authorized Changes in Limits of Work: Where the Department designates the pay quantity for any item to be the original plan quantity and authorizes a plan change which results in an increase or decrease in the quantity of that item, the Department will revise the plan quantity accordingly. In general, the Department will determine such revisions by final measurement, plan calculations or both.

9-3.2.3 Specified Adjustments to Pay Quantities: Do not apply the limitations specified in 9-3.2.1 and 9-3.2.2 to the following:

(1) Where these Specifications or Special Provisions provide that the Department determines the pay quantity for an item on the basis of area of finished work adjusted in accordance with the ratio of measured thickness to nominal thickness.

(2) Where these Specifications provide for a deduction due to test results falling outside of the allowable specified tolerances.

(3) To payment for extra length fence posts, as specified in 550-6.3.

9-3.3 Lump Sum Quantities:

9-3.3.1 Error in Lump Sum Quantity: Where the Department designates the pay quantity for an item to be a lump sum and the plans show an estimated quantity, the Department will adjust the lump sum compensation only in the event that either the Contractor submits satisfactory evidence or the Department determines and furnishes satisfactory evidence that the lump sum quantity shown is in substantial error as defined in 9-3.2.1.

EXCAVATION AND EMBANKMENT – ACCEPTANCE PROGRAM.
(REV 9-16-09) (FA 11-9-09) (7-10)

SUBRTICLE 120-10.3.1 (of the Supplemental Specifications) is deleted and the following substituted:

120-10.3.1 Frequency: Conduct QC sampling and testing at a minimum frequency listed in the table below. The Engineer will perform Verification sampling and tests at a minimum frequency listed in the table below.

Test Name	Quality Control	Verification	Verification of Shoulder Only Areas, Bike/Shared Use Paths, and Sidewalks
Standard Proctor Maximum Density	One per soil type	One per soil type	One per soil type
Density	One per LOT	One per eight LOTs and for wet conditions, the first lift not affected by water	One per two LOTs
Soil Classification	One per Standard Proctor Maximum Density	One per Standard Proctor Maximum Density	One per Standard Proctor Maximum Density

EXCAVATION FOR STRUCTURES AND PIPE – ACCEPTANCE PROGRAM.
(REV 9-16-09) (FA 11-9-09) (7-10)

SUBARTICLE 125-9.3.1 (Page 188) is deleted and the following substituted:

125-9.3.1 Frequency: Conduct QC Standard Proctor maximum density sampling and testing at a minimum frequency of one test per soil type. The Verification test will be at a minimum of one test per soil type:

Test Name	Quality Control	Verification
Standard Proctor Maximum Density	One per soil type	One per soil type
Density	One per LOT	One per eight LOTs and for wet conditions, the first lift not affected by water
Soil Classification	One per Standard Proctor Maximum density	One per Standard Proctor Maximum density

STABILIZING – ACCEPTANCE PROGRAM.
(REV 9-16-09) (FA 11-9-09) (7-10)

SUBARTICLE 160-4.2.4 (Page 199) is deleted and the following substituted:

160-4.2.4 Frequency: Conduct QC sampling and testing at a minimum frequency listed in the table below. The Engineer will perform Verification sampling and tests at a minimum frequency listed in the table below.

Test Name	Quality Control	Verification	Verification for Shoulder Only, Bike/Shared Use Path and Sidewalk Construction
Modified Proctor Maximum Density	One per two consecutive LOTs	One per sixteen consecutive LOTs	One per four LOTs
Density	One per LOT	One per eight LOTs	One per two LOTs
Stabilizing Mixing Depth	Three per 500 feet	Witness one per LOT	Witness one per LOT
LBR	One per two consecutive LOTs	One per sixteen consecutive LOTs	One per four LOTs
Gradation, LL/PI & Soil Classification (Local materials)	Not Required	One per sixteen consecutive LOTs	One per four LOTs

ROCK BASE – ACCEPTANCE PROGRAM.
(REV 9-16-09) (FA 11-9-09) (7-10)

SUBARTICLE 200-7.2.2 (Pages 208 and 209) is deleted and the following substituted:

200-7.2.2 Frequency: Conduct QC sampling and testing at a minimum frequency listed in the table below. The Engineer will perform Verification sampling and tests at a minimum frequency listed in the table below.

Mainline Pavement Lanes, Turn Lanes, Ramps, Parking Lots, Concrete Box Culverts and Retaining Wall Systems		
Test Name	Quality Control	Verification
Modified Proctor Maximum Density	One per eight consecutive LOTs	One per 16 consecutive LOTs
Density	One per LOT	One per eight LOTs
Roadway Surface	Ten per LOT	Witness
Roadway Thickness	Three per LOT	Witness

Shoulder-Only, Bike/Shared Use Path and Sidewalk Construction		
Test Name	Quality Control	Verification
Modified Proctor Maximum Density	One per two LOTs	One per four LOTs
Density	One per LOT	One per two LOTs
Surface	Five per 500 feet	Witness
Thickness	Three per 1000 consecutive feet	Witness

PORTLAND CEMENT CONCRETE – ACCEPTANCE SAMPLING FREQUENCY. (REV 6-25-10) (FA 7-8-10) (1-11)

SUBARTICLE 346-9.2 (of the Supplemental Specifications) is deleted and the following substituted:

346-9.2 Sampling Frequency for Quality Control Tests:

As a minimum, sample and test concrete of each design mix for water to cementitious materials ratio, air content, temperature, slump and compressive strength once per LOT as defined by Table 8. When more than one concrete production facility is used for the same mix design, describe the method of sampling, testing and LOT numbering in the QC Plan. The Engineer will randomly verify one of every eight consecutive LOTs of each design mix based on a random number generator, and may perform additional Independent Verification tests. All QC activities, calculations, and inspections will be randomly confirmed by the Department.

TABLE 8	
Class Concrete	Maximum LOT Size
I	one day's production
I (Pavement)	250 lane ft, or one day's production, whichever is less
II, II (Bridge Deck), III, IV, V (Special), V, VI	50 yd^3, or one day's production, whichever is less
IV (Drilled Shaft)	50 yd^3, or two hours between placements, whichever is less
III (Seal)	Each Seal placement

346-9.2.1 Reduced Frequency for Acceptance Tests: When ten consecutive strength test results from the same mix design for a Class IV or higher class of concrete are produced at the same concrete production facility, on a given Contract have all been verified and have attained an average strength greater than two standard deviations above the specified minimum, then the LOT may represent a maximum production quantity of 100 yd^3. When five consecutive strength test results from the same mix design for a Class III or lower class of concrete is produced at the same concrete production facility on a given Contract have all been verified and have attained an average strength greater than two standard deviations above the specified minimum, the LOT may represent a maximum production quantity of 100 yd^3.

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 data must also represent the same prime/subcontractor. The tests from the previous Department project must be within the last 60 calendar days 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.

If at any time a strength test is not verified and/or the average strength of the previous ten or five consecutive samples based on the class of concrete described above,

from the same mix design and the same production facility is less than the specified minimum plus two standard deviations, the maximum production quantity represented by the LOT will return to 50 yd^3. In order to reinitiate reduced frequency, a new set of strength test results will be required.

SUPPLEMENTAL SPECIFICATIONS

102 MAINTENANCE OF TRAFFIC.
(REV 8-3-11) (FA 8-9-11) (1-12)

SECTION 102 (Pages 109 - 126) is deleted and the following substituted:

SECTION 102
MAINTENANCE OF TRAFFIC

102-1 Description.

Maintain traffic within the limits of the project for the duration of the construction period, including any temporary suspensions of the work. Construct and maintain detours. Provide facilities for access to residences, businesses, etc., along the project. Furnish, install and maintain traffic control and safety devices during construction. Furnish and install work zone pavement markings for maintenance of traffic in construction areas. Provide any other special requirements for safe and expeditious movement of traffic specified on the plans. Maintenance of Traffic includes all facilities, devices and operations as required for safety and convenience of the public within the work zone.

Do not maintain traffic over those portions of the project where no work is to be accomplished or where construction operations will not affect existing roads. Do not obstruct or create a hazard to any traffic during the performance of the work, and repair any damage to existing pavement open to traffic.

Include the cost of any work that is necessary to meet the requirements of the Contract Documents under the MOT pay item, when there is not a pay item provided.

102-2 Materials.

Meet the following requirements:

Bituminous Adhesive	Section 970
Temporary Retroreflective 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, Design Standards and the 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 recycled asphalt pavement material, and having stability and drainage properties that will provide a firm surface under wet conditions.

102-3 Specific Requirements.

102-3.1 Beginning Date of Contractor's Responsibility: Maintain traffic starting the day work begins on the project or on the first day Contract time is charged, whichever is earlier.

102-3.2 Worksite Traffic Supervisor: Provide a Worksite Traffic Supervisor in accordance with Section 105. Provide the Worksite Traffic Supervisor with all equipment and materials needed to set up, take down, maintain traffic control, and handle traffic-related situations.

Ensure that the Worksite Traffic Supervisor performs the following duties:

1. Performs on site direction of all traffic control on the project.
2. Is on site during all set up and take down, and performs a drive through inspection immediately after set up.
3. Is on site during all nighttime operations to ensure proper Maintenance of Traffic.
4. Immediately corrects all safety deficiencies and does not permit minor deficiencies that are not immediate safety hazards to remain uncorrected for more than 24 hours.
5. Is available on a 24-hour per day basis and present within 45 minutes after notification of an emergency situation and is prepared to positively respond to repair the work zone traffic control or to provide alternate traffic arrangements.
6. Conducts daily daytime and weekly nighttime inspections of projects with predominately daytime work activities, and daily nighttime and weekly daytime inspections of projects with predominantly nighttime work activities of all traffic control devices, traffic flow, pedestrian, bicyclist, and business accommodations.

Advise the project personnel of the schedule of these inspections and give them the opportunity to join in the inspection as is deemed necessary. Submit a comprehensive weekly report, using the Department's currently approved form, to the Engineer detailing the condition of all traffic control devices (including pavement markings) being used. Include assurances in the inspection report that pedestrians are accommodated with a safe, accessible travel path around work sites separated from mainline traffic in compliance with the Americans with Disabilities Act (ADA) Standards for Transportation Facilities, that existing or detoured bicyclist paths are being maintained satisfactorily throughout the project limits, and that existing businesses in work areas are being provided with adequate entrances for vehicular and pedestrian traffic during business hours. Have the Worksite Traffic Supervisor sign the report and certify that all of the above issues are being handled in accordance with the Contract Documents. When deficiencies are found, the Worksite Traffic Supervisor is to note such deficiencies and include the proposed corrective actions, including the date corrected.

The Department may disqualify and remove from the project a Worksite Traffic Supervisor who fails to comply with the provisions of this Section. The Department may temporarily suspend all activities, except traffic, erosion control and such other activities that are necessary for project maintenance and safety, for failure to comply with these provisions.

102-4 Alternative Traffic Control Plan.

The Contractor may propose an alternative Traffic Control Plan (TCP) to the plan presented in the Contract Documents. Have the Contractor's Engineer of Record sign and seal the alternative plan. Prepare the TCP in conformance with and in the form outlined in the current version of the Roadway Plans Preparation Manual. Indicate in the plan a TCP for each phase of activities. Take responsibility for identifying and assessing any potential impacts to a utility that

may be caused by the alternate TCP proposed by the Contractor, and notify the Department in writing of any such potential impacts to utilities.

Engineer's approval of the alternate TCP does not relieve the Contractor of sole responsibility for all utility impacts, costs, delays or damages, whether direct or indirect, resulting from Contractor initiated changes in the design or construction activities from those in the original Contract Specifications, design plans (including traffic control plans) or other Contract Documents and which effect a change in utility work different from that shown in the utility plans, joint project agreements or utility relocation schedules.

The Department reserves the right to reject any Alternative Traffic Control Plan. Obtain the Engineer's written approval before beginning work using an alternate TCP. The Engineer's written approval is required for all modifications to the TCP. The Engineer will only allow changes to the TCP in an emergency without the proper documentation.

102-5 Traffic Control.

102-5.1 Standards: FDOT Design Standards (DS) are the minimum standards for the use in the development of all traffic control plans. The MUTCD Part VI is the minimum national standard for traffic control for highway construction, maintenance, and utility operations. Follow the basic principles and minimum standards contained in these documents for the design, application, installation, maintenance, and removal of all traffic control devices, warning devices and barriers which are necessary to protect the public and workers from hazards within the project limits.

102-5.2 Maintenance of Roadway Surfaces: Maintain all lanes that are being used for the maintenance of traffic, including those on detours and temporary facilities, under all weather conditions. Keep the lanes reasonably free of dust, potholes and rutting. Provide the lanes with the drainage facilities necessary to maintain a smooth riding surface under all weather conditions.

102-5.3 Number of Traffic Lanes: Maintain one lane of traffic in each direction. Maintain two lanes of traffic in each direction at existing four (or more) lane cross roads, where necessary to avoid undue traffic congestion. Construct each lane used for maintenance of traffic at least as wide as the traffic lanes existing in the area before commencement of construction. Do not allow traffic control and warning devices to encroach on lanes used for maintenance of traffic.

The Engineer may allow the Contractor to restrict traffic to one-way operation for short periods of time provided that the Contractor employs adequate means of traffic control and does not unreasonably delay traffic. When a construction activity requires restricting traffic to one-way operations, locate the flaggers within view of each other when possible. When visual contact between flaggers is not possible, equip them with 2-way radios, official, or pilot vehicle(s), or use traffic signals.

102-5.4 Crossings and Intersections: Provide and maintain adequate accommodations for intersecting and crossing traffic. Do not block or unduly restrict any road or street crossing the project unless approved by the Engineer. Before beginning any construction, provide the Engineer the names and phone numbers of persons that can be contacted when signal operation malfunctions.

102-5.5 Access for Residences and Businesses: Provide continuous access to all residences and all places of business.

102-5.6 Protection of the Work from Injury by Traffic: Where traffic would be injurious to a base, surface course, or structure constructed as a part of the work, maintain all traffic outside the limits of such areas until the potential for injury no longer exists.

102-5.7 Flagger: Provide trained flaggers in accordance with Section 105.

102-5.8 Conflicting Pavement Markings: Where the lane use or where normal vehicle or pedestrian paths are altered during construction, remove all pavement markings (paint, tape, thermoplastic, raised pavement markers, etc.) that will conflict with the adjusted vehicle or pedestrian paths. Use of paint to cover conflicting pavement markings is prohibited. Remove conflicting pavement markings using a method that will not damage the surface texture of the pavement and which will eliminate the previous marking pattern regardless of weather and light conditions.

Remove all pavement markings that will be in conflict with "next phase of operation" vehicle pedestrian paths as described above, before opening to vehicle traffic or use by pedestrians.

Cost for removing conflicting pavement markings (paint, tape, thermoplastic, raised pavement markers, etc.) to be included in Maintenance of Traffic, Lump Sum.

102-5.9 Vehicle and Equipment Visibility: Equip all pickups and automobiles used on the project with a minimum of one Class 2 amber or white warning light that meets the Society of Automotive Engineers Recommended Practice SAE J595, dated November 1, 2008, or SAE J845, dated December 1, 2007, and incorporated herein by reference. Existing lights that meet SAE J845, dated March, 1992, or SAE J1318, dated April, 1986, may be used to its end of service life. Lights should be unobstructed by ancillary vehicle equipment such as ladders, racks or booms. If the light is obstructed, additional lights will be required. The lights shall be operating when a vehicle is in a work area where a potential hazard exists, when operating the vehicle at less than the average speed for the facility while performing work activities, making frequent stops or called for in the plans or Design Standards.

Equip all other vehicles and equipment with a minimum of 4 square feet of retroreflective sheeting or flashing lights.

To avoid distraction to motorists, do not operate the lights on the vehicles or equipment when the vehicles are outside the clear zone or behind a barrier.

102-5.10 No Waiver of Liability: Conduct operations in such a manner that no undue hazard results due to the requirements of this Article. The procedures and policies described herein in no way acts as a waiver of any terms of the liability of the Contractor or his surety.

102-6 Detours.

102-6.1 General: Construct and maintain detour facilities wherever it becomes necessary to divert traffic from any existing roadway or bridge, or wherever construction operations block the flow of traffic.

102-6.2 Construction: Plan, construct, and maintain detours for the safe passage of traffic in all conditions of weather. Provide the detour with all facilities necessary to meet this requirement. Where pedestrian facilities are detoured, blocked or closed during the work, provide safe alternate accessible routes through or around the work zone meeting the requirements of the ADA Standards for Transportation Facilities.

Where the plans call for the Department to furnish detour bridge components, construct the pile bents in accordance with the plans, unless otherwise authorized by the Engineer.

Submit a letter with the following: company name, phone number, office address, project contact person, project number, detour bridge type, bridge length, span length, location and usage time frames, to the Engineer at least 30 calendar days before the intended pick-up date, to obtain the storage facility location and list of components for the project. Upon receipt of letter, the Engineer will, within ten calendar days provide an approved material list to the Contractor and the appropriate Department storage yard.

Provide a letter with an original company seal, identifying the representative with authority to pick up components, to the Engineer at least ten calendar days before the proposed pick-up date. The Department is not obligated to load the bridge components without this notice. Take responsibility and sign for each item loaded at the time of issuance.

Provide timber dunnage, and transport the bridge components from the designated storage facility to the job site. Unload, erect, and maintain the bridge, then dismantle the bridge and load and return the components to the designated storage facility.

Notify the Engineer in writing at least ten calendar days before returning the components. Include in this notice the name of the Contractor's representative authorized to sign for return of the bridge components. The yard supervisor is not obligated to unload the bridge components without this notice.

The Department will provide equipment and an operator at the Department's storage facility to assist in loading and unloading the bridge components. Furnish all other labor and equipment required for loading and unloading the components.

The Departments representative will record all bridge components issued or returned on the Detour Bridge Issue and Credit Ticket. The Tickets must be signed by a Department and Contractor representative, after loading or unloading each truck to document the quantity and type of bridging issued or returned.

Bind together all bridge components to be returned in accordance with the instructions given by the storage facility. The yard supervisor will repack components that are not packed in compliance with these instructions. Upon request, written packing instructions will be made available to the Contractor, before dismantling of the bridge for return to the Department's storage facility.

Assume responsibility for any shortage or damage to the bridge components. Monies due the Contractor will be reduced at the rate of $35.00 per hour plus materials for repacking, repairs or replacement of bridge components.

The skid resistance of open steel grid decking on the detour bridge may decrease gradually after opening the bridge to traffic. The Department will furnish a pneumatic floor scabbler machine for roughening the roadway surface of the detour bridge decking. Provide an air compressor at the job site with 200 ft^3/minute capacity, 90 psi air pressure for the power supply of the machine, and an operator. Transport the scabbler machine to and from the Department's Structures Shop. Repair any damage to the scabbler machine caused by operations at no expense to the Department. Perform scabbling when determined necessary by the Engineer. The Department will pay for the cost of scabbling as Unforeseeable Work in accordance with 4-4.

Return the bridge components to the designated storage facility beginning no later than ten calendar days after the date the detour bridge is no longer needed, the date the new bridge is placed in service, or the date Contract Time expires, whichever is earliest. Return the detour bridging at an average of not less than 200 feet per week. Upon failure to return the bridge components to the Department within the time specified, compensate the Department for the

bridge components not returned at the rate of $5.00 per 10 feet, per day, per bridge, for single lane; and $10.00 per 10 feet, per day, per bridge, for dual lane until the bridge components are returned to the Department.

102-6.3 Construction Methods: Select and use construction methods and materials that provide a stable and safe detour facility. Construct the detour facility to have sufficient durability to remain in good condition, supplemented by maintenance, for the entire period that the detour is required.

102-6.4 Removal of Detours: Remove detours when they are no longer needed and before the Contract is completed. Take ownership of all materials from the detour and dispose of them, except for materials, which might be on loan from the Department with the stipulation that they are returned.

102-6.5 Detours Over Existing Roads and Streets: When the Department specifies that traffic be detoured over roads or streets outside the project area, do not maintain such roads or streets. However, maintain all signs and other devices placed for the purpose of the detour.

102-6.6 Operation of Existing Movable Bridges: The Department will maintain and operate existing moveable bridges that are to be removed by the Contractor until such time as they are closed to traffic. During this period, make immediate repairs of any damage to such structures caused by use or operations related to the work at no expense to the Department, but do not provide routine repairs or maintenance. In the event that use or operations result in damage to a bridge requiring repairs, give such repairs top priority to any equipment, material, or labor available.

102-7 Traffic Control Officer.

Provide uniformed law enforcement officers, including marked law enforcement vehicles, to assist in controlling and directing traffic in the work zone when the following types of work is necessary on projects:

1. Directing traffic/overriding the signal in a signalized intersection.
2. When Standard Index No. 619 is used on Interstate roadways at nighttime and called for in the plans.
3. When Standard Index No. 655 Traffic Pacing for overhead work is called for in the plans or approved by the Engineer.
4. When pulling conductor/cable above an open traffic lane on limited access facilities, when called for in the plans or approved by the Engineer.

102-8 Driveway Maintenance.

102-8.1 General: Ensure that each residence and or business has safe, stable, and reasonable access.

102-8.2 Construction Methods: Place, level, manipulate, compact, and maintain the material, to the extent appropriate for the intended use.

As permanent driveway construction is accomplished at a particular location, the Contractor may salvage and reuse previously placed materials that are suitable for reuse on other driveways.

102-9 Temporary Traffic Control Devices.

102-9.1 Installation and Maintenance: Install and maintain temporary traffic control devices as detailed in the plans, Index 600 of the Design Standards and when applicable, in accordance with the approved vendor drawings, as provided on the Qualified Products List

(QPL) or the Approved Products List (APL). Erect the required temporary traffic control devices to prevent any hazardous conditions and in conjunction with any necessary traffic re-routing to protect the traveling public, workers, and to safeguard the work area. Use only those devices that are on the QPL or the APL. Immediately remove or cover any devices that do not apply to existing conditions.

All temporary traffic control devices must meet the requirements of National Cooperative Highway Research Program Report 350 (NCHRP 350) or the Manual for Assessing Safety Hardware 2009 (MASH) and current FHWA directives. Manufacturers seeking evaluation must furnish certified test reports showing that their product meets all test requirements set forth by NCHRP 350 or the MASH. Manufacturers seeking evaluation of Category I devices for inclusion on the QPL shall include the manufacturer's self-certification letter. Manufacturer's seeking evaluation of Category II and Category III devices for inclusion on the QPL shall include the FHWA WZ numbered acceptance letter with attachments and vendor drawings of the device in sufficient detail to enable the Engineer to distinguish between this and similar devices. For devices requiring field assembly or special site preparation, vendor drawings shall include all field assembly details and technical information necessary for proper application and installation and must be signed and sealed by a Professional Engineer registered in the State of Florida. Manufacturers seeking evaluation of Category IV devices for inclusion on the QPL or APL must comply with the requirements of Section 990 and include detailed vendor drawings of the device along with technical information necessary for proper application, field assembly and installation.

Ensure that the QPL or APL number is permanently marked on the device at a readily visible location. Sheeting used on devices is exempt from this marking requirement.

Notify the Engineer of any scheduled operation which will affect traffic patterns or safety sufficiently in advance of commencing such operation to permit his review of the plan for the proposed installation of temporary traffic control devices.

Ensure an employee is assigned the responsibility of maintaining the position and condition of all temporary traffic control devices throughout the duration of the Contract. Keep the Engineer advised at all times of the identification and means of contacting this employee on a 24-hour basis.

Keep temporary traffic control devices in the correct position, properly directed, clearly visible and clean, at all times. Ensure that all traffic control devices meet acceptable standards as outlined in American Traffic Safety Services Association (ATSSA's) "Quality Guidelines for Temporary Traffic Control Devices and Features". Immediately repair, replace or clean damaged, defaced or dirty devices.

102-9.2 Work Zone Signs: Provide signs in accordance with the plans and Design Standards. Meet the requirements of 700-2.5 and 990-8.. Use only approved systems, which includes sign support posts or stands and attachment hardware (nuts, bolts, clamps, brackets, braces, etc.), meeting the vendor requirements specified on the QPL Drawings.

Attach the sign to the sign support using hardware meeting the manufacturer's recommendations and as specified in the Design Standards.

Provide Federal Highway Administration's (FHWA) accepted sign substrate for use with accepted sign stands on the National Highway System (NHS) under the provisions of the National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

102-9.3 Business Signs: Provide and place signs in accordance with the plans and Design Standards. Furnish signs having retroreflective sheeting meeting the requirements of Section 990.

Use signs with specific business names on each sign. Install logos provided by business owners and approved by the Engineer. Standard Business entrance signs meeting the requirements of Index 17355 without specific business names may be used only with the approval of the Engineer.

102-9.4 High Intensity Flashing Lights: Furnish Type B lights in accordance with the plans and Design Standards.

102-9.5 Warning/Channelizing Devices: Furnish warning/channelizing devices in accordance with the plans and Design Standards.

102-9.5.1 Retroreflective Collars for Traffic Cones: Use collars for traffic cones listed on the QPL that meet the requirements of Section 990. Use cone collars at night designed to properly fit the taper of the cone when installed. Place the upper 6 inches collar a uniform 3 1/2 inch distance from the top of the cone and the lower 4 inch collar a uniform 2 inch distance below the bottom of the upper 6 inch collar. Ensure that the collars are capable of being removed for temporary use or attached permanently to the cone in accordance with the manufacturer's recommendations. Provide a white sheeting having a smooth outer surface and that has the property of a retroreflector over its entire surface.

102-9.5.2 Barrier Wall (Temporary): Furnish, install, maintain, remove and relocate a temporary barrier wall in accordance with the plans. Ensure that temporary concrete barrier wall for use on roadway sections, complies with Index No. 412, 415 or 414 as specified in the plans. Ensure that temporary concrete barrier wall for use on bridge and wall sections, complies with Index No 414 as specified in the plans. Ensure that temporary water filled barrier wall used on roadway sections meets the NCHRP Report 350 criteria or the MASH and is listed on the Qualified Products List (QPL). Barriers meeting the requirements of Index No. 412, 415 or temporary water filled barriers on the QPL will not be accepted as an alternate to barriers meeting the requirements of Index No. 414.

102-9.5.3 Glare Screen (Temporary): Use temporary glare screens listed on the QPL that meet the requirements of Section 990. Furnish, install, maintain, remove and relocate glare screen systems in conjunction with temporary barrier wall at locations identified in the plans.

Ensure the anchorage of the glare screen to the barrier is capable of safely resisting an equivalent tensile load of 600 lb/ft of glare screen, with a requirement to use a minimum of three fasteners per barrier section.

When glare screen is utilized on temporary barrier wall, warning lights will not be required.

102-9.6 Temporary Crash Cushion (Redirect/Inertia): Furnish, install, maintain and subsequently remove temporary crash cushions in accordance with the details and notes shown in the plans, the Design Standards, and requirements of the pre-approved alternatives listed on the QPL. Maintain the crash cushions until their authorized removal. Repair all attachment scars to permanent structures and pavements after crash cushion removal. Make necessary repairs due to defective material, work, or Contractor operations at no cost to the Department. Restore crash cushions damaged by the traveling public within 24 hours after notification as authorized by the Engineer.

102-9.7 Guardrail (Temporary): Furnish guardrail (temporary) in accordance with the plans and Design Standards. Meet the requirements of Section 536.

102-9.8 Arrow Board: Furnish arrow boards that meet the requirements of Section 990 as required by the plans and Design Standards to advise approaching traffic of lane closures or shoulder work.

102-9.9 Portable Changeable Message Sign (PCMS): Furnish portable changeable message signs that meet the requirements of Section 990 as required by the plans and Design Standards to supplement other temporary traffic control devices used in work zones.

A truck mounted PCMS may be used as a stand alone maintenance of traffic device only when used for accident or incident management situations as defined in the MUTCD and is listed on the APL.

102-9.10 Portable Regulatory Signs (PRS): Furnish portable regulatory signs that meet the requirements of 990 as required by the plans and Design Standards.

Activate portable regulatory signs only during active work activities and deactivate when no work is being performed.

102-9.11 Radar Speed Display Unit (RSDU): Furnish radar speed display units that meet the requirements of Section 990 as required by the plans and Design Standards to inform motorists of the posted speed and their actual speed.

Activate the radar speed display unit only during active work activities and deactivate when no work is being performed.

102-9.12 Temporary Signalization and Maintenance: Provide temporary signalization and maintenance at existing, temporary, and new intersections including but not limited to the following:

(1) Installation of temporary poles and span wire assemblies as shown in the Plans,

(2) Temporary portable traffic signals as shown in the Plans,

(3) Adding or shifting signal heads,

(4) Trouble calls,

(5) Maintaining intersection and coordination timing and preemption devices.

Restore any loss of operation within 12 hours after notification.

Provide traffic signal equipment that meets the requirements of the Design Standards and 603-2. The Engineer may approve used signal equipment if it is in acceptable condition. Replacement components for traffic signal cabinet assemblies will be provided by the maintaining agency.

102-9.13 Temporary Traffic Detection and Maintenance: Provide temporary traffic detection and maintenance at existing, temporary, and new signalized intersections. Provide temporary traffic detection equipment listed on the Department's APL. Restore any loss of detection within 12 hours. Ensure 90% accuracy per signal phase, measured at the initial installation and after any lane shifts, by comparing sample data collected from the detection system with ground truth data collected by human observation. Collect the sample and ground truth data for a minimum of five minutes during a peak and five minutes during an off-peak period with a minimum three detections for each signal phase. Perform the test in the presence of the Engineer.

102-9.14 Truck Mounted Attenuators and Trailer Mounted Attenuators: Furnish, install and maintain only those attenuators that meet the requirements of NCHRP 350 or the MASH.

Use Truck Mounted Attenuators or Trailer Mounted Attenuators, when called for in the Design Standards. Use attenuators listed on the QPL.

When attenuators are called for, use either a truck mounted attenuator or a trailer mounted attenuator system designed and installed in accordance with the manufacturers recommendations.

Equip the attenuator cartridge with lights and reflectors in compliance with applicable Florida motor vehicle laws, including turn signals, dual tail lights, and brake lights. Ensure that lights are visible in both the raised and lowered positions if the unit is capable of being raised.

Ensure that the complete unit is painted DOT yellow (Fed. Std. 595 b, No. 13538). Stripe the rear facing of the cartridge in the operating position with the alternating 6 inch white and 6 inch safety orange 45 degree striping to form an inverted "V" at the center of the unit and slope down and toward the outside of the unit, in both directions from the center. In the raised position, place at least the same square footage of striping on the bottom of the cartridge as placed on the rear facing cartridge in the open position. Use Type III retroreflectorized sheeting for striping.

Attenuators will not be paid for separately. Include the cost of the truck with either a truck mounted attenuator or a trailer mounted attenuator in Maintenance of Traffic Lump Sum. Payment includes all costs, including furnishing, maintaining and removal when no longer required, and all materials, labor, tools, equipment and incidentals required for attenuator maintenance.

102-9.15 Temporary Raised Rumble Strip Sets: When called for in the plans, furnish, install, maintain, remove, and reinstall temporary raised rumble strip sets.

Install the temporary raised rumble strip sets per the manufacturer's recommendations and in accordance with Index 600.

The temporary raised rumble strip may be either a removable polymer striping tape or a molded engineered polymer material.

102-9.16 Automated Flagger Assistance Devices (AFAD): Furnish, install, maintain, remove and relocate AFADs in accordance with the plans and Design Standards. Position AFADs where they are clearly visible to oncoming traffic and out of the lane of traffic. The devices may be operated either by a single flagger at one end of the traffic control zone, from a central location, or by a separate flagger near each device's location.

AFADs may be either a remotely controlled Stop/Slow AFAD mounted on either a trailer or a movable cart system, or a remotely controlled Red/Yellow Lens AFAD.

AFADs will not be paid for separately. AFADs may be used as a supplement or an alternate to flaggers in accordance with Index 603. Include the cost for AFADs in Maintenance of Traffic Lump Sum.

102-10 Work Zone Pavement Marking.

102-10.1 Description: Furnish and install Work Zone Pavement Markings for maintenance of traffic in construction areas and in close conformity with the lines and details shown in the plans and Design Standards.

Centerlines, lane lines, edge lines, stop bars and turn arrows will be required in work zones prior to opening the road to traffic.

The most common types of Work Zone Pavement Markings are painted pavement markings and removable tape. Other types of Work Zone Pavement Markings may be identified in the plans.

102.10.2 Painted Pavement Markings:

102-10.2.1 General: Use painted pavement markings meeting the requirements of Section 710. Use standard waterborne paint unless otherwise identified in the plans or approved by the Engineer.

102-10.3 Removable Tape:

102-10.3.1 General: Use removable tape listed on the QPL and meeting the requirements of 990-4.

102-10.3.2 Application: Apply removable tape with a mechanical applicator to provide pavement lines that are neat, accurate and uniform. Equip the mechanical applicator with a film cut-off device and with measuring devices that automatically and accumulatively measure the length of each line placed within an accuracy tolerance of ±2%. Ensure removable tape adheres to the road surface. Removable tape may be placed by hand on short sections 500 feet or less if it is done in a neat accurate manner.

102-10.3.3 Retroreflectivity: Apply white and yellow traffic stripes and markings that will attain an initial retroreflectivity of not less than 300 mcd/lx·m2 for white and contrast markings and not less than 250 mcd/lx·m2 for yellow markings. Black portions of contrast tapes and black masking tapes must be non-reflective and have a reflectance of less than 5 mcd/lx m2. At the end of the six month service life, the retroreflectance of white and yellow removable tape shall not be less than 150 mcd/lx·m^2.

102-10.3.4 Removability: Provide removable tape capable of being removed from bituminous concrete and portland cement concrete pavement intact or in substantially large strips, either manually or by a mechanical roll-up device, at temperatures above 40ºF, without the use of heat, solvents, grinding or blasting.

102-10.4 Temporary Retroreflective Pavement Markers (RPM's): Use markers listed on the QPL and meeting the requirements of 990-5. Apply all markers in accordance with the Design Standards, Index No. 600, prior to opening the road to traffic. Replace markers any time after installation when more than three consecutive markers fail or are missing, at no expense to the Department, in a timely manner, as directed by the Engineer.

102-11 Method of Measurement.

102-11.1 General: Devices installed/used on the project on any calendar day or portion thereof, within the allowable Contract Time, including time extensions which may be granted, will be paid for at the Contract unit price for the applicable pay item, except those paid for as Lump Sum.

102-11.2 Traffic Control Officers: The quantity to be paid for will be at the Contract unit price per hour (4 hour minimum) for the actual number of officers certified to be on the project site, including any law enforcement vehicle(s) and all other direct and indirect costs. Payment will be made only for those traffic control officers specified in the Plans and authorized by the Engineer.

102-11.3 Special Detours: When a detour facility is specifically detailed in the plans, or is otherwise described or detailed as a special item, and an item for separate payment is included in the proposal, the work of constructing, maintaining, and subsequently removing such detour facilities will be paid for separately. Traffic control devices, warning devices, barriers, signing, and pavement markings for Special Detours will also be paid for separately.

When the plans show more than one detour, each detour will be paid for separately, at the Contract lump sum price for each.

Where a separate item for a specific detour facility is included in the proposal, payment will be made under Special Detour.

102-11.4 Arrow Board: The quantity to be paid at the contract unit price will be for the number of arrow boards certified as installed/used on the project on any calendar day or portion thereof within the contract time.

102-11.5 Work Zone Signs: The number of temporary post-mounted signs (Temporary Regulatory, Warning and Guide) certified as installed/used on the project will be paid for at the Contract unit price for Work Zone Signs. When multiple signs are located on single or multiple post(s), each sign panel will be paid individually. Signs greater than 20 ft^2 and detailed in the plans will be paid for under Lump Sum MOT.

Temporary portable signs (excluding Mesh signs) and Vehicular Mounted Signs will be included for payment under work zone signs, only if used in accordance with the Design Standards.

102-11.6. Business Signs: The number of business signs certified as installed/used on the project will be paid for at the Contract unit price for Business Signs.

102-11.7 High Intensity Flashing Lights: The number of high intensity flashing lights (Type B) certified as installed/used on the project will be paid for at the Contract unit price for High Intensity Flashing Lights (Temporary - Type B).

102-11.8 Channelizing Devices: The number of Type I, Type II, Direction Indicator Barricade, Type III, Vertical Panel and Drum Channelizing Devices certified as installed/used on the project meeting the requirements of Design Standards, Index No. 600 and have been properly maintained will be paid for at the Contract unit prices for Barricade (Temporary). Payment will be made for each channelizing device that is used to delineate trailer mounted devices. Payment will be made for channelizing devices delineating portable changeable message signs during the period beginning fourteen working days before Contract Time begins as authorized by the Engineer.

102-11.9 Barrier Wall (Temporary): The Contract unit price for Barrier Wall (Temporary) will be full compensation for furnishing, installing, maintaining, and removing the barrier wall. When called for, the Contract unit price for Barrier Wall (Temporary/Relocate) will be full compensation for relocating the barrier. The certified quantity to be paid for will be determined by the number of sections times the nominal length of each section.

102-11.10 Lights, Temporary, Barrier Wall Mount: The number of Type C Steady Burn lights, mounted on barrier wall, certified as installed/used on the project, meeting the requirements of the Design Standards and have been properly maintained will be paid for at the Contract unit price for Lights Temporary, Barrier Wall Mount.

102-11.11 Glare Screen (Temporary): The certified quantity to be paid for will be determined by the number of sections times the nominal length of each section.

102-11.12 Temporary Crash Cushions:

102-11.12.1 Redirective: The quantity to be paid for will be the number of Temporary Crash Cushions (Redirective) certified as installed/used and maintained on the project, including object marker.

102-11.12.2 Inertia: The quantity to be paid for will be the number of Temporary Crash Cushions (Inertia) complete arrays certified as installed/used and maintained in accordance with the plans and Design Standards, Index No. 417.

102-11.13 Temporary Guardrail: The quantity to be paid for will be the length, in feet, of temporary guardrail constructed and certified as installed/used on the project. The length of a run of guardrail will be determined as a multiple of the nominal panel lengths.

102-11.14 Advance Warning Arrow Panel: The quantity to be paid at the contract unit price will be for the number of advance warning arrow panels certified as installed/used on the project on any calendar day or portion thereof within the contract time.

102-11.15 Portable Changeable Message Sign: The quantity to be paid at the contract unit price will be for the number of portable changeable message signs certified as installed/used on the project on any calendar day or portion thereof within the contract time. Payment will be made for each portable changeable message sign that is used during the period beginning fourteen working days before Contract Time begins as authorized by the Engineer.

102-11.16 Portable Regulatory Signs: The quantity to be paid for will be the number of portable regulatory signs certified as installed/used on the project on any calendar day or portion thereof within the contract time, will be paid for the contract unit price for portable regulatory sign.

102-11.17 Radar Speed Display Unit: The quantity to be paid for will be the number of radar speed display units certified as installed/used on the project on any calendar day or portion thereof within the contract time, will be paid for the contract unit price for radar speed display unit.

102-11.18 Temporary Signalization and Maintenance: For existing intersections, the quantity to be paid for will be the number of signalized intersections per day for the full duration of the Contract. For temporary intersections, the quantity to be paid for will be the number of signalized intersections per day for the duration of the temporary intersection. No separate payment will be made for temporary signalization and maintenance at new intersections.

102-11.19 Temporary Traffic Detection and Maintenance: For existing intersections, the quantity to be paid for will be the number of signalized intersections per day beginning the day contract time begins and ending the day the permanent detection is operational. For temporary and new intersections, the quantity to be paid for will be the number of signalized intersections per day beginning the day the temporary detection is functional and ending the day: the permanent detection is operational and the final lane configuration is in place for a new intersection; or, when the detection is removed for a temporary intersection.

102-11.20 Work Zone Pavement Markings: The quantities, furnished and installed, to be paid for will be the length of skip and solid pavement markings, and the area of pavement markings placed as follows:

(a) The total transverse distance, in feet, of skip pavement marking authorized and acceptably applied. The length of actual applied line will depend on the skip ratio of the material used. Measurement will be the distance from the beginning of the first stripe to the end of the last stripe with proper deductions made for unpainted intervals as determined by plan dimensions or stations, subject to 9-1.3.

(b) The net length, in feet, of solid pavement marking authorized and acceptably applied.

(c) The number of directional arrows or pavement messages authorized and acceptably applied.

(d) The number of Temporary RPM’s authorized and acceptably applied.

102-11.21 Temporary Raised Rumble Strips: The quantity of temporary raised rumble strip sets to be paid for will be the number of temporary raised rumble strip sets installed and accepted.

102-12 Submittals.

102-12.1 Submittal Instructions: Prepare a certification of quantities, using the Department's current approved form, for certified Maintenance of Traffic payment items for each project in the Contract. Submit the certification of quantities to the Engineer. The Department will not pay for any disputed items until the Engineer approves the certification of quantities.

102-12.2 Contractor's Certification of Quantities: Request payment by submitting a certification of quantities 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 done or completed. Ensure the certification consists of the following:

(a) Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

(b) The basis for arriving at the amount of the progress certification, less payments previously made and less an amount previously retained or withheld. The basis will include a detail breakdown provided on the certification of items of payment in accordance with 102-13. After the initial setup of the maintenance of traffic items and counts, the interval for recording the counts will be made weekly on the certification sheet unless there is a change. This change will be documented on the day of occurrence. Some items may necessitate a daily interval of recording the counts.

102-13 Basis of Payment.

102-13.1 Maintenance of Traffic (General Work): When an item of work is included in the proposal, price and payment will be full compensation for all work and costs specified under this Section except as may be specifically covered for payment under other items.

102-13.2 Traffic Control Officers: Price and payment will be full compensation for the services of the traffic control officers.

102-13.3 Special Detours: Price and payment will be full compensation for providing all detour facilities shown on the plans and all costs incurred in carrying out all requirements of this Section for general maintenance of traffic within the limits of the detour, as shown on the plans.

102-13.4 Commercial Materials for Driveway Maintenance: Price and payment will be full compensation for all work and materials specified for this item, including specifically all required shaping and maintaining of driveways.

102-13.5 Work Zone Signs: Price and payment will be full compensation for all work and materials for furnishing signs, supports and necessary hardware, installation, relocating, maintaining and removing signs.

102-13.6. Business Signs: Price and payment will be full compensation for all materials and labor required for furnishing, installing, relocating, maintaining, and removing the signs as well as the cost of installing any logos provided by business owners.

102-13.7 High Intensity Warning Lights: Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing high intensity flashing lights (Type B).

102-13.8 Channelizing Devices: Prices and payment will be full compensation for furnishing, installing, relocating, maintaining and removing the channelizing devices, including the costs associated with attached warning lights as required.

102-13.9 Barrier Wall (Temporary): Price and payment will be full compensation for furnishing, installing, maintaining, and removing the barrier. When called for, Barrier Wall (Temporary) (Relocate) will be full compensation for relocating the barrier.

102-13.10 Lights, Temporary, Barrier Wall Mount: Price and payment will be full compensation for all work and materials for furnishing, installing and maintaining the warning lights mounted on barrier wall. Payment will not be made for lights that are improperly placed or are not working.

102-13.11 Glare Screen (Temporary): Price and payment will be full compensation for furnishing, installing, maintaining, and removing the glare screen certified as installed/used on the project. When called for, Glare Screen (Relocate) will be full compensation for relocating the glare screen.

102-13.12 Temporary Crash Cushion:

102-13.12.1 Redirective: Price and payment will be full compensation for furnishing, installing, maintaining and subsequently removing such crash cushions. Payment for restoring damaged crash cushions will be 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. Additional MOT required for the repair of the crash cushion will be paid for under the appropriate MOT pay item.

102-13.12.2 Inertia: Price and payment for the number of complete arrays will be full compensation for furnishing, installing, maintenance and removal at each specified location. In addition, payment will be made for new modules replaced due to damages, excluding damage caused by the Contractor's operations.

102-13.13 Temporary Guardrail: Price and payment will be full compensation for furnishing all materials required for a complete installation, including end anchorage assemblies and any end connections to other structures and for installing, maintaining and removing guardrail.

102-13.14 Arrow Board: Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing arrow boards.

102-13.15 Portable Changeable Message Sign: Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing portable changeable message signs.

102-13.16 Portable Regulatory Signs: Price and payment will be full compensation for furnishing, installing, relocating, maintaining and removing a completely functioning system as described in these specifications portable regulatory signs. Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing portable regulatory signs.

Payment will include all labor, materials, incidentals, repairs and any actions necessary to operate and maintain the unit at all times that work is being performed or traffic is being affected by construction and/or maintenance of traffic operations.

102-13.17 Radar Speed Display Unit: Price and payment will be made only for a completely functioning system as described in these specifications. Payment will include all labor, hardware, accessories, signs, and incidental items necessary for a complete system.

Payment will include any measurements needed to insure that the unit conforms to all specification requirements.

Payment will include all labor, materials, incidentals, repairs and any actions necessary to operate and maintain the unit at all times that work is being performed or traffic is being affected by construction and/or maintenance of traffic operations. Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing radar speed display unit.

102-13.18 Temporary Signalization and Maintenance: Price and payment will constitute full compensation for furnishing, installing, operating, maintaining and removing temporary traffic control signals including all equipment and components necessary to provide an operable traffic signal. Payment will be withheld for each day at each intersection where the temporary signalization is not operational within 12 hours after notification.

102-13.19 Temporary Traffic Detection and Maintenance: Price and payment will constitute full compensation for furnishing, installing, operating, maintaining and removing temporary traffic detection including all equipment and components necessary to provide an acceptable signalized intersection. Take ownership of all equipment and components. Payment will be withheld for each day at each intersection where the temporary detection is not operational within 12 hours after notification.

102-13.20 Temporary Raised Rumble Strips: Price and payment will be full compensation for all work and materials described in this Section, including all cleaning and preparing of surfaces, disposal of all debris, furnishing of all materials, application, curing, removal, reinstalling and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work.

102-13.21 Work Zone Pavement Markings: Price and payment will be full compensation for all work specified including, all cleaning and preparing of surfaces, furnishing of all materials, application, curing and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

Removable Tape may be substituted for work zone paint at no additional cost to the Department.

Payment for Temporary Retroreflective Pavement Markers used to supplement line markings will be paid for under Temporary Retroreflective Pavement Markers. Install these markers as detailed in the Design Standards.

102-13.22 Payment Items: Payment will be made under:

Item No. 102- 1-	Maintenance of Traffic - lump sum.
Item No. 102- 2-	Special Detour - lump sum.
Item No. 102- 3-	Commercial Material for Driveway Maintenance - per cubic yard.
Item No. 102- 14-	Traffic Control Officer - per hour.
Item No. 102- 60-	Work Zone Sign - per each per day.
Item No. 102- 61-	Business Sign - each.
Item No. 102- 71-	Barrier Wall - per foot.
Item No. 102- 94-	Glare Screen - per foot.
Item No. 102- 73-	Guardrail (Temporary) - per foot.
Item No. 102- 74-	Barricade (Temporary) - per each per day.
Item No. 102- 76-	Arrow Board - per each per day.

Item No. 102- 77-	High Intensity Flashing Lights (Temporary - Type B) - per each per day.
Item No. 102- 78-	Temporary Retroreflective Pavement Markers - each.
Item No. 102- 79-	Lights, Temporary, Barrier Wall Mount - per each per day.
Item No. 102- 81-	Crash Cushion (Gating) (Temporary) –per location.
Item No. 102- 89-	Crash Cushion (Temporary) - per location.
Item No. 102- 99-	Portable Changeable Message Sign (Temporary) - per each per day.
Item No. 102-104-	Temporary Signalization and Maintenance - per intersection per day.
Item No. 102-107-	Temporary Traffic Detection and Maintenance - per intersection per day.
Item No. 102-150-	Portable Regulatory Sign - per each per day.
Item No. 102-150-	Radar Speed Display Unit - per each per day.
Item No. 102-910-	Temporary Raised Rumble Strip Set – per set
Item No. 102-911-	Removable Tape (White/Black) - per foot.
Item No. 102-912-	Removable Tape (Yellow) - per foot.
Item No. 710-	Painted Pavement Markings.
Item No. 711-	Thermoplastic Traffic Stripes and Markings.

104 PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION.

(REV 11-18-10) (FA 1-21-11) (7-11)

SECTION 104 (Pages 127 – 135) is deleted and the following substituted:

SECTION 104
PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION

104-1 Description.

Provide erosion control measures on the project and in areas outside the right-of-way where work is accomplished in conjunction with the project, so as to prevent pollution of water, detrimental effects to public or private property adjacent to the project right-of-way and damage to work on the project. Construct and maintain temporary erosion control features or, where practical, construct and maintain permanent erosion control features as shown in the plans or as may be directed by the Engineer.

104-2 General.

Coordinate the installation of temporary erosion control features with the construction of the permanent erosion control features to the extent necessary to ensure economical, effective, and continuous control of erosion and water pollution throughout the life of the Contract.

Due to unanticipated conditions, the Engineer may direct the use of control features or methods other than those included in the original Contract. In such event, the Department will pay for this additional work as unforeseeable work.

104-3 Control of Contractor's Operations Which May Result in Water Pollution.

Prevent pollution of streams, canals, lakes, reservoirs, and other water impoundments with fuels, oils, bitumens, calcium chloride, or other harmful materials. Also, conduct and schedule operations to avoid or otherwise minimize pollution or siltation of such water impoundments, and to avoid interference with movement of migratory fish. Do not dump any residue from dust collectors or washers into any live stream.

Restrict construction operations in rivers, streams, lakes, tidal waters, reservoirs, canals, and other water impoundments to those areas where it is necessary to perform filling or excavation to accomplish the work shown in the plans and to those areas which must be entered to construct temporary or permanent structures. As soon as conditions permit, promptly clear rivers, streams, and impoundments of all obstructions placed therein or caused by construction operations.

Do not frequently ford live streams with construction equipment. Wherever an appreciable number of stream crossings are necessary at any one location, use a temporary bridge or other structure.

Except as necessary for construction, do not deposit excavated material in rivers, streams, canals, or impoundments, or in a position close enough thereto, to be washed away by high water or runoff.

Where pumps are used to remove highly turbid waters from enclosed construction areas such as cofferdams or forms, treat the water by one or more of the following methods prior to discharge into State waters: pumping into grassed swales or appropriate vegetated areas or sediment basins, or confined by an appropriate enclosure such as turbidity barriers when other methods are not considered appropriate.

Do not disturb lands or waters outside the limits of construction as staked, except as authorized by the Engineer.

Obtain the Engineer's approval for the location of, and method of operation in, borrow pits, material pits, and disposal areas furnished for waste material from the project (other than commercially operated sources) such that erosion during and after completion of the work will not result in probability of detrimental siltation or water pollution.

104-4 Materials for Temporary Erosion Control.

The Engineer will not require testing of materials used in construction of temporary erosion control features other than as provided for geotextile fabric in 985-3 unless such material is to be incorporated into the completed project. When no testing is required, the Engineer will base acceptance on visual inspection.

The Contractor may use new or used materials for the construction of temporary silt fence, staked turbidity barriers, and floating turbidity barrier not to be incorporated into the completed project, subject to the approval of the Engineer.

104-5 Preconstruction Requirements.

At the Preconstruction Conference, provide to the Department an Erosion Control Plan meeting the requirements or special conditions of all permits authorizing project construction. If no permits are required or the approved permits do not contain special conditions or specifically address erosion and water pollution, the project Erosion Control Plan will be governed by 7-1.1, 7-2.2, 7-8.1, 7-8.2, and Section 104.

When a DEP generic permit is issued, the Contractor's Erosion Control Plan shall be prepared to accompany the Department's Stormwater Pollution Prevention Plan (SWPPP).

Ensure the Erosion Control Plan includes procedures to control off-site tracking of soil by vehicles and construction equipment and a procedure for cleanup and reporting of non-storm water discharges, such as contaminated groundwater or accidental spills. Do not begin any soil disturbing activities until Department approval of the Contractor's Erosion Control Plan, including required signed certification statements.

Failure to sign any required documents or certification statements will be considered a default of the Contract. Any soil disturbing activities performed without the required signed documents or certification statements may be considered a violation of the DEP Generic Permit.

When the SWPPP is required, prepare the Erosion Control Plan in accordance with the planned sequence of operations and present in a format acceptable to the Department. The Erosion Control Plan shall describe, but not be limited to, the following items or activities:

(1) For each phase of construction operations or activities, supply the following information:

(a) Locations of all erosion control devices

(b) Types of all erosion control devices

(c) Estimated time erosion control devices will be in operation

(d) Monitoring schedules for maintenance of erosion control devices

(e) Methods of maintaining erosion control devices

(f) Containment or removal methods for pollutants or hazardous wastes

(2) The name and telephone number of the person responsible for monitoring and maintaining the erosion control devices.

(3) Submit for approval the Erosion Control Plans meeting paragraphs 3a, 3b, or 3c below:

(a) Projects permitted by the Southwest Florida Water Management District (SWFWMD), require the following:

Submit a copy of the Erosion Control Plan to the Engineer for review and to the appropriate SWFWMD Office for review and approval. Include the SWFWMD permit number on all submitted data or correspondence.

The Contractor may schedule a meeting with the appropriate SWFWMD Office to discuss his Erosion Control Plan in detail, to expedite the review and approval process. Advise the Engineer of the time and place of any meetings scheduled with SWFWMD.

Do not begin construction activities until the Erosion Control Plan receives written approval from both SWFWMD and the Engineer.

(b) Projects permitted by the South Florida Water Management District or the St. Johns River Water Management District, require the following:

Obtain the Engineer's approval of the Erosion Control Plan.

Do not begin construction activities until the Erosion Control Plan receives written approval from the Engineer.

(c) Projects authorized by permitting agencies other than the Water Management Districts or projects for which no permits are required require the following:

The Engineer will review and approve the Contractor's Erosion Control Plan.

Do not begin construction activities until the Erosion Control Plan receives written approval from the Engineer.

Comply with the approved Erosion Control Plan.

104-6 Construction Requirements.

104-6.1 Limitation of Exposure of Erodible Earth: The Engineer may limit the surface areas of unprotected erodible earth exposed by the construction operation and may direct the Contractor to provide erosion or pollution control measures to prevent contamination of any river, stream, lake, tidal waters, reservoir, canal, or other water impoundments or to prevent detrimental effects on property outside the project right-of-way or damage to the project. Limit the area in which excavation and filling operations are being performed so that it does not exceed the capacity to keep the finish grading, turf, sod, and other such permanent erosion control measures current in accordance with the accepted schedule.

Do not allow the surface area of erodible earth that clearing and grubbing operations or excavation and filling operations expose to exceed 750,000 square feet without specific prior approval by the Engineer. This limitation applies separately to clearing and grubbing operations and excavation and filling operations.

The Engineer may increase or decrease the amount of surface area the Contractor may expose at any one time.

104-6.2 Incorporation of Erosion and Sediment Control Features: Incorporate permanent erosion control features into the project at the earliest practical time. Use temporary erosion and sediment control features found in the State of Florida Erosion and Sediment Control Designer and Reviewer Manual (E&SC Manual) to correct conditions that develop during construction which were not foreseen at the time of design, to control erosion and sediment prior to the time it is practical to construct permanent control features, or to provide immediate temporary control of erosion and sediment that develops during normal construction operations, which are not associated with permanent erosion control features on the project. An electronic version of the E&SC Manual can be found at the following URL:

www.dot.state.fl.us/specificationsoffice/Implemented/URLinSpecs/Files/FLErosionSedimentManual.pdf

Install all sediment control devices in a timely manner to ensure the control of sediment and the protection of lakes, streams, gulf or ocean waters, or any wetlands associated therewith and to any adjacent property outside the right-of-way as required.

At sites where exposure to such sensitive areas is prevalent, complete the installation of any sediment control device prior to the commencement of any earthwork.

After installation of sediment control devices, repair portions of any devices damaged at no expense to the Department. The Engineer may authorize temporary erosion and sediment control features when finished soil layer is specified in the Contract and the limited availability of that material from the grading operations will prevent scheduled progress of the work or damage the permanent erosion control features.

104-6.3 Scheduling of Successive Operations: Schedule operations such that the area of unprotected erodible earth exposed at any one time is not larger than the minimum area necessary for efficient construction operations, and the duration of exposure of uncompleted construction to the elements is as short as practicable.

Schedule and perform clearing and grubbing so that grading operations can follow immediately thereafter. Schedule and perform grading operations so that permanent erosion control features can follow immediately thereafter if conditions on the project permit.

104-6.4 Details for Temporary Erosion and Sediment Control Features:

104-6.4.1 General: Use temporary erosion, sediment and water pollution control features found in the E&SC Manual. These features consist of, but are not limited to, temporary

turf, rolled erosion control products, sediment containment systems, runoff control structures, sediment barriers, inlet protection systems, silt fences, turbidity barriers, and chemical treatment. For design details for some of these items, refer to the Design Standards and E&SC Manual.

104-6.4.2 Temporary Turf: The Engineer may designate certain areas of turf or sod constructed in accordance with Section 570 as temporary erosion control features. For areas not defined as sod, constructing temporary turf by seeding only is not an option for temporary erosion control under this Section. The Engineer may waive the turf establishment requirements of Section 570 for areas with temporary turf that will not be a part of the permanent construction.

104-6.4.3 Runoff Control Structures: Construct runoff control structures in accordance with the details shown in the plans, the E&SC Manual, or as may be approved as suitable to adequately perform the intended function.

104-6.4.4 Sediment Containment Systems: Construct sediment containment systems in accordance with the details shown in the plans, the E&SC Manual, or as may be approved as suitable to adequately perform the intended function. Clean out sediment containment systems as necessary in accordance with the plans or as directed.

104-6.4.5 Sediment Barriers: Provide and install sediment barriers according to details shown in the plans, as directed by the Engineer, or as shown in the E&SC Manual to protect against downstream accumulation of sediment. Sediment Barriers include, but are not limited to synthetic bales, silt fence, fiber logs and geosynthetic barriers. Reusable barriers that have had sediment deposits removed may be reinstalled on the project as approved by the Engineer.

104-6.4.6 Silt Fence:

104-6.4.6.1 General: Furnish, install, maintain, and remove silt fences, in accordance with the manufacturer's directions, these Specifications, the details as shown on the plans, the Design Standards, and the E&SC Manual.

104-6.4.6.2 Materials and Installation: Use a geotextile fabric made from woven or nonwoven fabric, meeting the physical requirements of Section 985 according to those applications for erosion control.

Choose the type and size of posts, wire mesh reinforcement (if required), and method of installation. Do not use products which have a separate layer of plastic mesh or netting. Provide a durable and effective silt fence that controls sediment comparable to the Design Standards and the E&SC Manual.

Erect silt fence at upland locations, across ditchlines and at temporary locations shown on the plans or approved by the Engineer where continuous construction activities change the natural contour and drainage runoff. Do not attach silt fence to existing trees unless approved by the Engineer.

104-6.4.6.3 Inspection and Maintenance: Inspect all silt fences immediately after each rainfall and at least daily during prolonged rainfall. Immediately correct any deficiencies. In addition, make a daily review of the location of silt fences in areas where construction activities have changed the natural contour and drainage runoff to ensure that the silt fences are properly located for effectiveness. Where deficiencies exist, install additional silt fences as directed by the Engineer.

Remove sediment deposits when the deposit reaches approximately 1/2 of the volume capacity of the silt fence or as directed by the Engineer. Dress any sediment deposits remaining in place after the silt fence is no longer required to conform with the finished grade, and prepare and seed them in accordance with Section 570.

104-6.4.7 Floating Turbidity Barriers and Staked Turbidity Barriers: Install, maintain, and remove turbidity barriers to contain turbidity that may occur as the result of dredging, filling, or other construction activities which may cause turbidity to occur in the waters of the State. The Contractor may need to deploy turbidity barriers around isolated areas of concern such as seagrass beds, coral communities, etc. both within as well as outside the right-of-way limits. The Engineer will identify such areas. Place the barriers prior to the commencement of any work that could impact the area of concern. Install the barriers in accordance with the details shown in the plans or as approved by the Engineer. Ensure that the type barrier used and the deployment and maintenance of the barrier will minimize dispersion of turbid waters from the construction site. The Engineer may approve alternate methods or materials.

Operate turbidity barriers in such a manner to avoid or minimize the degradation of the water quality of the surrounding waters and minimize damage to areas where floating barriers installed.

104-6.4.8 Inlet Protection System: Furnish and install inlet protection systems as shown in the plans, Design Standards and the E&SC Manual.

104-6.4.9 Rolled Erosion Control Products (RECPs):

104-6.4.9.1 General: Install RECPs in locations where temporary protection from erosion is needed. Two situations occur that require artificial coverings. The two situations have differing material requirements, which are described below.

(1) Use RECPs composed of natural or synthetic fiber mats, plastic sheeting, or netting as protection against erosion, when directed by the Engineer, during temporary pauses in construction caused by inclement weather or other circumstances. Remove the material when construction resumes.

(2) Use RECPs as erosion control blankets, at locations shown in the plans, to facilitate plant growth while permanent grassing is being established. For the purpose described, use non-toxic, biodegradable, natural or synthetic woven fiber mats. Install erosion control blankets capable of sustaining a maximum design velocity of 6.5 ft/sec as determined from tests performed by Utah State University, Texas Transportation Institute or an independent testing laboratory approved by the Department. Furnish to the Engineer, two certified copies of manufacturers test reports showing that the erosion control blankets meet the requirements of this Specification. Certification must be attested, by a person having legal authority to bind the manufacturing company. Also, furnish two 4 by 8 inch samples for product identification. The manufacturers test records shall be made available to the Department upon request. Leave the material in place, as installed, to biodegrade.

104-6.4.10 Chemical Treatment: Provide chemical treatment in accordance with the E&SC Manual. Chemical treatment may be used to clarify turbid or sediment laden water that does not yet meet state water quality standards or as an amendment to other erosion prevention and sediment control products to aid in their performance. The contractor must provide all of the required toxicity testing information in accordance with the E&SC Manual to the Engineer for review and acceptance prior to using any chemical treatment on the project site.

104-6.5 Removal of Temporary Erosion Control Features: In general, remove or incorporate into the soil any temporary erosion control features existing at the time of construction of the permanent erosion control features in an area of the project in such a manner that no detrimental effect will result. The Engineer may direct that temporary features be left in place.

104-7 Maintenance of Erosion and Sediment Control Features.

104-7.1 General: Provide routine maintenance of permanent and temporary erosion and sediment control features, at no expense to the Department, until the project is complete and accepted. If reconstruction of such erosion and sediment control features is necessary due to the Contractor's negligence or carelessness or, in the case of temporary erosion and sediment control features, failure by the Contractor to install permanent erosion control features as scheduled, the Contractor shall replace such erosion control features at no expense to the Department. If reconstruction of permanent or temporary erosion and sediment control features is necessary due to factors beyond the control of the Contractor, the Department will pay for replacement under the appropriate Contract pay item or items.

Inspect all erosion and sediment control features at least once every seven calendar days and within 24 hours of the end of a storm of 0.50 inches or greater. Maintain all erosion control features as required in the Stormwater Pollution Prevention Plan, Contractor's Erosion Control plan and as specified in the State of Florida Department of Environmental Protection Generic Permit for Stormwater Discharge from Large and Small Construction Activities.

104-8 Protection During Suspension of Contract Time.

If it is necessary to suspend the construction operations for any appreciable length of time, shape the top of the earthwork in such a manner to permit runoff of rainwater, and construct earth berms along the top edges of embankments to intercept runoff water. Provide temporary slope drains to carry runoff from cuts and embankments that are in the vicinity of rivers, streams, canals, lakes, and impoundments. Locate slope drains at intervals of approximately 500 feet, and stabilize them by paving or by covering with waterproof materials. Should such preventive measures fail, immediately take such other action as necessary to effectively prevent erosion and siltation. The Engineer may direct the Contractor to perform, during such suspensions of operations, any other erosion and sediment control work deemed necessary.

104-9 Method of Measurement.

When separate items for temporary erosion control features are included in the Contract, the quantities to be paid for will be: (1) the area, in square yards, of Rolled Erosion Control Products; (2) the length, in feet, of Runoff Control Structures, measured along the surface of the work constructed; (3) the number of Sediment Containment Systems constructed and accepted; (4) the number of Sediment Containment System Cleanouts accomplished and accepted; (5) the length, in feet, of Sediment Barriers; (6) the length, in feet, of Floating Turbidity Barrier; (7) the length, in feet, of Staked Turbidity Barrier; (8) the number of inlet protection systems; (9) the area, in square yards, of chemical treatment.(10) the number of floc logs or drums of product for chemical treatment.

Upon acceptance by the Engineer, the quantity of floating turbidity barriers, sediment barriers, staked turbidity barriers, and inlet protection devices will be paid for regardless of whether materials are new, used, or relocated from a previous installation on the project.

104-10 Basis of Payment.

Prices and payments will be full compensation for all work specified in this Section, including construction and routine maintenance of temporary erosion control features.

Any additional costs resulting from compliance with the requirements of this Section, other than construction, routine maintenance, and removal of temporary erosion control features, will be included in the Contract unit prices for the item or items to which such costs are related. The work of Performance Turf designated as a temporary erosion control feature in accordance with 104-6.4.2 will be paid for under the appropriate pay items specified in Sections 570 and 580.

Separate payment will not be made for the cost of constructing temporary earth berms along the edges of the roadways to prevent erosion during grading and subsequent operations. The Contractor shall include these costs in the Contract prices for grading items.

Additional temporary erosion control features constructed as directed by the Engineer will be paid for as unforeseeable work.

In case of repeated failure on the part of the Contractor to control erosion, pollution, or siltation, the Engineer reserves the right to employ outside assistance or to use the Department's own forces to provide the necessary corrective measures. Any such costs incurred, including engineering costs, will be charged to the Contractor and appropriate deductions made from the monthly progress estimate.

Payment will be made under:

Item No. 104- 1-	Artificial Coverings/ Rolled Erosion Control Products - per square yard.
Item No. 104- 6-	Slope Drains (Temporary)/ Runoff Control Structures - per foot.
Item No. 104- 7-	Sediment Basins/ Containment Systems - each.
Item No. 104- 9-	Sediment Basin/ Containment system Cleanouts - each.
Item No. 104- 10-	Sediment Barriers – per foot
Item No. 104- 11-	Floating Turbidity Barrier - per foot.
Item No. 104- 12-	Staked Turbidity Barrier - per foot.
Item No. 104- 18	Inlet Protection System – each.
Item No. 104- 19	Chemical Treatment – per square yard.
Item No. 104 – 20	Chemical Treatment (floc logs, drums of product) - each.

105 CONTRACTOR QUALITY CONTROL GENERAL REQUIREMENTS. (REV 5-18-11) (FA 8-4-11) (1-12)

SUBARTICLE 105-3.1 (Pages 137 – 138) is deleted and the following substituted:

105-3.1 General: Certain operations require personnel with specific qualifications. Certain materials require production under an approved Quality Control (QC) Plan to ensure that these materials meet the requirements of the Contract Documents. Applicable materials include hot mix asphalt, Portland cement concrete (Structural), earthwork, cementitious materials, timber, steel and miscellaneous metals, galvanized metal products, prestressed and/or precast concrete products and drainage products. For all applicable materials included in the Contract, submit a QC Plan prepared in accordance with the requirements of this Section to the Engineer. Do not incorporate any of these materials into the project prior to the Engineer's approval of the QC Plan.

Steel and Miscellaneous Metal products, including aluminum, are defined as the

metal components of bridges**,** including pedestrian and moveable bridges, overhead and cantilevered sign supports, ladders and platforms, bearings, end wall grates, roadway gratings, drainage items, expansion joints, roadway decking, shear connectors, handrails, galvanized products, fencing, guardrail, light poles, high mast light poles, standard mast arm assemblies and Monotube assemblies, stay in-place forms, casing pipe, strain poles, fasteners, connectors and other hardware.

When accreditation or certification is required, make supporting documents from the two previous inspections performed by the accrediting or certifying agency available to the Department upon request.

Obtain Department approval prior to beginning production. Meet and maintain the approved Quality Control Program requirements at all times. Production and construction of these products without the Department's prior approval of a Quality Control Program may result in rejection of the products. Continued approval will be subject to satisfactory results from Department evaluations, including the Independent Assurance program. In cases of non-compliance with the approved Quality Control Program, identify all affected material and do not incorporate or supply to the Department projects. The following conditions may result in suspension of a Quality Control Program:

a. Failure to timely supply information required.

b. Repeated failure of material to meet Standard Specification requirements.

c. Failure to take immediate corrective action relative to deficiencies in the performance of the Quality Control Program.

d. Certifying materials that are not produced under an approved Quality Control Program for use on Department projects.

e. Failure to correct any deficiencies related to any requirement of the Quality Control Program, having received notice from the Department, within the amount of time defined in the notice.

SUBARTICLE 105-3.2 (Pages 138 – 139) is deleted and the following substituted:

105-3.2 Compliance with the Materials Manual.

Producers of Flexible Pipe shall meet the requirements of Section 6.1, Volume II of the Department's Materials Manual, which may be viewed at the following URL: www.dot.state.fl.us/specificationsoffice/Implemented/URLinSpecs/Files/section61.pdf .

Producers of Precast Concrete Pipe shall meet the requirements of Section 6.2, Volume II of the Department's Materials Manual, which may be viewed at the following URL: www.dot.state.fl.us/specificationsoffice/Implemented/URLinSpecs/Files/section62.pdf .

Producers of Precast Concrete Drainage Structures shall meet the requirements of Section 6.3, Volume II of the Department's Materials Manual, which may be viewed at the following URL: www.dot.state.fl.us/specificationsoffice/Implemented/URLinSpecs/Files/section63.pdf .

Producers of Precast/Prestressed Concrete Products shall meet the requirements of Sections 8.1 and 8.3 of the Department's Materials Manual, which may be viewed at the following URLs: www.dot.state.fl.us/specificationsoffice/Implemented/URLinSpecs/Files/section81.pdf . http://www.dot.state.fl.us/specificationsoffice/Implemented/URLinSpecs/Files/section83.pdf.

Producers of Precast Prestressed Concrete Products using Self Consolidating Concrete shall meet the requirements of Section 8.4, Volume II of the Department's Materials Manual, which may be viewed at the following URL:
www.dot.state.fl.us/specificationsoffice/Implemented/URLinSpecs/Files/section84.pdf

Producers of Incidental Precast/Prestressed Concrete Products shall meet the requirements of Section 8.2, Volume II of the Department's Materials Manual, which may be viewed at the following URL:
www.dot.state.fl.us/specificationsoffice/Implemented/URLinSpecs/Files/section82.pdf .

Producers of Portland Cement Concrete shall meet the requirements of Section 9.2, Volume II of the Department's Materials Manual, which may be viewed at the following URL:
www.dot.state.fl.us/specificationsoffice/Implemented/URLinSpecs/Files/section92.pdf .

Producers of Structural Steel and Miscellaneous Metal Components shall meet the requirements of Sections 11.1 and 11.2 of the Department's Materials Manual, which may be viewed at the following URLs:
www.dot.state.fl.us/specificationsoffice/Implemented/URLinSpecs/Files/section111.pdf .
www.dot.state.fl.us/specificationsoffice/Implemented/URLinSpecs/Files/section112.pdf .

SUBARTICLE 105-5.2.1 (Page 140) is deleted and the following substituted:

105-5.2.1 Qualifications: Submit the Training Identification Numbers (TINs) or any other information which will be traceable to the certification agency's training location and dates for all technicians performing sampling, testing and inspection for both field and laboratory tests. Provide the names of the CTQP certifications and other pertinent certifications held and the expiration dates for each certification for each technician. Include employed and subcontracted technicians.

ARTICLE 105-6 (Page 142) is deleted and the following substituted:

105-6 Lab Qualification Program.

Testing Laboratories participating in the Department's Acceptance Program must have current Department qualification when testing materials that are used on Department projects. In addition, they must have one of the following:

a. Current AASHTO (AAP) accreditation.

b. Inspected on a regular basis per ASTM D 3740 for earthwork, ASTM D 3666 for asphalt and ASTM C 1077 for concrete for test methods used in the Acceptance Program, with all deficiencies corrected, and under the supervision of a Specialty Engineer.

c. Current Construction Materials Engineering Council (CMEC) program accreditation or other independent inspection program accreditation acceptable to the Engineer and equivalent to a. or b. above.

After meeting the criteria described above, submit a Laboratory Qualification Application to the Department. The application is available from the Department's website. Obtain the Department's qualification prior to beginning testing. The Department may inspect the laboratory for compliance with the accreditation requirements prior to issuing qualification.

Meet and maintain the qualification requirements at all times. Testing without Department's qualification may result in a rejection of the test results. Continued qualifications are subject to satisfactory results from Department evaluations, including Independent Assurance evaluations. In case of suspension or disqualification, prior to resumption of testing, resolve the issues to the Department's satisfaction and obtain reinstatement of qualification. The following conditions may result in suspension of a laboratory's qualified status:

a. Failure to timely supply required information.
b. Loss of accredited status.
c. Failure to correct deficiencies in a timely manner.
d. Unsatisfactory performance.
e. Changing the laboratory's physical location without notification to the accrediting agency and the Engineer.
f. Delays in reporting the test data in the Department's database.
g. Incomplete or inaccurate reporting.
h. Using unqualified technicians performing testing.

Should any qualified laboratory falsify records, the laboratory qualification will be subject to revocation by the Engineer. Falsification of project-related documentation will be subject to further investigation and penalty under state and federal laws.

It is prohibited for any contract laboratory or staff to perform Contractor Quality Control testing and any other Acceptance Program testing on the same contract.

SUBARTICLE 105-8.6.1 (Page 144) is deleted and the following substituted:

105-8.6.1 Plant Technicians: For asphalt plant operations, provide a QC technician, qualified as a CTQP Asphalt Plant Level II technician, available at the asphalt plant at all times when producing mix for the Department. Perform all asphalt plant related testing with a CTQP Asphalt Plant Level I technician. As an exception, measurements of temperature may be performed by someone under the supervision of a CTQP Plant Level II technician.

SUBARTICLE 105-8.6.2 (Page 144) is deleted and the following substituted:

105-8.6.2 Paving Technicians: For paving operations, keep a qualified CTQP Asphalt Paving Level II technician on the roadway at all times when placing asphalt mix for the Department, and perform all testing with a CTQP Asphalt Paving Level I technician. As an exception, measurements of cross-slope, temperature and yield (spread rate), as well as the inspection of the placement of miscellaneous asphalt, can be performed by someone under the supervision of a CTQP Paving Level II technician.

SUBARTICLE 105-8.7 (Pages 144-145) is deleted and the following substituted:

105-8.7 Concrete QC Personnel:

105-8.7.1 Concrete Field Technician - Level I: Ensure technicians performing plastic property testing on concrete for materials acceptance are qualified CTQP Concrete Field Technicians Level I. Plastic property testing will include but not be limited to slump,

temperature, air content, water-to-cementitious materials ratio calculation, and making and curing concrete cylinders. Duties will include initial sampling and testing to confirm specification compliance prior to beginning concrete placements, ensuring timely placement of initial cure and providing for the transport of compressive strength samples to the designated laboratories.

105-8.7.2 Concrete Field Inspector - Level II: Ensure field inspectors responsible for the quality of concrete being placed on major bridge projects are qualified CTQP Concrete Field Inspectors Level II. A Level II Inspector must be present on the jobsite during all concrete placements. Prior to the placement of concrete, the inspector will inspect the element to be cast to ensure compliance with Contract Documents. A Level II Inspector's duties may include ensuring that concrete testing, inspection, and curing in the field are performed in accordance with the Contract Documents. The QC Inspector will inform the Verification Inspector of anticipated concrete placements and LOT sizes.

105-8.7.3 Concrete Laboratory Technician:

105-8.7.3.1 Concrete Laboratory Technician - Level I: Ensure technicians testing cylinders and recording concrete strength for material acceptance are qualified CTQP Concrete Laboratory Technicians Level I. Duties include final curing, compressive strength testing, and the recording/reporting of all test data.

105-8.7.3.2 Concrete Laboratory Technician – Level II: Ensure that laboratories providing hardened property test results to the Department are under the supervision of a CTQP Concrete Laboratory Technician - Level II. This person is responsible to ensure that the tests are performed in accordance with Standard Test Methods, project specifications and other contract documents.

SUBARTICLE 105-8.8 (Page 145). The heading is deleted and the following substituted:

105-8.8 Supervisory Personnel – Post-Tensioned and Movable Bridge Structures:

SUBARTICLE 105-8.8.1 (Page 145) is deleted and the following substituted:

105-8.8.1 General: Provide supervisory personnel meeting the qualification requirements only for the post-tensioned and movable bridge types detailed in this Article. Submit qualifications to the Engineer at the pre-construction conference. Do not begin construction until the qualifications of supervisory personnel have been approved by the Engineer.

SUBARTICLE 105-8.8.4 (Pages 146-148) is deleted and the following substituted:

105-8.8.4 Concrete Post-Tensioned Segmental Box Girder Construction: Ensure the individuals filling the following positions meet the minimum requirements as follows:

105-8.8.4.1 Project Engineer-New Construction: Ensure the Project Engineer is a registered professional engineer with five years of bridge construction experience.

Ensure a minimum of three years of experience is in Segmental Box Girder Construction Engineering and includes a minimum of one year in segmental casting yard operations and related surveying, one year in segment erection and related surveying, including post-tensioning and grouting of longitudinal tendons and a minimum of one year as the Project Engineer in responsible charge of Segmental Box Girder Construction Engineering. Ensure this individual is present at the site of construction, at all times while segmental box girder construction or segment erection is in progress.

105-8.8.4.2 Project Engineer-Repair and Rehabilitation: Ensure the Project Engineer is a registered Professional Engineer with five years of bridge construction experience. Ensure a minimum of three years of experience is in Segmental Box Girder Construction Engineering and includes one year of post-tensioning and grouting of longitudinal tendons and a minimum of one year as the Project Engineer in responsible charge of Segmental Box Girder rehabilitation engineering or Segmental Box Girder new construction engineering.

105-8.8.4.3 Project Superintendent/Manager-New Construction: Ensure the Project Superintendent/Manager has a minimum of ten years of bridge construction experience or is a registered professional engineer with five years of bridge construction experience. Ensure that a minimum of three years of experience is in Segmental Box Girder construction operations and includes a minimum of one year in the casting yard operations and related surveying, one year in segment erection and related surveying including post-tensioning and grouting of longitudinal tendons and a minimum of one year as the Project Superintendent/Manager in responsible charge of Segmental Box Girder construction operations. Ensure this individual is present at the site of construction, at all times while segmental box girder construction or segment erection is in progress.

105-8.8.4.4 Project Superintendent/Manager-Repair and Rehabilitation: Ensure the Project Superintendent/Manager has a minimum of five years of bridge construction experience or is a registered professional engineer with three years of bridge construction experience. Ensure that a minimum of two years of experience is in Segmental Box Girder construction operations and includes a minimum of one year experience performing post-tensioning and grouting of longitudinal tendons and a minimum of one year as the Project Superintendent/Manager in responsible charge of Segmental Box Girder rehabilitation operations or Segmental Box Girder new construction operations.

105-8.8.4.5 Foreman-New Construction: Ensure that the Foreman has a minimum of five years of bridge construction experience with two years of experience in Segmental Box Girder Operations and a minimum of one year as the foreman in responsible charge of Segmental Box Girder new construction Operations. Ensure this individual is present at the site of construction, at all times while segmental box girder construction or segment erection is in progress.

105-8.8.4.6 Foreman-Repair and Rehabilitation: Ensure the Foremen has a minimum of five years of bridge construction experience with two years of experience in Segmental Box Girder Operations and a minimum of one year as the foreman in responsible charge of Segmental Box Girder rehabilitation operations or Segmental Box Girder new construction operations.

105-8.8.4.7 Geometry Control Engineer/Manager: Ensure that the Geometry Control Engineer/Manager for construction of cast-in-place box segments is a Registered Professional Engineer with one year of experience, a non-registered Engineer with three years of experience or a Registered Professional Land Surveyor with three years of

experience in geometry control for casting and erection of cast-in-place box segments. Credit for experience in cast-in-place box girder geometry control will be given for experience in precast box girder geometry control but not vice versa.

Ensure that the Geometry Control Engineer/Manager for precast box segments is a Registered Professional Engineer with one year of experience or non-registered with three years of experience in casting yard geometry control of concrete box segments.

The Geometry Control Engineer/Manager must be responsible for and experienced at implementing the method for establishing and maintaining geometry control for segment casting yard operations and segment erection operations and must be experienced with the use of computer programs for monitoring and adjusting theoretical segment casting curves and geometry. This individual must be experienced at establishing procedures for assuring accurate segment form setup, post-tensioning duct and rebar alignment and effective concrete placement and curing operations as well as for verifying that casting and erection field survey data has been properly gathered and recorded. Ensure this individual is present at the site of construction, at all times while cast-in-place segmental box girder construction is in progress or until casting yard operations and segment erection is complete.

105-8.8.4.8 Surveyor: Ensure that the Surveyor in charge of geometry control surveying for box segment casting and/or box segment erection has a minimum of one year of bridge construction surveying experience. Ensure this individual is present at the site of construction, at all times while segmental box girder construction or segment erection is in progress.

SUBARTICLE 105-8.8.7 (Page 149) is deleted and the following substituted:

105-8.8.7 Post-Tensioning (PT) and Grouting Personnel Qualifications: Perform all stressing and grouting operations in the presence of the Engineer and with personnel meeting the qualifications of this article. Coordinate and schedule all PT and grouting activities to facilitate inspection by the Engineer.

105-8.8.7.1 Post-Tensioning: Perform all PT field operations under the direct supervision of a Level II CTQP Qualified PT Technician who must be present at the site of the post-tensioning work during the entire duration of the operation. For the superstructures of bridges having concrete post-tensioned box or I girder construction, provide at least two CTQP qualified PT technicians, Level I or II, on the work crew. The supervisor of the work crew, who must be a Level II CTQP Qualified PT Technician, may also be a work crew member, in which case, the supervisor shall count as one of the two CTQP qualified work crew members. For PT operations other than the superstructures of post-tensioned box or I girder construction, perform all PT operations under the direct supervision of a Level II CTQP Qualified PT Technician who must be present at the site of the PT work during the entire duration of the operation. Work crew members are not required to be CTQP qualified.

105-8.8.7.2 Grouting: Perform all grouting field operations under the direct supervision of a Level II CTQP Qualified Grouting Technician who must be present at the site of the grouting work during the entire duration of the operation. For the superstructures of bridges having concrete post-tensioned box or I girder construction, provide at least two CTQP qualified grouting technicians, Level I or II, on the work crew. The supervisor of the work crew, who must be a Level II CTQP Qualified Grouting Technician, may also be a work crew member,

in which case, the supervisor shall count as one of two CTQP qualified work crew members. For grouting operations other than the superstructures of post-tensioned box or I girder construction, perform all grouting operations under the direct supervision of a Level II CTQP Qualified Grouting Technician who must be present at the site of the grouting work during the entire duration of the operation. Work crew members are not required to be CTQP qualified.

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

SUBARTICLE 105-8.11 (Pages 150 – 151) is deleted and the following substituted:

105-8.11 Pipe and Precast Concrete Products Manufacturing Facilities Quality Control Personnel:

105-8.11.1 General: Obtain personnel certifications from Department accredited training providers. The list of Department approved courses and their accredited providers is available on the State Materials Office website.

105-8.11.2 Precast Concrete Drainage Structures, Precast Concrete Box Culvert, Precast Concrete Pipe, Incidental Precast Concrete, and Flexible Pipe Manufacturing Facilities Quality Control Personnel:

105-8.11.2.1 Level I Quality Control Inspectors: Ensure that the Level I Inspectors have completed a minimum of a 12-hour, Department approved, Level I QC Inspector training course in the respective work area. As an exception to this, ensure Flexible Pipe Level I QC Inspectors have completed a minimum of an 8-hour, Department approved, Level I QC Flexible Pipe Inspector training course. For Incidental Precast Concrete, as an alternative to the completion of the 12-hour training course, the Department will accept QC personnel meeting the requirements of 105-8.11.2.4.1 and CTQP Concrete Field Technician level I certification or Precast/Prestressed Concrete Institute (PCI) Quality Control Technician/Inspector Level II certification.

105-8.11.2.2 Level II Quality Control Inspectors: Ensure that Level II Inspectors have completed Department approved Level I QC Inspector training and a minimum of a 5-hour, Department approved, Level II QC Inspector training course in the respective work areas. For Incidental Precast Concrete, as an alternative to the completion of the 5-hour training course, the Department will accept CTQP Concrete Field Technician Level II or PCI Quality Control Level III certifications.

105-8.11.2.3 Plant Quality Control Manager: Ensure that QC Manager has completed Department approved Level II QC Inspector training and has a minimum of 2 years construction related experience in the specific work area.

105-8.11.2.4 Additional Requirements for Quality Control Personnel of Precast Concrete Drainage, Precast Concrete Box Culvert, and Incidental Precast Concrete Manufacturing Facilities:

105-8.11.2.4.1 Testing Personnel: Ensure the personnel performing plastic property tests have ACI Concrete Field Testing Technician-Grade I certification. Ensure the personnel performing laboratory compressive strength testing have ACI Concrete Laboratory Testing Technician-Grade 1 certification or ACI Concrete Strength Testing Technician certification.

105-8.11. 2.4.2 Batch Plant Operator: Ensure the concrete batch plant operator is qualified as a CTQP Concrete Batch Plant Operator. As an alternative to CTQP qualification, the Department will accept the completion of a minimum of a 6-hour, Department approved, Batch Plant Operator training course.

107 LITTER REMOVAL AND MOWING (REV 12-17-09) (FA 1-27-10) (7-10)

PAGE 151. The following new section is added after Section 105.

SECTION 107
LITTER REMOVAL AND MOWING

107-1 Description.

Provide pickup, removal and disposal of litter within the project limits, excluding any areas identified in the plans as landscaping in accordance with Section 580. Mow turf or vegetation within the project limits, excluding any areas identified in the plans as landscaping areas in accordance with Section 580.

Litter, includes but is not limited to, bottles, cans, paper, tires, tire pieces, lumber, vehicle parts, metal junk, and brush debris. Turf consists of planted grasses in accordance with Section 570. Vegetation consists of planted and natural grasses, weeds, and other natural vegetation within the area to be mowed.

107-2 Operation.

107-2.1 Frequency: Begin litter removal and mowing when directed by the Engineer. Continue per the mowing frequency stated in the plans unless directed otherwise by the Engineer until final acceptance in accordance with 5-11. Mow all areas to obtain a uniform height of 6 inches.

After final acceptance, perform litter removal and mowing until new turf is established in accordance with 570-4 at no cost to the Department. Maintain turf and vegetation height between 6 and 12 inches. Do not include seed stalk or wildflowers when measuring height.

Perform litter removal prior to and in conjunction with mowing; however, the Engineer may direct litter pickups in addition to those performed in conjunction with mowing.

Do not mow new turf until a healthy root system is established. In designated wildflower areas, avoid cutting wildflowers when in bloom and when re-seeding.

107-2.2 General: Mow shoulders and medians concurrently so that not more than one mile will be left partially mowed at the conclusion of the working day. Mow turf and vegetation on slopes or around appurtenances concurrent with the mowing operation.

In areas saturated with standing water, mow or cut to the surface of the water using hand labor or other specialized equipment when standard equipment will cause damage.

Do not remove turf or other vegetation cuttings from the right-of-way, or rake or pick up the cuttings unless the cuttings are in the traveled ways, bike lanes, or sidewalk; are obstructing drainage structures; or are the result of cleaning the equipment.

107-2.3 Limitations: Maintain traffic in accordance with Section 102. When mowing within four feet of a travel lane, operate the equipment in the same direction of traffic, unless the adjacent lane is closed to traffic due to construction operations.

Perform all work during daylight hours.

107-2.4 Disposal of Litter and Debris: During each litter removal cycle, bag and remove all litter or piles at the end of each working day. Dispose of litter in accordance with applicable local and state laws. Do not store or stockpile litter within the project limits.

107-3 Method of Measurement.

For each Litter Removal cycle, the quantity to be paid will be the area, in acres, from which litter has been picked up, removed, and disposed, completed and accepted. The quantity will be determined by calculation using the lengths and widths based on the station to station dimensions shown in the plans.

For each Mowing cycle, the quantity to be paid will be the area, in acres, of mowing, completed and accepted. The quantity will be determined by calculation using the lengths and widths based on the station to station dimensions shown in the plans.

107-4 Basis of Payment.

For Litter Removal, price and payment will be full compensation for all work specified in this section.

For Mowing, price and payment will be full compensation for all work specified in this section.

No separate payment will be made for litter removal and mowing after final acceptance.

Payment will be made under:

Item No. 107 - 1- Litter Removal– per acre.

Item No. 107 - 2 - Mowing – per acre

110 CLEARING AND GRUBBING.

(REV 5-29-09) (FA 7-15-09) (1-10)

SUBARTICLE 110-6.2.1 (Page 154) is deleted and the following substituted:

110-6.2.1 General: Remove the structures in such a way so as to leave no obstructions to any proposed new structures or to any waterways. Pull, cut off, or break off pilings to the requirements of the permit or other Contract Documents, or if not specified, not less than 2 feet below the finish ground line. In the event that the plans indicate channel excavation to be done by others, consider the finish ground line as the limits of such excavation. For materials which are to remain the property of the Department or are to be salvaged for use in temporary structures, avoid damage to such materials, and entirely remove all bolts, nails, etc. from timbers to be so salvaged. Mark structural steel members for identification as directed.

120 EXCAVATION AND EMBANKMENT.
(REV 7-12-10) (FA 8-16-10) (1-11)

SUBARTICLE 120-1.2 (Pages 161 – 162) is deleted and the following substituted:

120-1.2 Unidentified Areas of Contamination: When encountering or exposing any abnormal condition indicating the presence of contaminated materials, cease operations immediately in the vicinity and notify the Engineer. The presence of tanks or barrels; discolored earth, metal, wood, ground water, etc.; visible fumes; abnormal odors; excessively hot earth; smoke; or other conditions that appear abnormal may indicate the presence of contaminated materials and must be treated with extreme caution.

Make every effort to minimize the spread of contamination into uncontaminated areas. Immediately provide for the health and safety of all workers at the job site and make provisions necessary for the health and safety of the public that may be exposed to any potentially hazardous conditions. Ensure provisions adhere to all applicable laws, rules or regulations covering potentially hazardous conditions and will be in a manner commensurate with the gravity of the conditions.

The Engineer will notify the District Contamination Impact Coordinator (DCIC) who will coordinate selecting and tasking the Department's Contamination Assessment/Remediation Contractor (CAR). Provide access to the potentially contaminated area. Preliminary investigation by the CAR Contractor will determine the course of action necessary for site security and the steps necessary under applicable laws, rules, and regulations for additional assessment and/or remediation work to resolve the contamination issue.

The CAR Contractor will delineate the contamination area(s), any staging or holding area required, and, in cooperation with the Prime Contractor and Engineer, develop a work plan that will provide the CAR Contractor's operations schedule with projected completion dates for the final resolution of the contamination issue.

The CAR Contractor will maintain jurisdiction over activities inside any outlined contaminated areas and any associated staging holding areas. The CAR Contractor will be responsible for the health and safety of workers within the delineated areas. Provide continuous access to these areas for the CAR Contractor and representatives of regulatory or enforcement agencies having jurisdiction.

Both Contractors will use the schedule as a basis for planning the completion of both work efforts. The Engineer may grant the Contract Time extensions according to the provisions of 8-7.3.2.

Cooperate with the CAR Contractor to expedite integration of the CAR Contractor's operations into the construction project. The Prime Contractor is not expected to engage in routine construction activities, such as excavating, grading, or any type of soil manipulation, or any construction processes required if handling of contaminated soil, surface water or ground water is involved. All routine construction activities requiring the handling of contaminated soil, surfacewater or groundwater will be by the CAR Contractor. Adjustments to quantities or to Contract unit prices will be made according to work additions or reductions on the part of the Prime Contractor in accordance with 4-3.

The Engineer will direct the Prime Contractor when operations may resume in the affected area.

SUBARTICLE 120-2.2.2 (Page 162) is deleted and the following substituted:

120-2.2.2 Borrow Excavation: Borrow Excavation consists of the excavation and utilization of material from authorized borrow pits, including only material that is suitable for the construction of roadway embankments or of other embankments covered by the Contract.

A Cost Savings Initiative Proposal submittal based on using borrow material from within the project limits will not be considered.

SUBARTICLE 120-6.2 (Pages 164 - 165) is deleted and the following substituted:

120-6.2 Furnishing of Borrow Areas:

To obtain the Engineer's approval to use an off-site construction activity area that involves excavation such as a borrow pit or local aggregate pit, request in writing, a review for - cultural resources involvement. Send the request to the Division of Historical Resources (DHR), Department of State, State Historic Preservation Officer, Tallahassee,FL. As a minimum, include in the request the Project Identification Number, the County, a description of the property with Township, Range, Section, etc., the dimensions of the area to be affected, and a location map. Do not start any work at the off-site construction activity area prior to receiving clearance from the DHR that no additional research is warranted.

For certain locations, the DHR will require a Cultural Resources Assessment Survey before approval can be granted. When this is required, secure professional archaeological services to complete an historical and archaeological survey report. Submit the report to the DHR with a copy to the Department. The Engineer will determine final approval or rejection of off-site construction activity areas based on input from the DHR.

Before receiving approval or before use of borrow areas, obtain written clearance from the engineer concerning compliance with the Federal Endangered Species Act and other Wildlife Regulations as specified in 7-1.4 and Section 4(f) of the USDOT Act as specified in 7-1.8.

The Department will adjust Contract Time in accordance with 8-7 for any suspension of operations required to comply with this Article. The Department will not accept any monetary claims due to delays or loss of off-site construction activity areas.

Except where the plans specifically call for the use of a particular borrow or dredging area, the Contractor may substitute borrow or dredging areas of his own choosing provided: (1) the Engineer determines the materials from such areas meet the Department's standards and other requirements for stability for use in the particular sections of the work in which it is to be placed, and (2) the Contractor absorbs any increase in hauling or other costs. Stake the corners of the proposed borrow area and provide the necessary equipment along with an operator in order for the Engineer to investigate the borrow area. The Engineer will determine test locations, collect samples, and perform tests to investigate the proposed borrow area based on soil strata and required soil properties. The Engineer will approve use of materials from the proposed area based on test results and project requirements. Final acceptance of materials will be based on Point of Use Test as described in 6-1.2.4.

Before using any borrow material from any substitute areas, obtain the Engineer's approval, in writing, for the use of the particular areas, and, where applicable, ensure that the Engineer has cross-sectioned the surface. Upon such written approval by the Engineer, consider the substitute areas as designated borrow areas.

When furnishing the dredging or borrow areas, supply the Department with evidence that the necessary permits, rights, or waivers for the use of such areas have been secured.

Do not excavate any part of a Contractor furnished borrow area which is less than 300 feet from the right-of-way of the project or any State Road until the Engineer has approved a plan for landscaping and restoring the disturbed area. Perform this landscaping and land restoration at no expense to the Department, prior to final acceptance of the project. Do not provide a borrow area closer than 25 feet to the right-of-way of any state road. In Department furnished borrow pits, do not excavate material within 5 feet of adjacent property lines.

Upon completion of excavation, neatly shape, dress, grass, vegetate, landscape, and drain all exposed areas including haul roads, as necessary so as not to present an objectionable appearance.

Meet the requirements of Section 104 when furnishing borrow areas, regardless of location.

SUBARTICLE 120-8.1 (Page 167) is deleted and the following substituted:

120-8.1 General: Construct embankments in sections of not less than 300 feet in length or for the full length of the embankment. Perform work in accordance with an approved Quality Control Plan meeting the requirements of 105-3.

For construction of mainline pavement lanes, turn lanes, ramps, parking lots, concrete box culverts and retaining wall systems, a LOT is defined as a single lift of finished embankment not to exceed 500 feet.

For construction of shoulder-only areas, bike/shared use paths, and sidewalks areas, a LOT is defined as 2,000 feet or one Day's Production, whichever is greater.

Isolated compaction operations will be considered as separate LOTS. For multiple phase construction, a LOT shall not extend beyond the limits of the phase.

SUBARTICLE 120-8.4 (Pages 169 – 170) is deleted and the following substituted:

120-8.4 Reclaimed Asphalt Pavement (RAP) Method:

120-8.4.1 General: Use only RAP material: 1) stored at facilities with an approved Florida Department of Environmental Protection Stormwater permit; or, 2) transferred directly from a milling project to the Department project. Certify the source if RAP material is from an identifiable Department project. Do not use RAP material in the following areas: 1) Construction areas that are below the seasonal high groundwater table elevation; 2) MSE Wall backfill; 3) underneath MSE Walls or 4) The top 6 inches of embankment.

Prior to placement, submit documentation to the Engineer for his approval, outlining the proposed location of the RAP material.

120-8.4.2 Soil and RAP Mixture: Place the RAP material at the location and spread uniformly**,** using approved methods to obtain a maximum layer thickness of 4 inches. Mix this 4 inches maximum layer of RAP with a loose soil layer of 8 to 10 inches thickness. After mixing, meet all Embankment Utilization requirements of Index 505 for the location used. Do not mix RAP in the uppermost 12 inches in order to comply with 120-8.2.1. The total RAP and other embankment material shall not exceed 12 inches per lift after mixing and compaction if the

contractor can demonstrate that the density of the mixture can be achieved. Perform mixing using rotary tillers or other equipment meeting the approval of the Engineer. The Engineer will determine the order in which to spread the two materials. Mix both materials to the full depth. Ensure that the finished layer will have the thickness and shape required by the typical section. Demonstrate the feasibility of this construction method by successfully completing a 500-foot-long test section. For embankment construction, meet the requirements of 120-8. For compaction requirements of the soil and RAP mixture, meet the requirements of 120-9.

120-8.4.3 Alternate Soil and RAP Layer Construction: Construct soil in 6 to 12 inch compacted lifts and RAP in alternate layers with 6 inch maximum compacted lifts. Use soil with a minimum LBR value of 40 to prevent failure during compaction of the overlying RAP layer. Demonstrate the feasibility of this construction method by successfully completing a 500-foot-long test section. For compaction requirements of both soil and RAP, meet the requirements of 120-9**.**

SUBARTICLE 120-10.1 (Pages 171-173) is expanded by the following new Subarticle:

120-10.1.7 Payment for Resolution Tests: If the Resolution laboratory results compare favorably with the Quality Control results, the Department will pay for Resolution testing. No additional compensation, either monetary or time, will be made for the impacts of any such testing.

If the Resolution laboratory results do not compare favorably with the Quality Control results, the costs of the Resolution testing will be deducted from monthly estimates. No additional time will be granted for the impacts of any such testing.

SUBRTICLE 120-10.3.1 (Page 173) is deleted and the following substituted:

120-10.3.1 Frequency: Conduct QC sampling and testing at a minimum frequency listed in the table below. The Engineer will perform Verification sampling and tests at a minimum frequency listed in the table below.

Test Name	Quality Control	Verification	Verification of Shoulder-Only Areas, Bike/Shared Use Paths, and Sidewalks
Standard Proctor Maximum Density	One per soil type	One per soil type	One per soil type
Density	One per LOT	One per four LOTS and for wet conditions, the first lift not affected by water	One per two LOTs
Soil Classification	One per Standard Proctor Maximum Density	One per Standard Proctor Maximum Density	One per Standard Proctor Maximum Density

121 FLOWABLE FILL.
(REV 3-12-10) (FA 5-24-10) (1-11)

SECTION 121 (Pages 179 – 181) is deleted and the following substituted:

121-1 Description.

Furnish and place flowable fill as an alternative to compacted soil as approved by the Engineer. Applications for conventional flowable fill include beddings; encasements; closures for tanks and pipes; and general backfill for trenches, embankments and walls. Applications for cellular concrete flowable fill include beddings; encasements; closures for tanks and pipes; and general backfill for embankments and walls.

121-2 Materials.

Meet the following requirements:

Fine Aggregate*.....Section 902
Portland Cement (Types I, II, or III).....Section 921
Water.....Section 923
Admixtures**.....Section 924
Fly Ash, Slag and other Pozzolanic Materials....Section 929
Preformed Foam.....ASTM C 869

*Any clean fine aggregate with 100% passing a 3/8 inch mesh sieve and not more than 15% passing a No. 200 sieve may be used.

**High air generators or foaming agents may be used in lieu of conventional air entraining admixtures and shall be added at jobsite and mixed in accordance with the manufacturer's recommendation.

121-3 Mix Design.

Conventional flowable fill is a mixture of portland cement, fly ash, fine aggregate, admixture and water. Flowable fill contains a low cementitious content for reduced strength development. Cellular concrete flowable fill is a low density concrete made with cement, water and preformed foam to form a hardened closed cell foam material. Cellular concrete flowable fill may also contain fine aggregate, fly ash, slag and admixtures.

Submit mix designs to the Engineer for approval. The following are suggested mix guides for excavatable, non-excavatable and cellular concrete flowable fill:

	Excavatable	Non-Excavatable	Cellular Concrete
Cement	75-100 lb/yd^3	75-150 lb/yd^3	Min 150 lb/yd^3
Pozzolans or Slag	None	150-600 lb/yd^3	Optional
Water	*	*	*
Air**	5-35%	5-15%	****
28 Day Compressive Strength**	Maximum 100 psi	Minimum 125 psi	Minimum 80 psi
Unit Weight **	90-110 lb/ft^3	100-125 lb/ft^3	20-80 lb/ft^3
Fine Aggregate	***	***	Optional

	Excavatable	Non-Excavatable	Cellular Concrete
*Mix designs shall produce a consistency that will result in a flowable self-leveling product at time of placement. **The requirements for percent air, compressive strength and unit weight are for laboratory designs only and are not intended for jobsite acceptance requirements. ***Fine Aggregate shall be proportioned to yield 1 yd^3. ****In cellular concrete, preformed foam shall be proportioned at the job site to yield 1 yd^3 in accordance with the design requirements.			

121-4 Production and Placing.

Use flowable fill manufactured at a production facility that meets the requirements of 347-3. Deliver flowable fill using concrete construction equipment. Revolution counter are waived. Place flowable fill by chute, pumping or other methods approved by the Engineer. Tremie flowable fill through water. Cellular concrete flowable fill may not be placed within three feet of the bottom elevation for roadway base courses.

121-5 Construction Requirements.

Use straps, soil anchors or other approved means of restraint to ensure correct alignment when flowable fill is used as backfill for pipe or where flotation or misalignment may occur.

Protect flowable fill from freezing for a period of 36 hours after placement.

Place flowable fill to the designated fill line without vibration or other means of compaction. Do not place flowable fill during inclement weather, e.g. rain or ambient temperatures below 40ºF. Take all necessary precautions to prevent any damages caused by the hydraulic pressure of the fill during placement prior to hardening. Provide the means to confine the material within the designated space.

121-6 Acceptance.

Acceptance of flowable fill will be based on the following documentation and a minimum temperature of flowable fill at the point of delivery of 50ºF.

Furnish a delivery ticket to the Engineer for each load of flowable fill delivered to the worksite. Ensure that each ticket contains the following information:

(1) Project designation,
(2) Date,
(3) Time,
(4) Class and quantity of flowable fill,
(5) Actual batch proportions,
(6) Free moisture content of aggregates,
(7) Quantity of water withheld.

Leave the fill undisturbed until the material obtains sufficient strength. Sufficient strength is 35 psi penetration resistance as measured using a hand held penetrometer in accordance with ASTM C-403. Provide a hand held penetrometer to measure the penetration resistance of the hardened flowable fill.

121-7 Basis of Payment.

When the item of flowable fill is included in the Contract, payment will be made at the Contract unit price per cubic yard. Such price and payment will include all cost of the mixture, in place and accepted, determined as specified above. No measurement and payment will be made for material placed outside the neat line limits or outside the adjusted limits, or for unused or wasted material.

Payment will be made under:

Item No. 121- 70- Flowable Fill - per cubic yard.

125 EXCAVATION FOR STRUCTURES AND PIPE – ACCEPTANCE PROGRAM. (REV 6-3-09) (FA 8-13-09) (1-10)

SUBARTICLE 125-9.1 (Page 187) is deleted and the following substituted:

125-9.1 General Requirements: Meet the requirements of 120-10, except replace the requirements of 120-10.1.6 with 125-9.1.1, 120-10.2 with 125-9.2, 120-10.3 with 125-9.3, and 120-10.4 with 125-10.

125-9.1.1 Reduced Testing Frequency: When no Resolution testing is required for 6 consecutive LOTs, or if required, the Quality Control test data was upheld, reduce the Quality Control density testing to one test every two Lots by identifying the substantiating tests in the Density Log Book and notifying the Engineer in writing prior to starting reduced frequency of testing. Generate random numbers based on the two LOTs under consideration. When Quality Control test frequency is reduced to one every two LOTs, obtain the Engineer's approval to place more than one LOT over an untested LOT. Assure similar compaction efforts for the untested sections. If the Verification test fails, and Quality Control test data is not upheld by Resolution testing the Quality Control testing will revert to the original frequency.

160 STABILIZING. (REV 5-24-11) (FA 6-7-11) (1-12)

SUBARTICLE 160-3.2 (Pages 196 and 197) is deleted and the following substituted:

160-3.2 Application of Stabilizing Material: After substantially completing the roadbed grading operations, determine the type and quantity (if any) of stabilizing material necessary for compliance with the bearing value requirements. Notify the Engineer of the approximate quantity to be added before spreading. When additive stabilizing materials are required, spread the material uniformly over the area to be stabilized.

160-3.2.1 Sampling and Testing of Local Material: Randomly select locations for sampling using a random number generator approved by the Engineer in accordance with FM 1-T 267 and test at the minimum frequency listed in the table below before mixing. The Engineer will reject the material for failing QC test results. The Engineer will sample for Verification and Resolution testing at the minimum frequency listed in the table below. The Engineer will perform Verification tests at the minimum frequency listed in the table below.

Test Name	Quality Control	Verification	Resolution
Liquid Limit (LL), Plastic Index (PI), and Organic Content	One per two LOTs	One per eight LOTs	One per eight LOTs

160-3.2.1.1 Verification Comparison Criteria and Resolution

Procedures: If the QC and the Department's Verification tests meet the requirements of Section 914 then the Engineer will accept the corresponding LOTs. Otherwise, the Engineer will submit the Resolution sample to the State Materials Office or an AASHTO accredited laboratory designated by the State Materials Office to perform Resolution testing.

If the Resolution Test results meet the requirements of Section 914 then the Engineer will accept the LOTs in question. Otherwise remove the material and apply new material meeting the requirements of Section 914 and retest in accordance with 160-3.2.

SUBARTICLE 160-4.3.2(Page 200) is deleted and the following substituted:

160-4.3.2 Department Verification Tests:

160-4.3.2.1 Bearing Value & Soil Classification: The Engineer will collect a sample at a location other than the location where the sample was collected in 160-4.3.1.3, and test the Stabilized Subgrade for determination of the LBR in accordance with FM 5-515. The Engineer will select test locations, including Stations and Offsets, using a Random Number generator, based on the LOTs under consideration.

If Local Material is used for stabilizing, the Engineer will determine compliance with embankment utilization requirements and 160-3.4 by testing and classifying the Stabilized Subgrade in accordance with AASHTO T88 and AASHTO M 145 at the frequency shown in 160-4.2.4.

160-4.3.2.1.1 Unsoaked LBR: The Engineer will sample and test the initial LOT for one soaked and one unsoaked LBR if consideration of the Unsoaked LBR has been approved.

160-4.3.2.2 Mixing Depth: The Engineer will witness the Contractor's mixing depth checks to ensure compliance with 160-4.2.2. The Engineer will select test locations, including Stations and Offsets, using a Random Number generator.

160-4.3.2.3 Modified Proctor Maximum Density: The Engineer will randomly select one of the retained split samples and test in accordance with FM 1-T 180, Method D.

200 ROCK BASE.
(REV 10-12-10) (FA 12-10-10) (7-11)

SUBARTICLE 200-7.2.1 (Page 208) is deleted and the following substituted:

200-7.2.1 Density: Within the entire limits of the width and depth of the base, obtain a minimum density in any LOT of 98% of modified Proctor maximum density as determined by FM 1-T 180, Method D. For shoulder only areas and bike/shared use paths, obtain a minimum density of 95% of the modified Proctor maximum density as determined by FM 1-T 180, Method D.

234 SUPERPAVE ASPHALT BASE.
(REV 5-19-11) (FA 8-4-11) (1-12)

ARTICLE 234-1 (Page 218) 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 B-12.5. The Contractor may use a Type SP-12.5 mixture, (Traffic Level B or C) in lieu of a Type B-12.5.

ARTICLE 234-4 (Page 219) is deleted and the following substituted:

234-4 Contractor's Process Control.

Meet the requirements of 320-2, 330-2 and 334-4.

ARTICLE 234-5 (Page 219) is deleted and the following substituted:

234-5 Acceptance of the Mixture.

The mixture will be accepted in accordance with the requirements of 334-5, except density testing for acceptance will not be performed in areas as defined in 334-5.1.2. In these situations compact the base in accordance with the rolling procedure (equipment and pattern) submitted as part of the Quality Control (QC) Plan and as approved by the Engineer. Use the permissible variations from longitudinal and transverse grades as specified in 200-7. The pay factor for LOTs where there are areas not requiring density testing will be prorated based on a pay factor of 1.00 for the tonnage of material in areas not requiring density testing and the actual pay factor for the tonnage of material in areas requiring density.

ARTICLE 234-8 (Pages 220 - 221) is deleted and the following substituted:

234-8 Thickness Requirements.

234-8.1 General: The total thickness of the Type B asphalt layers will be the plan thickness as shown in the Contract Documents. Before paving, propose a thickness for each individual layer meeting the requirements of this specification, which when combined with other layers (as applicable) will equal the plan thickness. For construction purposes, the plan thickness and individual layer thickness will be converted to spread rate based on the maximum specific gravity of the asphalt mix being used, as well as the minimum density level, as shown in the following equation:

Spread rate (lbs. per square yard) = $t \times G_{mm} \times 43.3$

Where: t = Thickness (in.) (Plan thickness or individual layer thickness)

G_{mm} = Maximum specific gravity from the verified mix design

The weight of the mixture shall be determined as provided in 320-3.2. For target purposes only, spread rate calculations should be rounded to the nearest whole number.

234-8.2 Spread Rate Tolerance: Control the average spread rate on a daily basis to within plus or minus 5% of the target spread rate for the individual layer(s) established by the Engineer. When the average daily spread rate is outside this tolerance from the target, adjust the spread rate to the required value established by the Engineer. The Engineer will periodically verify the spread rate at the job site during the paving operation.

234-8.3 Allowable Deficiencies: The Engineer will allow a maximum deficiency from the specified spread rate for the total thickness as follows:

1. For pavement of a specified thickness of 2-1/2 inches or more: 50 lbs. per square yard.

2. For pavement of a specified thickness of less than 2-1/2 inches: 25 lbs. per square yard.

234-8.4 Pavement Exceeding Allowable Deficiency in Spread Rate: Where the deficiency in spread rate for the total thickness is: (1) in excess of 50 lbs. per square yard for pavements with a specified thickness of 2-1/2 inches or more, or (2) in excess of 25 lbs. per square yard for pavements with a specified thickness of less than 2-1/2 inches, the Engineer may require removal and replacement at no cost or may require a correction as specified in 234-8.5. The Engineer may require the Contractor to core the pavement for thickness in order to determine the area of pavement with deficient thickness.

As an exception to the above, the Contractor may leave pavement outside the main roadway in place without compensation when the Engineer allows, even though the deficiency exceeds the tolerance as specified above.

The Department will not compensate the Contractor for any pavement removed or for the work of removing such pavement.

234-8.5 Correcting Deficiency by Adding New Surface Material: In the event the total thickness as determined by the spread rate is excessively deficient as defined above and if approved by the Engineer for each particular location, correct the deficient thickness by adding new surface material and compacting it using a rolling pattern as approved by the Engineer. The Engineer will determine the area to be corrected and the thickness of new material added. Perform all overlaying and compacting at no expense to the Department.

287 ASPHALT TREATED PERMEABLE BASE – CONTROL OF QUALITY. (REV 5-19-11) (FA 8-4-11) (1-12)

ARTICLE 287-4 (Page 227) is deleted and the following substituted:

287-4 Control of Quality.

Provide the necessary control of the ATPB and construction in accordance with the applicable provisions of 320-2 and 330-2.

300 PRIME AND TACK COATS FOR BASE COURSES – RATE OF APPLICATION. (REV 6-10-10) (FA 8-16-10) (1-11)

SUBARTICLE 300-8.4 (Page 240) is deleted and the following substituted:

300-8.4 Rate of Application: Use a rate of application as defined in Table 300-1. Control the rate of application to be within plus or minus 0.01 gal. 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 rate of application 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 RA-550, multiply the target rate of application by 0.6.

Table 300-1
Tack Coat Application Rates

Asphalt Mixture Type	Underlying Pavement Surface	Target Tack Rate (gal/yd^2)
Base Course, Structural Course, Dense Graded Friction Course	Newly Constructed Asphalt Layers	0.02 minimum
	Milled Surface or Oxidized and Cracked Pavement	0.06
	Concrete Pavement	0.08
Open Graded Friction Course	Newly Constructed Asphalt Layers	0.05
	Milled Surface	0.07

320 HOT MIX ASPHALT – PLANT METHODS AND EQUIPMENT. (REV 7-19-11) (FA 8-4-11) (1-12)

SECTION 320 (Pages 241 - 247) is deleted and the following substituted:

SECTION 320
HOT MIX ASPHALT -
PLANT METHODS AND EQUIPMENT

320-1 General.

This Section specifies the basic equipment and operational requirements for hot mix asphalt (including warm mix asphalt) production facilities used in the construction of asphalt pavements and bases. Establish and maintain a quality control system that provides assurance that all materials and products submitted for acceptance meet Contract requirements.

320-2 Quality Control (QC) Requirements.

320-2.1 Minimum Producer QC Requirements: Perform as a minimum the following activities:

1. Stockpiles:
    a. Assure materials are placed in the correct stockpile;
    b. Assure good stockpiling techniques;
    c. Inspect stockpiles for separation, contamination, segregation, and other similar items;
    d. Properly identify and label each stockpile.
2. Incoming Aggregate:
    a. Obtain gradations and bulk specific gravity (G_{sb}) values from aggregate supplier for reference;
    b. Determine the gradation of all component materials and routinely compare gradations and G_{sb} values to mix design.
3. Cold Bins:
    a. Calibrate the cold gate/feeder belt for each material;
    b. Determine cold gate/feeder belt settings;
    c. Observe operation of cold feeder for uniformity;
    d. Verify accuracy of all settings;
    e. Verify that the correct components are being used, and that all modifiers or additives or both are being incorporated into the mix.
4. Batch Plants:
    a. Determine percent used and weight to be pulled from each bin to assure compliance with the mix design;
    b. Check mixing time;
    c. Check operations of weigh bucket and scales.
5. Drum Mixer Plants:
    a. Determine aggregate moisture content;
    b. Calibrate the weigh bridge on the charging conveyor.
6. Control Charts: Maintain QC data and charts (updated daily) for all QC Sampling and Testing and make available upon demand. Provide the following charts:
    a. All components used to determine the composite pay factor (No. 8 sieve, No. 200 sieve, asphalt binder content, air voids, and density) by LOT;
    b. Gradation of incoming aggregate;

c. Gradation, asphalt binder content and maximum specific gravity (G_{mm}) of RAP;

d. Any other test result or material characteristic (as determined by the Contractor) necessary for process control.

The above listed minimum activities are to be considered normal activities necessary to control the production of hot mix asphalt at an acceptable quality level. Depending on the type of process or materials, some of the activities listed may not be necessary and in other cases, additional activities may be required. The frequency of these activities will also vary with the process and the materials. When the process varies from the defined process average and variability targets, the frequency of these activities will be increased until the proper conditions have been restored.

320-2.2 Minimum Process Control Testing Requirements: Perform, as a minimum, the following activities at the testing frequencies provided in Table 320-1. QC tests used in the acceptance decision may be used to fulfill these requirements.

Table 320-1

Asphalt Plant - Materials Testing Frequencies

Material	Property	Minimum Testing Frequency
Aggregate	Gradation	Once per 1,000 tons of incoming aggregate
Aggregate	Moisture Content (stockpiled aggregate or combined cold feed bin)	Once per day
Asphalt Mix	Asphalt Binder Content	If daily production > 100 tons, once per day; If daily production > 1,000 tons, twice per day. *
Asphalt Mix	Bulk Specific Gravity (G_{mb})	If daily production > 100 tons, once per day; If daily production > 1,000 tons, twice per day. *
Asphalt Mix	Gradation	If daily production > 100 tons, once per day; If daily production > 1,000 tons, twice per day. *
Asphalt Mix	Maximum Specific Gravity (G_{mm})	If daily production > 100 tons, once per day; If daily production > 1,000 tons, twice per day. *
Asphalt Mix	Temperature	Each of first 5 loads, then once every 5 loads thereafter, per day per mix design.
RAP	Asphalt Binder Content	Once per 1,000 tons RAP
RAP	Gradation	Once per 1,000 tons RAP
RAP	Maximum Specific Gravity (G_{mm})	Once per 5,000 tons RAP
RAP	Recovered Viscosity	Once per 5,000 tons RAP

*If less than 100 tons of mix is produced on each of successive days of production, resulting in a cumulative quantity of greater than 100 tons, then perform the indicated test.

320-2.3 Personnel Qualifications: Provide QC Technicians in accordance with Section 105.

320-2.4 Hot Mix Asphalt Testing Laboratory Requirements: Furnish a fully equipped asphalt laboratory at the production site. The laboratory must be qualified under the Department's Laboratory Qualification Program, as described in Section 105. In addition, the laboratory shall meet the following requirements:

1. Area - The effective working area of the laboratory shall be a minimum of 180 square feet, with a layout of which will facilitate multiple tests being run simultaneously by two technicians. This area does not include the space for desks, chairs and file cabinets. Any variations shall be approved by the Engineer.

2. Lighting - The lighting in the lab must be adequate to illuminate all areas of the work.

3. Temperature Control - Equip the lab with heating and air conditioning units that provide a satisfactory working environment.

4. Ventilation - Equip the lab with exhaust fans that will remove all hazardous fumes from within the laboratory in accordance with OSHA requirements.

5. Equipment and Supplies - Furnish the lab with the necessary sampling and testing equipment and supplies for performing contractor QC and Department Verification Sampling and Testing. A detailed list of equipment and supplies required for each test is included in the appropriate FDOT, AASHTO, or ASTM Test Method.

6. Calibration of the Superpave Gyratory Compactor - Calibrate the Superpave Gyratory Compactor in accordance with the manufacturer's recommendations. The calibration frequency shall be the more frequent interval of the manufacturer's recommendation or once per year as stated in AASHTO R 18. Identify in the Quality Control Plan (QCP) the established frequencies and document all calibrations.

7. Personal Computer - Provide a personal computer capable of running a Microsoft Excel™ spreadsheet program, along with a printer.

8. Communication - Provide a telephone and fax machine (with a private line) for the use of the testing facility's QC personnel. In addition, provide an internet connection capable of uploading data to the Department's database and for e-mail communications.

320-3 Requirements for All Plants.

320-3.1 General: Design, manufacture, coordinate, and operate the asphalt plant in a manner that will consistently produce a mixture within the required tolerances and temperatures specified.

320-3.2 Electronic Weigh Systems: Equip the asphalt plant with an electronic weigh system that: 1) has an automatic printout, 2) is certified every six months by an approved certified scale technician, and 3) meets monthly comparison checks with certified truck scales as specified in 320-3.2.4. Weigh all plant produced hot mix asphalt on the electronic weigh system, regardless of the method of measurement for payment.

Include, as a minimum, the following information on the printed delivery ticket:

(a) Sequential load number
(b) Project number
(c) Date
(d) Name and location of plant
(e) Mix design number
(f) Place for hand-recording mix temperature
(g) Truck number
(h) Gross, tare, and net tonnage per truck (as applicable)

(i) Daily total tonnage of mix for the mix design

Print the delivery ticket with an original and at least one copy. Furnish the original to the Engineer at the plant and one copy to the Engineer at the paving site.

Utilize any one of the following three electronic weigh systems.

320-3.2.1 Electronic Weigh System on the Truck Scales: Provide an electronic weigh system on all truck scales, which is equipped with an automatic recordation system that is approved by the Engineer. Use scales of the type that directly indicate the total weight of the loaded truck. Use scales meeting the requirements for accuracy, condition, etc., of the Bureau of Weights and Measures of the Florida Department of Agriculture, and re-certify such fact every six months, either by the Bureau of Weights and Measures or by a registered scale technician.

320-3.2.2 Electronic Weigh System on Hoppers Beneath a Surge or Storage Bin: Provide an electronic weigh system on the hopper (hopper scales or load cells) beneath the surge or storage bin, which is equipped with an automatic recordation system approved by the Engineer.

320-3.2.3 Automatic Batch Plants with Printout: For batch plants, provide an approved automatic printer system which will print the individual or cumulative weights of aggregate and liquid asphalt delivered to the pugmill and the total net weight of the asphalt mix measured by hopper scales or load cell type scales. Use the automatic printer system only in conjunction with automatic batching and mixing control systems that have been approved by the Engineer.

320-3.2.4 Monthly Electronic Weigh System Comparison Checks: Check the accuracy of the electronic weighing system at the commencement of production and thereafter at least every 30 days during production by one of the following two methods and maintain a record of the weights in the Scale Check Worksheet.

320-3.2.4.1. Electronic Weigh System on Truck Scales:

(a) The Engineer will randomly select a loaded truck of asphalt mix and record the truck number and gross weight from the Contractor's delivery ticket.

(b) Weigh the selected truck on a certified truck scale, which is not owned by the Contractor and record the gross weight for the comparison check. If another certified truck scale is not available, the Engineer may permit another set of certified truck scales owned by the Contractor to be used. The Engineer may elect to witness the scale check.

(c) The gross weight of the loaded truck as shown on the Contractor's delivery ticket will be compared to the gross weight of the loaded truck from the other certified truck scale. The maximum permissible deviation is 8 pounds per ton of load, based on the certified truck scale weight.

(d) If the distance from the asphalt plant to the nearest certified truck scale is enough for fuel consumption to affect the accuracy of the comparison checks, a fuel adjustment may be calculated by using the truck odometer readings for the distance measurement, and 6.1 miles per gallon for the fuel consumption rate, and 115 ounces per gallon for fuel weight.

(e) During production, when an additional certified truck scale is not available for comparison checks, the Engineer may permit the Contractor to weigh the truck on his certified scales used during production and then weigh it on another certified truck scale, as soon the other scale is available for the comparison checks.

In addition to the periodic checks as specified above, check the scales at any time the accuracy of the scales becomes questionable. When such inaccuracy does

not appear to be sufficient to seriously affect the weighing operations, the Engineer will allow a period of two calendar days for the Contractor to conduct the required scale check. However, in the event the indicated inaccuracy is sufficient to seriously affect the mixture, the Engineer may require immediate shut-down until the accuracy of the scales has been checked and necessary corrections have been made. Include the cost of all scale checks in the bid price for asphalt concrete, at no additional cost to the Department.

320-3.2.4.2. Electronic Weigh System on Hoppers Beneath a Surge or Storage Bin and Automatic Batch Plants with Printout:

(a) The Engineer will randomly select a loaded truck of asphalt mix and record the truck number, and the net weight of the asphalt mix from the Contractor's delivery ticket.

(b) Weigh the selected truck on a certified truck scale, which is not owned by the Contractor and record the gross weight for the comparison check. If another certified truck scale is not available, the Engineer may permit another set of certified truck scales owned by the Contractor to be used. The Engineer may elect to witness the scale check.

(c) Deliver the asphalt mix to the project, then weigh the selected empty truck on the same certified truck scales. Record the tare weight of the truck.

(d) Compare the net weight of the asphalt mix from the delivery ticket to the calculated net weight of the asphalt mix as determined by the certified truck scale weights. The maximum permissible deviation is 8 pounds per ton of load, based on the certified truck scale weight.

(e) Use the fuel adjustment as specified in 320-3.2.4.1(d), when the distance from the asphalt plant to the nearest certified truck scale is enough for fuel consumption to affect the accuracy of the comparison checks.

(f) During production, when an additional certified truck scale is not available for comparison checks, the Engineer may permit the Contractor to load a truck with aggregate from the pugmill, surge or storage bin, and follow the above procedures to conduct the comparison checks as soon as certified truck scale is available.

If the check shows a greater difference than the tolerance specified above, then recheck on a second set of certified scales. If the check and recheck indicate that the printed weight is out of tolerance, have a certified scale technician check the electronic weigh system and certify the accuracy of the printer. While the system is out of tolerance and before its adjustment, the Engineer may allow the Contractor to continue production only if provisions are made to use a set of certified truck scales to determine the truck weights.

320-3.3 Asphalt Binder: Meet the following requirements:

320-3.3.1 Transportation: Deliver the asphalt binder to the asphalt plant at a temperature not to exceed 370°F, and equip the transport tanks with sampling and temperature sensing devices meeting the requirements of 300-3.2.

320-3.3.2 Storage: Equip asphalt binder storage tanks to heat the liquid asphalt binder to the temperatures required for the various mixtures. Heat the material in such a manner that no flame comes in contact with the binder. Heat or insulate all pipe lines and fittings. Use a circulating system of adequate size to ensure proper and continuous circulation during the entire operating period. Locate a thermometer, reading from 200 to 400°F, either in the storage tank or in the asphalt binder feed line. Maintain the asphalt binder in storage within a range of 230 to 370°F in advance of mixing operations. Locate a sampling device on the discharge piping exiting the storage tank or at a location as approved by the Engineer.

320-3.4 Aggregate: Meet the following requirements:

320-3.4.1 Stockpiles: Place each aggregate component in an individual stockpile, and separate each from the adjacent stockpiles, either by space or by a system of bulkheads. Prevent the intermingling of different materials in stockpiles at all times. Identify each stockpile, including RAP, as shown on the mix design.

Form and maintain stockpiles in a manner that will prevent segregation. If a stockpile is determined to be segregated, discontinue the use of the material on the project until the appropriate actions have been taken to correct the problem.

320-3.4.2 Blending of Aggregates: Stockpile all aggregates prior to blending or placing in the cold feed bins. If mineral filler or hydrated lime is required in the mix, feed or weigh it in separately from the other aggregates.

320-3.4.2.1 Cold Feed Bin: Provide a separate cold feed bin for each component of the fine and coarse aggregate required by the mix design. Equip the cold feed bins with accurate mechanical means for feeding the aggregate uniformly into the dryer in the proportions required for the finished mix to maintain uniform production and temperature. When using RAP as a component material, prevent any oversized RAP from being incorporated into the completed mixture by the use of: a grizzly or grid over the RAP bin; in-line roller or impact crusher; screen; or other suitable means. If oversized RAP material appears in the completed recycled mix, take the appropriate corrective action immediately. If the appropriate corrective actions are not immediately taken, stop plant operations.

Use separate bin compartments in the cold aggregate feeder that are constructed to prevent any spilling or leakage of aggregate from one cold feed bin to another. Ensure that each cold feed bin compartment has the capacity and design to permit a uniform flow of aggregates. Mount all cold feed bin compartments over a feeder of uniform speed, which will deliver the specified proportions of the separate aggregates to the drier at all times. If necessary, equip the cold feed bins with vibrators to ensure a uniform flow of the aggregates at all times.

320-3.4.2.2 Gates and Feeder Belts: Provide each cold feed bin compartment with a gate and feeder belt, both of which are adjustable to assure the aggregate is proportioned to meet the requirements of the mix design.

320-3.4.3 Screening Unit: Remove any oversized pieces of aggregate by the use of a scalping screen. Do not return this oversized material to the stockpile for reuse unless it has been crushed and reprocessed into sizes that will pass the scalping screen. Ensure that the quantity of aggregates being discharged onto the screens does not exceed the capacity of the screens to actually separate the aggregates into the required sizes.

320-3.5 Dryer: Provide a dryer of satisfactory design for heating and drying the aggregate. Use a dryer capable of heating the aggregate to within the specified temperature range for any mix, and equip the dryer with an electric pyrometer placed at the discharge chute to automatically register the temperature of the heated aggregates.

320-3.6 Asphalt Binder Control Unit: Provide a satisfactory means, either by weighing, metering, or volumetric measuring, to obtain the proper amount of asphalt binder material in the mix, within the tolerance specified for the mix design.

320-3.7 Contractor's Responsibilities: Acceptance of any automatic delivery ticket printout, electronic weight delivery ticket, other evidence of weight of the materials or approval of any particular type of material or production method will not constitute agreement by the Department that such matters are in accordance with the Contract Documents and it shall be the

Contractor's responsibility to ensure that the materials delivered to the project are in accordance with the Contract Documents.

320-4 Additional Requirements for Batch Plants.

320-4.1 Heating and Drying: Heat and dry the aggregate before screening. Control the temperature of the aggregate so the temperature of the completed mixture at the plant falls within the permissible range allowed by this Section.

320-4.2 Gradation Unit: Provide plant screens capable of separating the fine and coarse aggregates and of further separating the coarse aggregate into specific sizes. In addition, equip the gradation unit with a scalping screen to restrict the maximum size of the aggregates. In the event that the plant is equipped with cold feed bins that are capable of adequately controlling the gradation of the mixture, the use of plant screens is optional.

320-4.3 Hot Bins: Provide storage bins of sufficient capacity to supply the mixer when it is operating at full capacity. Provide hot bins with divided compartments to ensure separate and adequate storage of the appropriate fractions of the aggregate. Equip each compartment with an overflow chute of suitable size and location to prevent any backing up of material into other bins.

320-4.4 Weigh Box or Hopper: Equip the batch plant with a means for accurately weighing each bin size of aggregate and the mineral filler into the weigh box or hopper.

320-4.5 Pugmills: Utilize a pugmill capable of mixing the aggregate and the asphalt binder.

320-5 Additional Requirements for Drum Mixer Plants.

320-5.1 Weight Measurements of Aggregate: Equip the plant with a weigh-in-motion scale capable of measuring the quantity of aggregate (and RAP) entering the dryer.

320-5.2 Synchronization of Aggregate Feed and Asphalt Binder Feed: Couple the asphalt binder feed control with the total aggregate weight device, including the RAP feed, in such a manner as to automatically vary the asphalt binder feed rate as necessary to maintain the required proportions.

320-5.3 Hot Storage or Surge Bins: Equip the plant with either a surge bin or storage silo that is capable of storing an adequate amount of material to assure a uniform and consistent product.

320-6 Preparation of the Mixture.

320-6.1 Mixing: After the aggregate is dried and properly proportioned, mix the aggregate, along with any other components, with the asphalt binder to produce a thoroughly and uniformly coated mixture.

320-6.2 Storage: If necessary, store the asphalt mixture in a surge bin or hot storage silo for a maximum of 72 hours. For FC-5 mixtures, store the asphalt mixture in a surge bin or hot storage silo for a maximum of one hour.

320-6.3 Mix Temperature: Produce the mixture with a temperature within the master range as defined in Table 320-2.

320-6.3.1 Test Requirements: Determine the temperature of the completed mixture using a quick-reading thermometer through a hole in the side of the loaded truck immediately after loading. Locate a 1/4 inch hole on both sides of the truck body within the middle third of the length of the body, and at a distance from 6 to 10 inches above the surface supporting the mixture. If a truck body already has a hole located in the general vicinity of the

specified location, use this hole. At the Engineer's discretion, the Contractor may take the temperature of the load over the top of the truck in lieu of using the hole in the side of the truck.

320-6.3.2 Test Frequency: The normal frequency for taking asphalt mix temperatures will be for each day, for each design mix on the first five loads and one out of every five loads thereafter. Take the temperature of the asphalt mix at the plant and at the roadway before the mix is placed at the normal frequency. Record the temperature on the front of the respective delivery ticket. The Engineer shall review the plant and roadway temperature readings and may take additional temperature measurements at any time.

If any single load at the plant or at the roadway is within the master range shown in Table 320-2 but does not meet the criteria shown in Table 320-3 (for single measurements or the average of five consecutive measurements), the temperature of every load will be monitored until the temperature falls within the specified tolerance range in Table 320-3; at this time the normal frequency may be resumed.

320-6.3.3 Rejection Criteria: Reject any load or portion of a load of asphalt mix at the plant or at the roadway with a temperature outside of its respective master range shown in Table 320-2. Notify the Engineer of the rejection immediately.

Table 320-2	
Mix Temperature Master Range Tolerance	
Location	Acceptable Temperature Tolerance
Plant	Mixing Temperature ±30 F
Roadway	Compaction Temperature ±30F

Table 320-3	
Mix Temperature Tolerance From Verified Mix Design	
Any Single Measurement	±25°F
Average of Any Five Consecutive Measurements	±15°F

320-7 Transportation of the Mixture.

Transport the mix in trucks of tight construction, which prevents the loss of material and the excessive loss of heat and previously cleaned of all foreign material. After cleaning, thinly coat the inside surface of the truck bodies with soapy water or an asphalt release agent as needed to prevent the mixture from adhering to the beds. Do not allow excess liquid to pond in the truck body. Do not use diesel fuel or any other hazardous or environmentally detrimental material as a coating for the inside surface of the truck body. Provide each truck with a tarpaulin or other waterproof cover mounted in such a manner that it can cover the entire load when required. When in place, overlap the waterproof cover on all sides so that it can be tied down. Cover each load during cool and cloudy weather and at any time it appears rain is likely during transit with a tarpaulin or waterproof cover.

327 MILLING OF EXISTING ASPHALT PAVEMENT – CONSTRUCTION. (REV 6-7-11) (FA 8-4-11) (1-12)

ARTICLE 327-3 (Pages 248–249) is deleted and the following substituted:

327-3 Construction.

327-3.1 General: Remove the existing raised reflective pavement markers prior to milling. Include the cost of removing existing pavement markers in the price for milling.

When milling to improve rideability or cross slope, remove the existing pavement to the average depth specified in the plans, in a manner that will restore the pavement surface to a uniform cross-section and longitudinal profile. The Engineer may require the use of a stringline to ensure maintaining the proper alignment.

Establish the longitudinal profile of the milled surface in accordance with the milling plans. Ensure that the final cross slope of the milled surface parallels the surface cross slope shown on the plans or as directed by the Engineer. Establish the cross slope of the milled surface by a second sensing device near the outside edge of the cut or by an automatic cross slope control mechanism. The plans may waive the requirement of automatic grade or cross slope controls where the situation warrants such action.

Operate the milling machine to minimize the amount of dust being emitted. The Engineer may require prewetting of the pavement.

Provide positive drainage of the milled surface and the adjacent pavement. Perform this operation on the same day as milling. Repave all milled surfaces no later than the day after the surface was milled unless otherwise stated in the plans.

If traffic is to be maintained on the milled surface prior to the placement of the new asphalt concrete, provide suitable transitions between areas of varying thickness to create a smooth longitudinal riding surface. Produce a pattern of striations that will provide an acceptable riding surface. The Engineer will control the traveling speed of the milling machine to produce a texture that will provide an acceptable riding surface.

Prior to opening an area which has been milled to traffic, sweep the pavement with a power broom or other approved equipment to remove, to the greatest extent practicable, fine material which will create dust under traffic. Sweep in a manner that will minimize the potential for creation of a traffic hazard and to minimize air pollution.

Sweep the milled surface with a power broom prior to placing asphalt concrete.

In urban and other sensitive areas, use a street sweeper or other equipment capable of removing excess milled materials and controlling dust. Obtain the Engineer's approval of such equipment, contingent upon its demonstrated ability to do the work.

Perform the sweeping operation immediately after the milling operations or as directed by the Engineer.

327-3.2 Quality Control Requirements: Furnish an electronic level with a length of 4 feet and an accuracy of plus or minus 0.1 degree approved by the Engineer for the control of cross slope. Make this electronic level available at the jobsite at all times during milling operations. Calibrate and compare electronic levels in accordance with 330-9.3.1 at a minimum frequency of once per day before any milling operation.

Multiple cuts may be made to achieve the required pavement configuration or depth of cut. Measure the cross slope of the milled surface by placing the level at the center location of a lane and perpendicular to the roadway centerline. Record all the measurements to the nearest 0.1% on an approved form and submit to the Engineer for documentation.

1. Tangent Sections: Measure the cross slope per lane at a minimum frequency of one measurement every 100 feet. Calculate the absolute deviation of cross slope at each measurement and then average the absolute deviation of ten consecutive cross slope measurements. The absolute deviation is the positive value of a deviation. When the average absolute deviation cross slope is consistently within the acceptance tolerance as shown in Table 327-1 and upon approval by the Engineer, the frequency of the cross slope measurements can be reduced to one measurement every 200 feet during milling operations.

2. Superelevated Sections: Measure the cross slope every 100 feet per lane within the length of full superelevation. Calculate the absolute deviation of each measurement and then average the absolute deviation of ten consecutive cross slope measurements. For every transition section, measure the cross slope at control points identified in the plans or, if not shown in the plans, at a control point at a location of 0.0% cross slope. For curves where the length of the fully superelevated section is less than 250 feet, measure the cross slope at the beginning point, midpoint and ending point of the fully superelevated section, calculate the absolute deviation and average. When the number of measurements is less than ten and the length of full superelevation is greater than 250 feet, average the absolute deviation of all measurements.

If the average absolute deviation of the cross slope measurements falls outside the acceptance tolerance shown in Table 327-1, stop the milling operations and make adjustments until the problem is resolved to the satisfaction of the Engineer. If an individual cross slope deviation falls outside the acceptance tolerance as shown in Table 327-1, make corrections only in the deficient area to the satisfaction of the Engineer at no cost to the Department. For pavement with multiple cuts, the deficient areas not caused by the final cut may be left in place upon approval of the Engineer. All milling corrections shall be completed before placement of the asphalt course unless stated otherwise in the plans or as determined by the Engineer.

The limits of deficient areas requiring correction may be verified and adjusted with more accurate measurement methods, including survey instruments, upon approval by the Engineer at no cost to the Department. Should the Contractor wish to have any corrections waived, submit a request to the Engineer for approval. The Engineer may waive the corrections at no reduction in payment if an engineering determination indicates that the deficiencies are sufficiently separated so as not to significantly affect the final cross slope or project grade.

For intersections, tapers, crossovers, transitions at the beginning and end of the project, bridge approaches and similar areas, adjust the cross slope to match the actual site conditions, or as directed by the Engineer.

TABLE 327-1
Cross Slope Milling Acceptance Tolerance

Roadway Feature	Individual Absolute Deviation	Average Absolute Deviation
Tangent section (including turn lanes)	0.4%	0.2%
Superelevated curve	0.4%	0.2%
Shoulder	0.5%	0.5%

In the event that the distance between tow edges of deficient areas is less than 100 feet, the correction work shall include the area between the deficient sections.

327-3.3 Verification: The Engineer will verify the Contractor's cross slope measurements by randomly taking a minimum of ten cross slope measurements per lane per mile in tangent sections, control points in transition sections, and a minimum of three cross slope measurements on fully superelevated sections. The Engineer will measure the cross slope of the milled surface by placing the level at the center location of a lane and perpendicular to the roadway centerline. If the average absolute deviation or an individual cross slope deviation falls outside the acceptance tolerance as shown in Table 327-1, immediately make a comparison check at the QC test locations to verify the QC measurements in the questionable section. If the comparisons are beyond the acceptable comparison tolerance in accordance with 327-3.2, stop the milling operation until the problem is resolved to the satisfaction of the Engineer. Correct any cross slope not meeting the individual deviation acceptance tolerance at no cost to the Department. The Engineer reserves the right to check the cross slope of the milled surface at any time by taking cross slope measurements at any location.

330 HOT MIX ASPHALT – GENERAL CONSTRUCTION REQUIREMENTS. (REV 7-20-11) (FA 8-4-11) (1-12)

SECTION 330 (Pages 250 – 265) is deleted and the following substituted:

SECTION 330
HOT MIX ASPHALT -
GENERAL CONSTRUCTION REQUIREMENTS

330-1 Description.

This Section specifies the basic equipment and construction requirements for hot mix asphalt (including warm mix asphalt) pavements and bases. Establish and maintain a quality control system that provides assurance that all materials, products and completed construction submitted for acceptance meet Contract requirements.

330-2 Quality Control (QC) Requirements.

330-2.1 Minimum QC Requirements: In addition to the requirements set forth in Section 105, describe in the Quality Control Plan (QCP) how the following attributes will be monitored: pavement density, mix temperature, pavement smoothness, pavement cross-slope, mix spread rate, and pavement texture, including methods for monitoring pavement segregation and the corrective actions that will be taken to resolve any identified problems. Perform as a minimum, the following activities necessary to maintain process control and meet Specification requirements:

1. Pavement Density: Monitor the pavement temperature with an infrared temperature device so that compaction is completed before the surface temperature of the pavement drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement. Monitor the roadway density with either 6 inch diameter roadway cores, a nuclear density gauge, or other density measuring device, at a minimum frequency of once per 1,500 feet of pavement.

2. Mix Temperature: Determine the mix temperature at the roadway for the first five loads and one out of every five loads thereafter.

3. Mix Spread Rate: Monitor the mix spread rate at the beginning of each day's production, and as needed to control the operations, at a minimum of once per 200 tons placed. When determining the spread rate, use, at a minimum, an average of five truckloads of mix.

4. Pavement Texture: Monitor the pavement texture to minimize pavement segregation. Use density gauges, infrared temperature measurement devices, or roadway cores at the beginning of each day's production, and as necessary, both at truck exchanges and during normal paving operations.

5. Reporting: Ensure the accuracy of the Quality Control Roadway Reports on the Department's approved form to reflect the actual surface area of the finished work and be in compliance with the requirements of the Contract Documents.

330-2.2 Personnel Qualifications: Provide QC Technicians in accordance with Section 105.

330-3 Limitations of Operations.

330-3.1 Weather Limitations: Do not transport asphalt mix from the plant to the roadway unless all weather conditions are suitable for the paving operations.

330-3.2 Limitations of Paving Operations:

330-3.2.1 General: Place the mixture only when the surface upon which it is to be placed has been previously prepared, is intact, firm, dry, clean, and the tack or prime coat, with acceptable spread rate, is properly broken or cured. Do not place friction course until the adjacent shoulder area has been dressed and grassed.

330-3.2.2 Ambient Air Temperature: Place the mixture only when the air temperature in the shade and away from artificial heat meets requirements of Table 330-1. The minimum ambient temperature requirement may be reduced by 5ºF when using warm mix technology, if mutually agreed to by both the Engineer and the Contractor. For friction course mixtures, meet the requirements of 337-7.

Table 330-1

Ambient Air Temperature Requirements for Paving

Layer Thickness or Asphalt Binder Type	Minimum Temperature (°F)
≤ 1/2 inch	50
≤ 1 inch or any mixture containing a PG asphalt binder having a high temperature designation greater than PG 67	45
> 1 inch	40

330-3.2.3 Rain and Surface Conditions: Immediately cease transportation of asphalt mixtures from the plant when rain begins at the roadway. Do not place asphalt mixtures while rain is falling, or when there is water on the surface to be covered. Once the rain has stopped and standing water has been removed from the tacked surface to the satisfaction of the Engineer and the temperature of the mixture caught in transit still meets the requirements as specified in 320-6.3, the Contractor may then place the mixture caught in transit.

330-3.2.4 Wind: Do not place the mixture when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc., are being deposited on the surface being paved to the extent that the bond between layers will be diminished.

330-4 Surface Preparation.

330-4.1 Cleaning: Prior to placing the mixture, clean the surface of the base or underlying pavement of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.

330-4.1.1 Application over Asphalt Rubber Membrane Interlayer (ARMI): Where an asphalt mix is to be placed over a newly constructed ARMI, do not sweep or otherwise disturb the cover material prior to placing the asphalt mix, unless directed by the Engineer.

330-4.2 Tacking: Apply a tack coat on all existing pavement surfaces that are to be overlaid with an asphalt mix as specified in Section 300 and between successive layers of all asphalt mixes. Apply a tack coat on freshly primed bases only when so directed by the Engineer.

330-5 Paving Equipment.

330-5.1 General Requirements: Use equipment that is mechanically sound and capable of consistently meeting the requirements of these Specifications.

330-5.2 Asphalt Paver:

330-5.2.1 General: Provide an asphalt paver that is self-propelled, can be steered, and is equipped with a receiving and distribution hopper and a mechanical screed. Use a mechanical screed capable of adjustment to regulate the depth of material spread and to produce the desired cross-section.

330-5.2.2 Automatic Screed Control: For all asphalt courses placed with an asphalt paver, equip the paver with automatic longitudinal screed controls of either the skid type, traveling stringline type, or non-contact averaging ski type with a minimum length of 25 feet. On the final layer of asphalt base, overbuild, and structural courses, and for friction courses, use the joint matcher in lieu of the skid, traveling stringline, or non-contact averaging ski on all passes after the initial pass. Equip the asphalt paver with electronic cross slope controls.

330-5.2.3 Screed Width: Provide an asphalt paver having a screed width greater than 8 feet when required to pave full width lanes. Do not use extendable screed strike-off devices that do not provide preliminary compaction of the mat in place of fixed screed extensions. Use a strike-off device only on irregular areas that would normally be done by hand and on shoulders 5 feet or less in width. When using the strike-off device on shoulders in lieu of an adjustable screed extension, demonstrate the ability to obtain an acceptable texture, density, and thickness.

When using an extendable screed device to extend the screed's width on the full width lane or shoulder by 24 inches or greater, the Engineer will require an auger extension, paddle, or kicker device unless written documentation from the manufacturer is provided that these are not necessary.

330-5.3 Rollers:

330-5.3.1 Steel-Wheeled Rollers: Provide compaction equipment capable of meeting the density requirements described in these Specifications. In the event that density testing is not required, and the standard rolling pattern is used, provide a tandem steel-wheeled roller weighing 5 to 15 tons for breakdown rolling. For finish rolling, use a separate roller with a weight of 5 to 15 tons. Variations from these requirements shall be approved by the Engineer.

330-5.3.2 Traffic Rollers: Provide compaction equipment capable of meeting the density requirements described in the Specifications. In the event that density testing is not required, and the standard rolling pattern is used, provide a self-propelled, pneumatic-tired traffic roller equipped with at least seven smooth-tread, low pressure tires, equipped with pads or scrapers on each tire. Maintain the tire pressure between 50 and 55 psi or as specified by the

manufacturer. Use rollers with a minimum weight of 6 tons. Do not use wobble-wheeled rollers. Variations from these requirements shall be approved by the Engineer.

330-5.3.3 Prevention of Adhesion: Do not allow the mixture to adhere to the wheels of any rollers. Do not use fuel oil or other petroleum distillates to prevent adhesion. Do not use any method which results in water being sprinkled directly onto the mixture.

330-5.4 Coring Equipment: Furnish a suitable saw or drill for obtaining the required density cores.

330-5.5 Hand Tools: Provide the necessary hand tools such as rakes, shovels, and other similar tools, and a suitable means for keeping them clean.

330-6 Placing Mixture.

330-6.1 Requirements Applicable to All Pavement Types:

330-6.1.1 Alignment of Edges: Place all asphalt mixtures by the stringline method to obtain an accurate, uniform alignment of the pavement edge. As an exception, pavement edges adjacent to curb and gutter or other true edges do not require a stringline. Control the unsupported pavement edge to ensure that it will not deviate more than plus or minus1.5 inches from the stringline.

330-6.1.2 Paving Width: If necessary due to the traffic requirements, place the mixture in strips in such a manner as to provide for the passage of traffic. As an option, where the road is closed to traffic, place the mixture to the full width with machines traveling in echelon.

330-6.1.3 Mix Temperature: Maintain the temperature of the mix at the time of paving within the master range as defined in 320-6.3. The minimum frequency for taking mix temperatures on the roadway will be as indicated in 320-6.3. Any load or portion of a load of asphalt mix on the roadway with a temperature outside of the master range shall be rejected for use on the project. Immediately notify the Engineer of the rejection.

330-6.1.4 Speed of Paver: Establish the forward speed of the asphalt paver based on the rate of delivery of the mix to the roadway but not faster than the optimum speed needed to adequately compact the pavement.

330-6.1.5 Thickness and Spread Rate of Layers: Construct each layer as defined in the following table:

Table 330-2	
Thickness and Target Spread Rate Requirements	
Mix Type	Specification Section and Article
Type SP	334-1
Type FC	337-8
Type B	234-8
ATPB	287-8

330-6.1.5.1 Thickness Control: Ensure the spread rate is within 5% of the target spread rate. When determining the spread rate, use, at a minimum, an average of five truckloads of mix. When the average spread rate is beyond plus or minus 5% of the target spread rate, monitor the thickness of the pavement layer closely and adjust the construction operations.

If the Contractor fails to maintain an average spread rate within plus or minus 5% of the target spread rate for two consecutive days, the Engineer may elect to stop the construction operation at any time until the issue is resolved.

330-6.1.5.2 Maximum Spread Rate Tolerances: When the average spread rate for the total structural or friction course pavement thickness measured in accordance with 330-6.1.5.1 exceeds the maximum spread rate tolerances shown in Table 330-3, address the unacceptable pavement in accordance with 330-9.5.

Table 330-3		
Maximum Spread Rate Tolerances		
Course	Design Thickness	Spread Rate Tolerance
Structural	≥ 2.5 inches	± 50 lbs per sy
Structural	< 2.5 inches	± 25 lbs per sy
Friction (dense)	-	± 25 lbs per sy
Friction (open)	-	± 15 lbs per sy

As an exception, the Engineer may allow the Contractor to leave areas in place if it is determined by the Engineer that the deficiency is not a significant detriment to the pavement quality. A reduction to the pay item quantity will be made in accordance with 330-9.5.2.

330-6.1.6 Correcting Defects: Before starting any rolling, check the surface; correct any irregularities; remove all drippings, sand accumulations from the screed, and fat spots from any source; and replace them with satisfactory material. Do not skin patch. When correcting a depression while the mixture is hot, scarify the surface and add fresh mixture.

330-6.1.7 Hand Work: In limited areas where the use of the paver is impossible or impracticable, the Contractor may place and finish the mixture by hand.

330-7 Compacting Mixture.

330-7.1 General Requirements: When density testing for acceptance is required, select equipment, sequence, and coverage (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 that effective compaction may not be achieved or the rollers begin to damage the pavement.

330-7.2 Standard Rolling Procedure: When density testing for acceptance is not required, propose an alternative rolling pattern to be approved by the Engineer or use the following standard rolling procedure:

1. Breakdown rolling: Provide two static coverages with a tandem steel-wheeled roller, following as close behind the paver as possible without pick-up, undue displacement, or blistering of the material.

2. Intermediate rolling: Provide five static coverages with a pneumatic-tired roller, following as close behind the breakdown rolling operation as the mix will permit.

3. Finish rolling: Provide one static coverage with a tandem steel-wheeled roller, after completing the breakdown rolling and intermediate rolling, but before the surface pavement temperature drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

330-7.3 Rolling Procedures: Utilize procedures that will uniformly compact the pavement layer to the desired density level, while meeting the appropriate smoothness requirements, without damaging the pavement surface, crushing aggregate or leaving excessive roller marks, roller heads, or ripples. While rolling is in progress, monitor the surface continuously, and adjust the compaction operations to comply with the surface requirements.

330-7.4 Compaction of Areas Inaccessible to Rollers: Use hand tamps or other satisfactory means to compact areas which are inaccessible to a roller, such as areas adjacent to curbs, gutters, bridges, manholes, etc.

330-7.5 Correcting Defects: Do not allow the compaction equipment to deposit contaminants onto the pavement surface. Remove and replace any areas damaged by such deposits as directed by the Engineer. Correct any depressions that develop before completing the rolling by loosening the mixture and adding new mixture to bring the depressions to a true surface. Should any depression remain after obtaining the final compaction, remove the full depth of the mixture, and replace it with sufficient new mixture to form a true and even surface. Correct all defects prior to laying the subsequent course.

330-7.6 Use of Traffic Roller: Use a traffic roller on the first overbuild course. Use a traffic roller or vibratory roller (unless restricted by the Contract Documents) on the first structural layer placed on an ARMI.

330-7.7 Compaction at Bridge Structures: Compact asphalt mixtures placed over bridge decks and approach slabs using static compaction only. Utilize the standard rolling procedure described in 330-7.2 or an alternative procedure approved by the Engineer.

330-8 Joints.

330-8.1 General: When laying fresh mixture against the exposed edges of joints, place it in close contact with the exposed edge to produce an even, well-compacted joint after rolling.

330-8.2 Transverse Joints: Place the mixture as continuously as possible to minimize transverse joints. When constructing permanent transverse joints, meet the surface requirements as defined in 330-9. Construct temporary transverse joints in such a manner to allow traffic to pass over it. When resuming the paving operation, construct a transverse joint by cutting back on the previously placed pavement at a location where the straightedge requirements are met. At the project limits, tie into the adjoining pavement layers as shown in the Plans.

330-8.3 Longitudinal Joints: Place each layer of pavement so that all longitudinal construction joints are offset 6 to 12 inches laterally between successive layers. Plan offsets in advance so that longitudinal joints of the friction course are not in wheel path areas. The longitudinal joints for friction course layers should be within 6 inches of the lane edge or at the center of the lane. The Engineer may waive this requirement where offsetting is not feasible due to the sequence of construction.

330-8.4 Placing Asphalt Next to Concrete Pavement: When placing asphalt next to concrete pavement, construct the joint as shown in the Plans.

330-9 Surface Requirements.

330-9.1 General: Construct a smooth pavement with good surface texture and the proper cross-slope.

330-9.2 Texture of the Finished Surface of Paving Layers: Produce a finished surface of uniform texture and compaction with no pulled, torn, raveled, crushed or loosened portions and free of segregation, bleeding, flushing, sand streaks, sand spots, or ripples. Address any pavement not meeting the requirements of this specification in accordance with 330-9.5.

For dense graded structural and friction course mixtures, in areas not defined to be a density testing exception per 334-5.1.2, obtain for the Engineer three 6 inch diameter roadway cores at locations visually identified by the Engineer to be segregated. The Engineer will determine the density of each core in accordance with FM 1-T 166 and calculate the percent G_{mm} of the segregated area using the average G_{mb} of the roadway cores and the QC sublot G_{mm} for the questionable material. If the average percent G_{mm} is less than 90.0, address the segregated area in accordance with 330-9.5.

Do not use asphalt concrete mixtures containing aggregates that cause a different color appearance in the final wearing surface unless the section is greater than or equal to one mile in length and across the full width of the pavement, including shoulders and turn lanes. Exceptions to these requirements will be permitted if approved by the Engineer.

330-9.3 Cross Slope: Construct a pavement surface with cross slopes in compliance with the requirements of the Contract Documents. Furnish an electronic level with a length of 4 feet and an accuracy of 0.1 degree, approved by the Engineer for the control of cross slope. Make this electronic level available at the jobsite at all times during paving operations.

330-9.3.1 QC Requirements: Calibrate the electronic levels a minimum of once per day before paving operations begin, in accordance with manufacturer's instructions.

Compare the QC level with the Verification level before paving operations begin, and at any time as directed by the Engineer. If the comparison between the QC and Verification levels is within the comparison tolerance of plus or minus 0.2%, the QC level is considered to compare favorably and can be used for measurement and acceptance of cross slopes. If the levels do not compare favorably, perform a second comparison using another calibrated electronic level (FDOT or Contractor) for resolution. If this resolution level compares favorably with the QC level, the QC level is considered to be verified. If the second level does not compare favorably with the QC level, discontinue the use of the QC electronic level and obtain another approved electronic level that meets the requirements of this specification. Regardless of the comparison analysis outcome, the Contractor assumes all risk associated with placing the pavement at the correct cross slope.

Measure the cross slope of the compacted pavement surface by placing the level at the center location of a lane and perpendicular to the roadway centerline. Record all measurements to the nearest 0.1% on the Cross Slope Measurement Data Form and submit to the Engineer for documentation.

1. Tangent Sections: Measure the cross slope at a minimum frequency of one measurement every 100 feet per lane. Calculate the absolute deviation of each cross slope measurement and then average the absolute deviations of ten consecutive cross slope measurements. (The absolute deviation is the positive value of a deviation) When the average absolute deviation cross slope is consistently within the acceptance tolerance as shown in Table 330-4 and upon the approval of the Engineer, the frequency of cross slope measurements can be reduced to one measurement every 200 feet during paving operations.

2. Superelevated Sections: Measure the cross slope every 100 feet per lane within the length of the full superelevation. Calculate the absolute deviation of each measurement and then average the absolute deviations of ten consecutive cross slope measurements. For the transition sections, measure the cross slope at control points identified in the Plans, or if not shown in the Plans, at a control point at the location of 0.0% cross slope and calculate the absolute deviation. For curves where the length of full superelevation is less than 250 feet, measure the cross slope at the beginning point, midpoint and ending point of the fully

superelevated sections, calculate the absolute deviation, and average. When the number of measurements is less than ten and the length of full superelevation is greater than 250 feet, average the absolute deviation of all measurements.

If the average absolute deviation of the cross slope measurements falls outside the acceptance tolerance, as shown in Table 330-4, stop the paving operation and make adjustments until the problem is resolved to the satisfaction of the Engineer. If an individual cross slope deviation falls outside the acceptance tolerance as shown in Table 330-4, make corrections at no cost to the Department in accordance with 330-9.5 to address the deficient area of the structural course. Complete all corrections before placement of the final pavement surface layer, unless stated otherwise in the Plans, or as determined by the Engineer. For pavement with multiple layers, the deficient areas for the structural course may be left in place, upon the approval of the Engineer. For friction course layers, make corrections in accordance with 330-9.5.

The limits of deficient areas requiring correction may be verified and adjusted with more accurate measurement methods, including survey instruments, upon approval by the Engineer at no cost to the Department.

Should the Contractor wish to have any corrections waived, submit a request to the Engineer for approval. The Engineer may waive the corrections at no reduction in payment if the deficiencies are sufficiently separated so as not to affect the overall traffic safety, surface drainage and ride quality characteristics of the pavement and the corrective action would unnecessarily mar the appearance of the finished pavement.

For intersections, tapers, crossovers, transitions at the beginning and end of the project, bridge approaches and similar areas, adjust the cross slope to match the actual site conditions, or as directed by the Engineer.

Table 330-4
Cross Slope Acceptance Tolerance

Roadway Feature	Individual Absolute Deviation	Average Absolute Deviation
Tangent section (including turn lanes)	0.4%	0.2%
Superelevated curve	0.4%	0.2%
Shoulder	0.5%	0.5%

In the event that the distance between two edges of deficient areas is less than 100 feet, the correction work shall include the area between the deficient sections.

330-9.3.2 Verification: The Engineer will verify the Contractor's cross slope measurements by randomly taking a minimum of ten cross slope measurements per lane per mile in tangent sections, control points in transition sections, and a minimum of three cross slope measurements on fully superelevated sections over a day's production. The Engineer will measure the cross slope of the compacted pavement surface by placing the level at the center location of a lane and perpendicular to the roadway centerline. If the average absolute deviation or an individual cross slope deviation falls outside of the acceptance tolerance as shown in Table 330-4, immediately make a comparison check at the QC test locations to verify the QC measurements in the section. If the comparisons are beyond the acceptable comparison tolerance in accordance with 330-9.3.1, stop the paving operations until the issue is resolved to the

satisfaction of the Engineer. Correct any cross slope not meeting the individual deviation acceptance tolerance in accordance with 330-9.5 at no cost to the Department. The Engineer reserves the right to check the pavement cross slope at any time by taking cross slope measurements at any location.

330-9.4 Pavement Smoothness: Construct a smooth pavement meeting the requirements of this Specification.

330-9.4.1 General: Furnish a 15 foot manual and a 15 foot rolling straightedge meeting the requirements of FM 5-509. Obtain a smooth surface on all pavement courses placed, and then straightedge all layers as required by this Specification.

330-9.4.2 Test Method: Perform all straightedge testing in accordance with FM 5-509 in the outside wheel path of each lane. The Engineer, may require additional testing at other locations within the lane.

330-9.4.3 Traffic Control: Provide traffic control in accordance with Section 102 and the Design Standards Index Nos. 607 or 619 during all testing. When traffic control cannot be provided in accordance with Index Nos. 607 or 619, submit an alternative Traffic Control Plan as specified in 102-4. Include the cost of this traffic control in the Contract bid prices for the asphalt items.

330-9.4.4 Process Control Testing: Assume full responsibility for controlling all paving operations and processes such that the requirements of these Specifications are met at all times.

330-9.4.5 QC Testing:

330-9.4.5.1 General: Straightedge the final Type SP structural layer and friction course layer in accordance with 330-9.4.2, regardless of whether the method of acceptance is by straightedge or laser profiler. Test all pavement lanes and ramps where the width is constant and document all deficiencies in excess of 3/16 inch on a form approved by the Engineer.

330-9.4.5.2 Straightedge Exceptions: Straightedge testing will not be required in the following areas: shoulders, intersections, tapers, crossovers, sidewalks, bicycle/shared use paths, parking lots and similar areas, or in the following areas when they are less than 250 feet in length: turn lanes, acceleration/deceleration lanes and side streets.

As an exception, in the event the Engineer identifies a surface irregularity in the above areas that is determined to be objectionable, straightedge and address all deficiencies in excess of 3/8 inch in accordance with 330-9.5.

The Engineer may waive straightedge requirements for transverse joints at the beginning and end of the project, at the beginning and end of bridge structures, at manholes, and at utility structures if the deficiencies are caused by factors beyond the control of the Contractor, as determined by the Engineer. In addition, the Engineer may also waive the straightedging requirements on ramps and superelevated sections where the geometrical orientation of the pavement results in an inaccurate measurement with the rolling straightedge.

330-9.4.5.3 Intermediate Layers and Temporary Pavement: When the design speed is 55 mph or greater and the intermediate Type SP layer or temporary pavement is to be opened to traffic, if the Engineer identifies a surface irregularity that is determined to be objectionable, straightedge and address all deficiencies in excess of 3/8 inch within 72 hours of placement in accordance with 330-9.5.

330-9.4.5.4 Final Type SP Structural Layer: Straightedge the final Type SP structural layer in accordance with 330-9.4.2, either behind the final roller of the paving

train or as a separate operation. Notify the Engineer of the location and time of straightedge testing a minimum of 48 hours before beginning testing. The Engineer will verify the straightedge testing by observing the QC straight edging operations. Address all deficiencies in excess of 3/16 inch in accordance with 330-9.5.

When the final structural course is to be opened to traffic and the design speed is 55 mph or greater, if any defect is 3/8 inch or greater, the Engineer may require deficiencies to be corrected within 72 hours after opening to traffic.

330-9.4.5.5 Friction Course Layer: Straightedge the friction course layer in accordance with 330-9.4.2, either behind the final roller of the paving train or as a separate operation upon completion of all paving operations. Notify the Engineer of the location and time of straightedge testing a minimum of 48 hours before beginning testing. The Engineer will verify the straightedge testing by observing the QC straightedging operations. Address all deficiencies in excess of 3/16 inch in accordance with 330-9.5. For laser acceptance, corrections may be made either before or after laser acceptance testing.

330-9.4.6 Acceptance:

330-9.4.6.1 Straightedge Acceptance: For areas of roadways where the design speed is less than 55 miles per hour, acceptance for pavement smoothness of the friction course will be based on verified QC measurements using the straightedge as required by 330-9.4.5. The Engineer will verify the straightedge testing by observing the QC straightedging operations.

330-9.4.6.2 Laser Acceptance: For areas of high speed roadways where the design speed is equal to or greater than 55 miles per hour, acceptance testing for pavement smoothness of the friction course (for mainline traffic lanes only) will be based on the Laser Profiler. Ramps, acceleration and deceleration lanes, and other areas not suitable for testing with the Laser Profiler will be tested and accepted with the straightedge in accordance with 330-9.4.5.5 and 330-9.4.6.1.

The pavement smoothness of each lane will be determined by a Laser Profiler furnished and operated by the Department in accordance with FM 5-549 and a report issued with the Ride Number (RN) reported to one decimal place. If corrections are made, as required following Laser Acceptance, the pavement will not be retested for smoothness using the Laser Profiler.

For this testing, the pavement will be divided into 0.1 mile segments. Partial segments equal to or greater than 0.01 mile will be considered as a 0.1 mile segment. The pavement will be accepted as follows:

1) For segments with a RN greater than or equal to 4.0, the pavement will be accepted at full pay.

2) For segments with a RN less than 4.0, the Engineer will further evaluate the data in 0.01 mile intervals for both wheel paths.

If the RN is 3.5 or above for all 0.01 mile intervals in both wheel paths, the segment will be accepted at full payment.

If the RN is less than 3.5 for one or more 0.01 mile intervals, the segment will be tested with the rolling straightedge in both wheel paths in accordance with FM 5-509. If approved by the Engineer, this straightedging may be completed (in both wheel paths) as part of the QC straightedging operations described in 330-9.4.5.5, prior to testing with the laser profiler. Notify the Engineer of the location and time of straightedge testing a minimum of 48 hours before beginning testing. The Engineer will verify the

straightedge testing by observing the QC straightedging operations. Address all deficiencies in excess of 3/16 inch in accordance with 330-9.5.

Test and accept areas at the beginning and ending of the project, bridge approaches and departures, and areas where the segment is less than 0.01 mile, with the straightedge in accordance with 330-9.4.5.5 and 330-9.4.6.1.

330-9.5 Unacceptable Pavement:

330-9.5.1 Corrections: Address all areas of unacceptable pavement at no cost to the Department. Retest all corrected areas and assure the requirements of these Specifications are met.

330-9.5.1.1 Structural Layers: Correct all deficiencies, as defined in these Specifications, in the Type SP structural layers by removing and replacing the full depth of the layer, extending a minimum of 50 feet on both sides (where possible) of the defective area for the full width of the paving lane.

As an option, for straightedge deficiencies only, mill the pavement surface to a depth and width that is adequate to remove the deficiency. This option only applies if the structural layer is not the final surface layer.

330-9.5.1.2 Friction Course: Correct deficiencies in the friction course or final surface layer by removing and replacing the full depth of the layer, extending a minimum of 50 feet on both sides (where possible) of the defective area for the full width of the paving lane. As an exception, the Engineer may allow the Contractor to leave these areas in place if it is determined by the Engineer that the deficiency is not a significant detriment to the pavement quality. A reduction to the pay item quantity will be made in accordance with 330-9.5.2.

330-9.5.2 Reduction in Pay Item Quantity: When the Engineer elects to waive corrections, the Department will reduce the pay quantity for the pay item in question by the amount of material that the Contractor would have removed and replaced had the correction been made. When the pay quantity is in tons, the Department will base the reduction on the volume of material that the Contractor would have removed (the length by the lane width by layer thickness) multiplied by the maximum specific gravity of the mix as determined through the following equation:

$$\text{Quantity (tons)} = L \times W \times t \times G_{mm} \times 0.0024$$

Where: L = Lane length (ft.)
W = Lane width (ft.)
t = Layer thickness (in.)
G_{mm} = Maximum specific gravity from verified mix design

For FC-5 open-graded friction course, the Department will base the reduction on the area that the Contractor would have removed (the length by lane width) multiplied by a spread rate of 80 lb/yd^2 as determined through the following equation:

$$\text{Quantity (tons)} = L \times W \times 0.0044$$

Where: L = Lane length (ft.)
W = Lane width (ft.)

330-10 Protection of Finished Surface.

Keep sections of newly compacted asphalt concrete, which are to be covered by additional courses, clean until the successive course is laid.

Do not dump embankment or base material directly on the pavement. Dress shoulders before placing the friction course on adjacent pavement.

Equip blade graders operating adjacent to the pavement during shoulder construction with a 2 inch by 8 inch or larger board, or other attachment providing essentially the same results, attached to their blades in such manner that it extends below the blade edge in order to protect the pavement surface from damage by the grader blade.

To prevent rutting or other distortion, protect sections of newly finished dense-graded friction course and the last structural layer prior to the friction course from traffic until the surface temperature has cooled below 160ºF.

The Contractor may use artificial methods to cool the pavement to expedite paving operations. The Department may direct the Contractor to use artificial cooling methods when maintenance of traffic requires opening the pavement to traffic at the earliest possible time.

334 SUPERPAVE ASPHALT CONCRETE.
(REV 8-9-11) (FA 8-16-11) (1-12)

SECTION 334 (Pages 265-291) is deleted and the following substituted:

SECTION 334
SUPERPAVE ASPHALT CONCRETE

334-1 Description.

334-1.1 General: Construct a Superpave Asphalt Concrete pavement with the type of mixture specified in the Contract, or when offered as alternates, as selected. Superpave mixes are identified as Type SP-9.5, Type SP-12.5 or Type SP-19.0.

Meet the requirements of Section 320 for plant and equipment. Meet the general construction requirements of Section 330, except as modified herein, including the provision for Quality Control Plans and Quality Control Systems as specified in Section 105.

334-1.2 Traffic Levels: The requirements for Type SP Asphalt Concrete mixtures are based on the design traffic level of the project, expressed in 18,000 pound Equivalent Single Axle Loads (ESAL's). The five traffic levels are as shown in Table 334-1.

Table 334-1
Superpave Traffic Levels

Traffic Level	Traffic Level ($1x10^6$ ESAL's)
A	<0.3
B	0.3 to <3
C	3 to <10
D	10 to <30
E	≥30

The traffic level(s) for the project are as specified in the Contract. A Type SP mix one traffic level higher than the traffic level specified in the Contract may be substituted, at no cost to the Department (i.e. Traffic Level B may be substituted for Traffic Level A, etc.).

334-1.3 Gradation Classification: The Superpave mixes are classified as either coarse or fine, depending on the overall gradation of the mixture. Coarse and fine mixes are defined in 334-3.2.2.

The equivalent AASHTO nominal maximum aggregate size Superpave mixes are as follows:

Type SP-9.5..... 9.5 mm
Type SP-12.5..... 12.5 mm
Type SP-19.0..... 19.0 mm

334-1.4 Thickness: The total thickness of the Type SP asphalt layer(s) will be the plan thickness as shown in the Contract Documents. Before paving, propose a thickness for each individual layer meeting the requirements of this specification, which when combined with other layers (as applicable) will equal the plan thickness. For construction purposes, the plan thickness and individual layer thickness will be converted to spread rate based on the maximum specific gravity of the asphalt mix being used, as well as the minimum density level, as shown in the following equation:

Spread rate (lbs/yd^2) = $t \times G_{mm} \times 43.3$

Where: t = Thickness (in.) (Plan thickness or individual layer thickness)

G_{mm} = Maximum specific gravity from the verified mix design

The weight of the mixture shall be determined as provided in 320-3.2. For target purposes only, spread rate calculations should be rounded to the nearest whole number.

Note: Plan quantities are based on a G_{mm} of 2.540, corresponding to a spread rate of 110 lbs/yd^2-in. Pay quantities will be based on the actual maximum specific gravity of the mix being used.

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

Type SP-9.5.....1 - 1 1/2 inches
Type SP-12.5.....1 1/2 - 2 1/2 inches
Type SP-19.0.....2 - 3 inches

In addition to the minimum and maximum thickness requirements, the following restrictions are placed on fine 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 – May not be used on Traffic Level D and E applications.

Type SP-19.0 - May not be used in the final (top) structural layer.

334-1.4.2 Layer Thicknesses - Coarse Mixes: The allowable layer thicknesses for coarse Type SP Asphalt Concrete mixtures are as follows:

Type SP-9.5.....1 1/2 - 2 inches
Type SP-12.5.....2 - 3 inches

Type SP-19.0.....3 - 3 1/2 inches

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

Type SP-19.0 - May not be used in the final (top) structural layer.

334-1.4.3 Additional Requirements: The following requirements also apply to coarse and fine Type SP Asphalt Concrete mixtures:

1. A minimum 1 1/2 inch initial lift is required over an Asphalt Rubber Membrane Interlayer (ARMI).

2. When construction includes the paving of adjacent shoulders (≤5 feet wide), the layer thickness for the upper pavement layer and shoulder must be the same and paved in a single pass, unless called for differently in the Contract Documents.

3. All overbuild layers must be fine Type SP Asphalt Concrete designed at the traffic level as stated in the Contract. Use the minimum and maximum layer thicknesses as specified above unless called for differently in the Contract Documents. On variable thickness overbuild layers, the minimum allowable thickness may be reduced by 1/2 inch, and the maximum allowable thickness may be increased 1/2 inch, unless called for differently in the Contract Documents.

334-2 Materials.

334-2.1 General Requirements: Meet the material requirements specified in Division III. Specific references are as follows:

Superpave PG Asphalt Binder or
Recycling Agent.....916-1, 916-2
Coarse Aggregate.....Section 901
Fine Aggregate.....Section 902

334-2.2 Superpave Asphalt Binder: Unless specified otherwise in the Contract, use a PG 67-22 asphalt binder. In addition, meet the requirements of 334-2.3.

334-2.3 Reclaimed Asphalt Pavement (RAP) Material:

334-2.3.1 General requirements: RAP may be used as a component of the asphalt mixture subject to the following requirements:

1. When using a PG 76-22 Asphalt Binder, limit the amount of RAP material used in the mix to a maximum of 20 percent by weight of total aggregate. As an exception, amounts greater than 20 percent RAP by weight of total aggregate can be used if no more than 20 percent by weight of the total asphalt binder comes from the RAP material.

2. Assume full responsibility for the design, production and construction of asphalt mixes which incorporate RAP as a component material.

3. Use RAP from an FDOT approved stockpile or RAP that has an FDOT furnished Pavement Composition Data Sheet.

4. Provide stockpiled RAP material that is reasonably consistent in characteristics and contains no aggregate particles which are soft or conglomerates of fines.

5. Provide RAP material having a minimum average asphalt binder content of 4.0 percent by weight of RAP. As an exception, when using fractionated RAP, the minimum average asphalt binder content for the coarse portion of the RAP shall be 2.5 percent by weight of the coarse portion of the RAP. The coarse portion of the RAP shall be the portion of the RAP retained on the No. 4 sieve. The Engineer may sample the stockpile(s) to verify that this requirement is met.

334-2.3.2 Material Characterization for Mix Design: Assume responsibility for establishing the asphalt binder content, gradation, viscosity and bulk specific gravity (G_{sb}) of the RAP material based on a representative sampling of the material by roadway cores or stockpile samples. For roadway core samples, assume responsibility for the degradation that will occur during the milling operation.

334-2.3.3 RAP Stockpile Approval: Prior to the incorporation of RAP into the asphalt mixture, stockpile the RAP material and obtain approval for the stockpile by one of the following methods:

1. Continuous stockpile: When RAP is obtained from one or multiple sources and is either processed, blended, or fractionated, and stockpiled in a continuous manner, assure an adequate number of test results are obtained for stockpile approval. Test the RAP material for gradation and asphalt content at a minimum frequency of 1 sample per 1000 tons with a minimum of six test results. Test the RAP material for G_{mm} (for G_{sb} determination) and for recovered viscosity at a minimum frequency of 1 sample per 5000 tons with a minimum of two test results. Based on visual inspection and a review of the test data, the Engineer will determine the suitability of the stockpiled material. In addition, address in the QC Plan the details and specifics of the processing, sampling, testing and actions to be taken.

2. Non-continuous single stockpile: When an individual stockpile is being constructed, obtain representative samples at random locations and test the RAP material for gradation and asphalt content at a minimum frequency of 1 sample per 1000 tons with a minimum of six test results. Test the RAP material for G_{mm} (for G_{sb} determination) and for recovered viscosity at a minimum frequency of 1 sample per 5000 tons with a minimum of two test results. Based on visual inspection and a review of the test data, the Engineer will determine the suitability of the stockpiled material. Once the RAP stockpile has been approved, do not add additional material without prior approval of the Engineer.

Determine the asphalt binder content and gradation of the RAP material in accordance with FM 5-563 and FM 1-T 030, respectively. Extract and recover the asphalt binder from the RAP in accordance with FM 5-524 and FM 3-D 5404, respectively. Determine the viscosity of the recovered asphalt binder in accordance with ASTM D 2171. Establish the G_{sb} of the RAP material by using one of the following methods:

a. Calculate the G_{sb} value based upon the effective specific gravity (G_{se}) of the RAP material, determined on the basis of the asphalt binder content and maximum specific gravity (G_{mm}) of the RAP material. The Engineer will approve the estimated asphalt binder absorption value used in the calculation.

b. Measure the G_{sb} of the RAP aggregate, in accordance with FM 1-T 084 and FM 1-T 085. Obtain the aggregate by using a solvent extraction method.

334-2.3.4 Pavement Composition: When the Contract includes milling of the existing asphalt pavement, the Pavement Composition Data Sheet may be available on the Department's website. The URL for obtaining this information, if available, is: www.dot.state.fl.us/statematerialsoffice/laboratory/asphalt/centrallaboratory/compositions/index.shtm .

334-2.3.5 Asphalt Binder for Mixes with RAP: Select the appropriate asphalt binder grade based on Table 334-2. The Engineer reserves the right to change the asphalt binder type and grade at design based on the characteristics of the RAP asphalt binder, and reserves the right to make changes during production. Maintain the viscosity of the recycled mixture within

the range of 5,000 to 15,000 poises. Obtain a sample of the mixture for the Engineer within the first 1,000 tons of production and at a continuing frequency of one sample per 4,000 tons of mix.

Table 334-2 Asphalt Binder Grade for Mixes Containing RAP	
Percent RAP	Asphalt Binder Grade
<20	PG 67-22
20 – 29	PG 64-22
≥ 30	Recycling Agent

334-2.4 Recycled Crushed Glass: Recycled crushed glass may be used as a component of the asphalt mixture subject to the following requirements:

1. Consider the recycled crushed glass a local material and meet all requirements specified in 902-6.

2. Limit the amount of recycled crushed glass to a maximum of 15 percent by weight of total aggregate.

3. Use an asphalt binder that contains a minimum of 0.5 percent anti-stripping agent by weight of binder. The antistrip additive shall be one of the products included on the Qualified Products List specified in 6-1 of the Specifications. The antistrip additive shall be introduced into the asphalt binder by the supplier during loading.

4. Do not use recycled crushed glass in friction course mixtures or in structural course mixtures which are to be used as the final wearing surface.

334-3 General Composition of Mixture.

334-3.1 General: Compose the asphalt mixture using a combination of aggregate (coarse, fine or mixtures thereof), mineral filler, if required, and asphalt binder material. Size, grade and combine the aggregate fractions to meet the grading and physical properties of the mix design. Aggregates from various sources may be combined.

334-3.2 Mix Design:

334-3.2.1 General: Design the asphalt mixture in accordance with AASHTO R35-04, 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 Traffic Level B through E mix designs, include representative samples of all component materials, including asphalt binder. Allow the State Materials Engineer a maximum of four weeks to either conditionally verify or reject the mix as designed.

Do not use more than three mix designs per nominal maximum aggregate size per traffic level per binder grade per contract year. Exceeding this limitation will result in a maximum Composite Pay Factor 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:
http://www.dot.state.fl.us/Specificationsoffice/implemented/URLinSpecs/files/WarmMixAsphalt.pdf .

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.

334-3.2.2 Mixture Gradation Requirements: Combine the coarse and fine aggregate in proportions that will produce an asphalt mixture meeting all of the requirements defined in this specification and conform to the gradation requirements at design as defined in AASHTO M323-07, Table 3. Aggregates from various sources may be combined.

334-3.2.2.1 Mixture Gradation Classification: Plot the combined mixture gradation on an FHWA 0.45 Power Gradation Chart. Include the Control Points from AASHTO M323-07, Table-3, as well as the Primary Control Sieve (PCS) Control Point from AASHTO M323-07, Table 4. Coarse mixes are defined as having a combined aggregate gradation that passes below the primary control sieve control point and below the maximum density line for all sieve sizes smaller than the primary control sieve. Fine mixes are defined as having a gradation that passes above the primary control sieve control point and above the maximum density line for all sieve sizes smaller than the primary control sieve and larger than the #100 sieve. Use a fine mix for Traffic Levels A through C; use either a coarse mix or fine mix for Traffic Levels D and E.

334-3.2.3 Aggregate Consensus Properties: For Traffic Level C 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.

334-3.2.3.1 Coarse Aggregate Angularity: When tested in accordance with ASTM D 5821, meet the percentage of fractured faces requirements specified in AASHTO M 323-07, Table 5.

334-3.2.3.2 Fine Aggregate Angularity: When tested in accordance with AASHTO T 304, Method A, meet the uncompacted void content of fine aggregate specified in AASHTO M 323-07, Table 5.

334-3.2.3.3 Flat and Elongated Particles: When tested in accordance with ASTM D 4791, (with the exception that the material passing the 3/8 inch sieve and retained on the No. 4 sieve shall be included), meet the requirements specified in AASHTO M 323-07, Table 5. Measure the aggregate using the ratio of 5:1, comparing the length (longest dimension) to the thickness (shortest dimension) of the aggregate particles.

334-3.2.3.4 Sand Equivalent: When tested in accordance with AASHTO T 176, meet the sand equivalent requirements specified in AASHTO M 323-07, Table 5.

334-3.2.4 Gyratory Compaction: Compact the design mixture in accordance with AASHTO T 312-08, with the following exception: use the number of gyrations at N_{design} as defined in Table 334-3. Measure the inside diameter of gyratory molds in accordance with FM 5-585.

Table 334-3
Gyratory Compaction Requirements

Traffic Level	N_{design} Number of Gyrations
A	50
B	65
C	75
D	100
E	100

334-3.2.5 Design Criteria: Meet the requirements for nominal maximum aggregate size as defined in AASHTO M323-07, as well as for relative density, VMA, VFA, and dust-to-binder ratio as specified in AASHTO M323-07, Table 6. Use a dust-to-binder ratio of 0.8 to 1.6 for coarse mixes. $N_{maximum}$ requirements are not applicable for Traffic Level A and B mixtures.

334-3.2.6 Moisture Susceptibility:

1. For Traffic Level A and B mixtures, use a liquid anti-strip additive, which is on the Department's Qualified Products List, at a rate of 0.5% by weight of the asphalt binder. Other rates of anti-strip additive may be used upon approval of the Engineer.

2. For Traffic Level C through E mixtures, test 4 inch specimens in accordance with FM 1-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. If necessary, add a liquid anti-stripping agent, which is on the Department's Qualified Products List and/or hydrated lime (meeting the requirements of Section 337) in order to meet these criteria.

334-3.2.7 Additional Information: In addition to the requirements listed above, provide the following information with each proposed mix design submitted for verification:

1. The design traffic level and the design number of gyrations (N_{design}).
2. The source and description of the materials to be used.
3. The DOT source number and the DOT product code of the aggregate components furnished from a DOT approved source.
4. The gradation and proportions of the raw materials as intended to be combined in the paving mixture. The gradation of the component materials shall be representative of the material at the time of use. Compensate for any change in aggregate gradation caused by handling and processing as necessary.
5. A single percentage of the combined mineral aggregate passing each specified sieve. Degradation of the aggregate due to processing (particularly material passing the No. 200 sieve) should be accounted for and identified.
6. The bulk specific gravity (G_{sb}) value for each individual aggregate and RAP component, as identified in the Department's aggregate control program.
7. A single percentage of asphalt binder by weight of total mix intended to be incorporated in the completed mixture, shown to the nearest 0.1 percent.
8. A target temperature for the mixture at the plant (mixing temperature) and a target temperature for the mixture at the roadway (compaction temperature) in accordance with 320-6.3. Do not exceed a target temperature of 330°F for PG 76-22 asphalt binders, 320°F for ARB-12 asphalt binders, and 315°F for ARB-5 and unmodified asphalt binders.
9. Provide the physical properties achieved at four different asphalt binder contents. One of which shall be at the optimum asphalt content, and must conform to all specified physical requirements.
10. The name of the CTQP Qualified Mix Designer.
11. The ignition oven calibration factor.
12. The warm mix technology, if used.

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: (1) the target change falls within the limits defined in Table 334-4, (2) appropriate data exists demonstrating

that the mix complies with production air voids specification criteria, and (3) the mixture gradation meets the basic gradation requirements defined in 334-3.2.2.

Table 334-4
Limits for Potential Adjustments to Mix Design Target Values

Characteristic	Limit from Original Mix Design
No. 8 sieve and Coarser	± 5.0 percent
No. 16 sieve	± 4.0 percent
No. 30 sieve	± 4.0 percent
No. 50 sieve	± 3.0 percent
No. 100 sieve	± 3.0 percent
No. 200 sieve	± 1.0 percent
Asphalt Binder Content [(1)]	± 0.3 percent
Each Component of Aggregate Blend [(2)]	± 5.0 percent

[(1)] Reductions to the asphalt binder content will not be permitted if the VMA during production is lower than 1.0 percent below the design criteria.
[(2)] 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.

334-4 Contractor Process Control.

Assume full responsibility for controlling all operations and processes such that the requirements of these Specifications are met at all times. Perform any tests necessary at the plant and roadway for process control purposes. Enter all Process Control test data into the Department's Laboratory Information Management System (LIMS) database. The Engineer will not use these test results in the acceptance payment decision.

Address in the Quality Control Plan how Process Control failures will be handled. When a Process Control failure occurs, investigate, at a minimum, the production process, testing equipment and/or sampling methods to determine the cause of the failure, and make any necessary changes to assure compliance with these Specifications. Obtain a follow up sample immediately after corrective actions are taken to assess the adequacy of the corrections. In the event the follow-up Process Control sample also fails to meet Specification requirements, cease production of the asphalt mixture until the problem is adequately resolved to the satisfaction of the Quality Control Manager.

334-5 Acceptance of the Mixture.

334-5.1 General: The mixture will be accepted at the plant with respect to gradation (P_{-8} and P_{-200}), asphalt content (P_b), and volumetrics (volumetrics is defined as air voids at N_{design}). The mixture will be accepted on the roadway with respect to density of roadway cores.

Acceptance will be on a LOT-by-LOT basis (for each mix design) based on tests of random samples obtained within each sublot taken at a frequency of one set of samples per sublot. A roadway LOT and a plant production LOT shall be the same. Acceptance of the mixture will be based on Contractor Quality Control test results that have been verified by the Department.

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 Quality Control, one for Verification and one for Resolution testing; each sample at approximately 35 pounds. 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. In the event the FM 5-563 ignition oven goes out of service during production, the Contractor may elect to use a replacement oven at another location for no more than 72 hours while the oven is being repaired. 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 312-08 and FM 1-T 209. Measure the inside diameter of gyratory molds in accordance with FM 5-585. 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. Test for roadway density in accordance with FM 1-T 166.

334-5.1.2 Acceptance Testing Exceptions: When the total combined quantity of hot mix asphalt for the project, as indicated in the plans for Type SP and Type FC mixtures only, is less than 2000 tons, the Engineer will accept the mix on the basis of visual inspection. The Engineer may require the Contractor to run process control tests for informational purposes, as defined in 334-4, or may run independent verification tests to determine the acceptability of the material.

Density testing for acceptance will not be performed on widening strips or shoulders with a width of 5 feet or less, open-graded friction courses, variable thickness overbuild courses, leveling courses, any asphalt layer placed on subgrade (regardless of type), miscellaneous asphalt pavement, bike/shared use paths, crossovers, or any course with a specified thickness less than 1 inch or a specified spread rate that converts to less than 1 inch as described in 334-1.4. Density testing for acceptance will not be performed on asphalt courses placed on bridge decks or approach slabs; compact these courses in static mode only per the requirements of 330-7.7. In addition, density testing for acceptance will not be performed on the following areas when they are less than 1,000 feet (continuous) in length: turning lanes, acceleration lanes, deceleration lanes, shoulders, parallel parking lanes or ramps.

Density testing for acceptance will not be performed in intersections. The limits of the intersection will be from stop bar to stop bar for both the mainline and side streets. A random core location that occurs within the intersection shall be moved forward or backward from the intersection at the direction of the Engineer.

Where density testing for acceptance is not required, compact these courses (with the exception of open-graded friction courses) in accordance with the rolling procedure (equipment and pattern) as approved by the Engineer or with Standard Rolling Procedure as specified in 330-7.2. In the event that the rolling procedure deviates from the

procedure approved by the Engineer, or the Standard Rolling Procedure, placement of the mix shall be stopped.

The density pay factor (as defined in 334-8.2) for LOTs where there are areas not requiring density testing for acceptance will be prorated based on a pay factor of 1.00 for the quantity (tonnage) of material in areas not requiring density testing for acceptance and the actual pay factor for the tonnage of material in areas requiring density testing.

334-5.2 Full LOTs: Each LOT will be defined (as selected by the Contractor prior to the start of the LOT) as either (1) 2,000 tons, with each LOT subdivided into four equal sublots of 500 tons each, or (2) 4,000 tons, with each LOT subdivided into four equal sublots of 1,000 tons each. As an exception to this, the initial LOT of all new mix designs shall be defined as 2,000 tons, subdivided into four equal sublots of 500 tons each. Before the beginning of a LOT, the Engineer will develop a random sampling plan for each sublot and direct the Contractor on sample points, based on tonnage, for each sublot during construction.

334-5.3 Partial LOTs: A partial LOT is defined as a LOT size that is less than a full LOT. A partial LOT may occur due to the following:

l. The completion of a given mix type or mix design on a project.

2. Closure of the LOT due to time. LOTs will be closed 30 calendar days after the start of the LOT. Time periods other than 30 calendar days may be used if agreed to by both the Engineer and the Contractor.

3. A LOT is terminated per 334-5.4.4.

All partial LOTs will be evaluated based on the number of tests available, and will not be redefined.

334-5.4 Quality Control Sampling and Testing: Obtain all samples randomly as directed by the Engineer.

Should the Engineer determine that the Quality Control requirements are not being met or that unsatisfactory results are being obtained, or should any instances of falsification of test data occur, approval of the Contractor's Quality Control Plan will be suspended and production will be stopped.

334-5.4.1 Lost or Missing Verification/Resolution Samples: In the event that any of the Verification and/or Resolution samples that are in the custody of the Contractor are lost, damaged, destroyed, or are otherwise unavailable for testing, the minimum possible pay factor for each quality characteristic as described in 334-8.2 will be applied to the entire LOT in question, unless called for otherwise by the Engineer. Specifically, if the LOT in question has more than two sublots, the pay factor for each quality characteristic will be 0.55. If the LOT has two or less sublots, the pay factor for each quality characteristic will be 0.80. In either event, the material in question will also be evaluated in accordance with 334-5.9.5.

If any of the Verification and/or Resolution samples that are in the custody of the Department are lost, damaged, destroyed or are otherwise unavailable for testing, the corresponding Quality Control test result will be considered verified, and payment will be based upon the Contractor's data.

334-5.4.2 Plant Sampling and Testing Requirements: Obtain one random sample of mix per sublot in accordance with 334-5.1.1 as directed by the Engineer. Test the Quality Control split sample for gradation, asphalt binder content and volumetrics in accordance with 334-5.1.1. Complete all Quality Control testing within one working day from the time the samples were obtained.

334-5.4.3 Roadway Sampling and Testing Requirements: Obtain five 6 inch diameter roadway cores within 24 hours of placement at random locations as directed by the Engineer within each sublot. Test these Quality Control samples for density (G_{mb}) in accordance with 334-5.1.1. In situations where it is impractical to cut five cores per sublot, obtain a minimum of three cores per sublot at random locations as identified by the Engineer. Do not obtain cores any closer than 12 inches from an unsupported edge. Maintain traffic during the coring operation; core the roadway, patch the core holes (within three days of coring); and trim the cores to the proper thickness prior to density testing.

Density for the sublot shall be based on the average value for the cores cut from the sublot with the target density being the maximum specific gravity (G_{mm}) of the sublot. Once the average density of a sublot has been determined, do not retest the samples unless approved by the Engineer. Ensure proper handling and storage of all cores until the LOT in question has been accepted.

334-5.4.4 Individual Test Tolerances for Quality Control Testing: Terminate the LOT if any of the following Quality Control failures occur:

1) An individual test result of a sublot for air voids does not meet the requirements of Table 334-5,

2) The average sublot density for coarse mixes does not meet the requirements of Table 334-5,

3) Two consecutive test results for gradation (P_{-200}) do not meet the requirements of Table 334-5,

4) Two consecutive test results for asphalt binder content do not meet the requirements of Table 334-5,

5) The average sublot density for two consecutive sublots for fine mixes does not meet the requirements of Table 334-5,

6) Two core densities for coarse mixes within a sublot are less than 91.00% of G_{mm}.

When a LOT is terminated due to a QC failure, stop production of the mixture until the problem is resolved to the satisfaction of the Quality Control Manager(s) and/or Asphalt Plant Level II technician(s) responsible for the decision to resume production after a quality control failure, as identified in 105-8.6.4. In the event that it can be demonstrated that the problem can immediately be or already has been resolved, it will not be necessary to stop production. When a LOT is terminated, make all necessary changes to correct the problem. Do not resume production until appropriate corrections have been made. Inform the Engineer of the problem and corrections made to correct the problem. After resuming production, sample and test the material to verify that the changes have corrected the problem. Summarize this information and provide it to the Engineer prior to the end of the work shift when production resumes.

In the event that a Quality Control failure is not addressed as defined above, the Engineer's approval will be required prior to resuming production after any future Quality Control failures.

Address any material represented by a failing test result in accordance with 334-5.9.5. Any LOT terminated under this Subarticle will be limited to a maximum Pay Factor of 1.00 (as defined in 334-8.2) for each quality characteristic.

In the event that a G_{mm} test result differs by more than 0.040 from the mix design G_{mm}, investigate the cause(s) of the discrepancy and report the findings and proposed actions to the Engineer.

Table 334-5 Master Production Range	
Characteristic	Tolerance [1]
Asphalt Binder Content (percent)	Target ±0.55
Passing No. 200 Sieve (percent)	Target ±1.50
Air Voids (percent) Coarse Graded	2.00 - 6.00
Air Voids (percent) Fine Graded	2.30 – 6.00
Density (percent G_{mm}) [2]	
Coarse Graded (minimum)	93.00
Fine Graded (minimum)	90.00
[1] Tolerances for sample size of n = 1 from the verified mix design [2] Based on an average of 5 randomly located cores	

334-5.5 Verification Testing: In order to determine the validity of the Contractor's Quality Control test results prior to their use in the Acceptance decision, the Engineer will run verification tests.

334-5.5.1 Plant Testing: At the completion of each LOT, the Engineer will test a minimum of one Verification split sample randomly selected from the LOT. Results of the testing and analysis for the LOT will be made available to the Contractor within one working day from the time the LOT is completed. Verification samples shall be reheated at the target roadway compaction temperature for 1 1/2 hours plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1.

The Verification test results will be compared with the Quality Control test results based on the between-laboratory precision values shown in Table 334-6.

Table 334-6 Between-Laboratory Precision Values	
Property	Maximum Difference
G_{mm}	0.016
G_{mb} (gyratory compacted samples)	0.022
Gmb (roadway cores – fine graded mixture)	0.015
Gmb (roadway cores – coarse graded mixture)	0.018
P_b	0.44 percent
P_{-200}	FM 1-T 030 (Figure 2)
P_{-8}	FM 1-T 030 (Figure 2)

If all of the specified mix characteristics compare favorably, then the LOT will be accepted, with payment based on the Contractor's Quality Control test data for the LOT.

If any of the results do not compare favorably, then the Resolution samples from the LOT will be sent to the Resolution laboratory for testing, as described in 334-5.6.

334-5.5.2 Roadway Testing: At the completion of each LOT, the Engineer will determine the density (G_{mb}) of each core (previously tested by Quality Control) as described in 334-5.1.1 from the same sublot as the Plant samples. For situations where roadway density is not required for the random sublot chosen, then another sublot shall be randomly chosen for roadway density cores only. Results of the testing and analysis for the LOT will be made available to the Contractor within one working day from the time the LOT is completed.

The individual Verification test results will be compared with individual Quality Control test results by the Engineer based on the between-laboratory precision values given in Table 334-6.

If each of the core test results compare favorably, then the LOT will be accepted with respect to density, with payment based on the Contractor's Quality Control test data for the LOT.

If any of the results do not compare favorably, then the core samples from the LOT will be sent to the Resolution laboratory for testing as specified in 334-5.6.

334-5.6 Resolution System:

334-5.6.1 Plant Samples: In the event of an unfavorable comparison between the Contractor's Quality Control test results and the Engineer's Verification test results on any of the properties identified in Table 334-6, the Resolution laboratory will test all of the split samples from the LOT for only the property (or properties) in question. Resolution samples shall be reheated at the target roadway compaction temperature for 1-1/2 hours plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1.

334-5.6.2 Roadway Samples: In the event of an unfavorable comparison between the Contractor's Quality Control test data and the Engineer's Verification test data on the density results, the Resolution laboratory will test all of the cores from the LOT. Testing will be as described in 334-5.1.1. Any damaged roadway cores will not be included in the evaluation; replace damaged cores with additional cores at the direction of the Engineer.

334-5.6.3 Resolution Determination: The Resolution test results (for the property or properties in question) will be compared with the Quality Control test results based on the between-laboratory precision values shown in Table 334-6.

If the Resolution laboratory results compare favorably with all of the Quality Control results, then acceptance and payment for the LOT will be based on the Quality Control results, and the Department will bear the costs associated with Resolution testing. No additional compensation, either monetary or time, will be made for the impacts of any such testing.

If the Resolution laboratory results do not compare favorably with all of the Quality Control results, then acceptance and payment for the LOT will be based on the Resolution test data for the LOT, and the costs of the Resolution testing will be deducted from monthly estimates. No additional time will be granted for the impacts of any such testing. In addition, in the event that the application of the Resolution test data results in a failure to meet the requirements of Table 334-5, address any material represented by the failing test result in accordance with 334-5.9.5.

In the event of an unfavorable comparison between the Resolution test results and Quality Control test results, make the necessary adjustments to assure that future comparisons are favorable.

334-5.7 Independent Verification Testing:

334-5.7.1 Plant: The Contractor shall provide sample boxes and take samples as directed by the Engineer for Independent Verification testing. Obtain enough material for three complete sets of tests (two samples for Independent Verification testing by the Engineer and one sample for testing by the Contractor). If agreed upon by both the Engineer and the Contractor, only one sample for Independent Verification testing by the Engineer may be obtained. Independent Verification samples will be reheated at the target roadway compaction temperature for 1-1/2 hours plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. The Contractor's split sample, if tested immediately after sampling, shall be reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. If the Contractor's sample is not tested immediately after sampling, then the sample shall be reheated at the target roadway compaction temperature for 1-1/2 hours plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. The Contractor's test results shall be provided to the Engineer within one working day from the time the sample was obtained.

If any of the Independent Verification test results do not meet the requirements of Table 334-5, then a comparison of the Independent Verification test results and the Contractor's test results, if available, will be made. If a comparison of the Independent Verification test results and the Contractor's test results meets the precision values of Table 334-6 for the material properties in question, or if the Contractor's test results are not available, then the Independent Verification test results are considered verified and the Contractor shall cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Address any material represented by the failing test results in accordance with 334-5.9.5.

If a comparison of the Independent Verification test results and the Contractor's test results does not meet the precision values of Table 334-6 for the material properties in question, then the second Independent Verification sample shall be tested by the Engineer for the material properties in question. If a comparison between the first and second Independent Verification test results does not meet the precision values of Table 334-6 for the material properties in question, then the first Independent Verification test results are considered unverified for the material properties in question and no action shall be taken.

If a comparison between the first and second Independent Verification test results meets the precision values of Table 334-6 for the material properties in question, then the first Independent Verification sample is considered verified and the Contractor shall cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Address any material represented by the failing test results in accordance with 334-5.9.5.

The Engineer has the option to use the Independent Verification sample for comparison testing as specified in 334-6.

334-5.7.2 Roadway: Obtain five 6 inch diameter roadway cores within 24 hours of placement, as directed by the Engineer, for Independent Verification testing. In situations where it is impractical to cut five cores per sublot, obtain a minimum of three cores per sublot at random locations, as identified by the Engineer. These independent cores will be obtained from the same LOTs and sublots as the Independent Verification Plant samples, or as directed by the Engineer. The density of these cores will be obtained as described in 334-5.1.1. If the average of

the results for the sublot does not meet the requirements of Table 334-5 for density, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Address any material represented by the failing test results in accordance with 334-5.9.5.

334-5.8 Surface Tolerance: The asphalt mixture will be accepted on the roadway with respect to surface tolerance in accordance with the applicable requirements of 330-9.

334-5.9 Minimum Acceptable Quality Levels:

334-5.9.1 Pay Factors Below 0.90: In the event that an individual pay factor for any quality characteristic of a LOT falls below 0.90, take steps to correct the situation and report the actions to the Engineer. In the event that the pay factor for the same quality characteristic for two consecutive LOTs is below 0.90, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Actions taken must be approved by the Engineer before production resumes.

334-5.9.2 Composite Pay Factors Less Than 0.90 and Greater Than or Equal to 0.80: If the composite pay factor for the LOT is less than 0.90 and greater than or equal to 0.80, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Actions taken must be approved by the Engineer before production resumes.

334-5.9.3 Composite Pay Factors Less Than 0.80 and Greater Than or Equal to 0.75: If the composite pay factor for the LOT is less than 0.80 and greater than or equal to 0.75, address the defective material in accordance with 334-5.9.5.

334-5.9.4 Composite Pay Factors Less Than 0.75: If the composite pay factor for the LOT is less than 0.75, remove and replace the defective LOT at no cost to the Department, or as approved by the Engineer.

334-5.9.5 Defective Material: Assume responsibility for removing and replacing all defective material placed on the project, at no cost to the Department.

As an exception to the above and upon approval of the Engineer, obtain an engineering analysis by an independent laboratory (as approved by the Engineer) to determine the disposition of the material. The engineering analysis must be signed and sealed by a Professional Engineer licensed in the State of Florida.

The Engineer may determine that an engineering analysis is not necessary or may perform an engineering analysis to determine the disposition of the material.

Any material that remains in place will be accepted with a composite pay factor as determined by 334-8, or as determined by the Engineer.

If the defective material is due to a gradation, asphalt binder content or density failure, upon approval of the Engineer the Contractor may perform delineation tests on roadway cores in lieu of an engineering analysis to determine the limits of the defective material that requires removal and replacement. Prior to any delineation testing, all sampling locations shall be approved by the Engineer. All delineation sampling and testing shall be monitored and verified by the Engineer. The minimum limit of removal of defective material is fifty-feet either side of the failed sample. For materials that are defective due to air voids, an engineering analysis is required.

When evaluating defective material by engineering analysis or delineation testing, at a minimum, evaluate all material located between passing Quality Control, Process Control or Independent Verification test results. Exceptions to this requirement shall be approved by the Engineer.

334-6 Comparison Testing.

At the start of the project (unless waived by the Engineer) and at other times as determined necessary by the Engineer, provide split samples for comparison testing with the Engineer. The purpose of these tests is to verify that the testing equipment is functioning properly and that the testing procedures are being performed correctly. In the event that the Engineer determines that there is a problem with the Contractor's testing equipment and/or testing procedures, immediately correct the problem to the Engineer's satisfaction. In the event that the problem is not immediately corrected, cease production of the asphalt mixture until the problem is adequately resolved to the satisfaction of the Engineer.

If so agreed to by both the Contractor and the Engineer, the split sample used for comparison testing may also be used for the Quality Control sample. The split sample used for comparison testing will also meet the requirements for Independent Verification Testing described in 334-5.7.

334-7 Method of Measurement.

For the work specified under this Section (including the pertinent provisions of Sections 320 and 330), the quantity to be paid for will be the weight of the mixture, in tons. The pay quantity will be based on the project average spread rate, excluding overbuild, limited to a maximum of 105% of the spread rate determined in accordance with 334-1.4 or as set by the Engineer. The project average spread rate is calculated by totaling the arithmetic mean of the average daily spread rate values for each layer.

The bid price for the asphalt mix will include the cost of the liquid asphalt or the asphalt recycling agent and the tack coat application as directed in 300-8. There will be no separate payment or unit price adjustment for the asphalt binder material in the asphalt mix. For the calculation of unit price adjustments of bituminous material, the average asphalt content will be based on the percentage specified in 9-2.1.2. The weight will be determined as provided in 320-3.2 (including the provisions for the automatic recordation system).

Prepare a Certification of Quantities, using the Department's current approved form, for the certified Superpave asphalt concrete pay item. Submit this certification to the Engineer no later than Twelve O'clock noon Monday after the estimate cut-off or as directed by the Engineer, based on the quantity of asphalt produced and accepted on the roadway per Contract. The certification must include the Contract Number, FPID Number, Certification Number, Certification Date, period represented by Certification and the tons produced for each asphalt pay item.

334-8 Basis of Payment.

334-8.1 General: Price and payment will be full compensation for all the work specified under this Section (including the applicable requirements of Sections 320 and 330).

For materials accepted in accordance with 334-5, based upon the quality of the material, a pay adjustment will be applied to the bid price of the material as determined on a LOT by LOT basis. The pay adjustment will be assessed by calculating a Pay Factor for the following individual quality characteristics: pavement density, air voids, asphalt binder content, and the

percentage passing the No. 200 and No. 8 sieves. The pay adjustment will be computed by multiplying a Composite Pay Factor for the LOT by the bid price per ton. Perform all calculations with the Department's Asphalt Plant - Pay Factor Worksheets.

334-8.2 Pay Factors:

334-8.2.1 Partial LOTs: For Partial LOTs where no random sample is obtained due to insufficient tonnage, a Composite Pay Factor of 1.00 shall be applied.

334-8.2.2 Two or Less Sublot Test Results: In the event that two or less sublot test results are available for a LOT, Pay Factors will be determined based on the Small Quantity Pay Table. The Small Quantity Pay Table and Pay Factor calculations are determined in accordance with the instructions contained within the Department's Asphalt Plant – Pay Factor Worksheets.

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 shown in (Table 334-7). The Percent Within Limits (PWL) is determined in accordance with the instructions contained within the Department's Asphalt Plant – Pay Factor Worksheets.

Table 334-7
Specification Limits

Quality Characteristic	Specification Limits
Passing No. 8 sieve (percent)	Target ± 3.1
Passing No. 200 sieve (percent)	Target ± 1.0
Asphalt Content (percent)	Target ± 0.40
Air Voids - Coarse Mixes (percent)	4.00 ± 1.40
Air Voids - Fine Mixes (percent)	4.00 ± 1.20
Density - Coarse Mixes (percent of G_{mm}):	94.50 ± 1.30
Density - Fine Mixes (percent of G_{mm}):	93.00 + 2.00, - 1.20 (1)

Note (1): If the Engineer (or Contract Documents) limits compaction to the static mode only, or for all one-inch thick lifts, compaction shall be in the static mode. No vibratory mode in the vertical direction will be allowed. Other vibratory modes will be allowed, if approved by the Engineer. In either case, the specification limits will be as follows: 92.00 + 3.00, -1.20 percent of G_{mm}. No additional compensation, cost or time, shall be made.

334-8.2.3.1 Pay Factors (PF): Pay Factors will be calculated by using the following equation:

Pay Factor = (55 + 0.5 x PWL) / 100

The PWL is determined in accordance with the instructions contained within the Department's Asphalt Plant – Pay Factor Worksheets.

334-8.3 Composite Pay Factor (CPF): A Composite Pay Factor for the LOT will be calculated based on the individual Pay Factors (PF) with the following weighting applied: 35% Density (D), 25% Air Voids (V_a), 25% asphalt binder content (P_b), 10% Passing No. 200 (P_{-200}) and 5% Passing No. 8 (P_{-8}). Calculate the CPF by using the following formula:

CPF = [(0.350 x PF D) + (0.250 x PF V_a) + (0.250 x PF P_b) + (0.100 x PF P_{-200}) + (0.050 x PF P_{-8})]

Where the Pay Factor (PF) for each quality characteristic is determined in either 334-8.2.2 or 334-8.2.3, depending on the number of sublot tests. Note that the number after each multiplication will be rounded to the nearest 0.01.

The pay adjustment shall be computed by multiplying the Composite Pay Factor for the LOT by the bid price per ton.

334-8.4 Payment: Payment will be made under:

Item No. 334- 1- Superpave Asphaltic Concrete - per ton.

336 ASPHALT RUBBER BINDER.
(REV 5-24-10) (FA 8-16-10) (1-11)

SECTION 336 (Pages 291-294) is deleted and the following substituted:

SECTION 336
ASPHALT RUBBER BINDER

336-1 Description.

Produce asphalt rubber binder for use in Asphalt Concrete Friction Courses and Asphalt Rubber Membrane Interlayers.

336-2 Materials.

336-2.1 Superpave PG Asphalt Binder: For the particular grade of asphalt as specified in Table 336-1, meet the requirements of Section 916.

336-2.2 Ground Tire Rubber: For the type of ground tire rubber, meet the requirements of Section 919.

336-3 Asphalt Rubber Binder.

Thoroughly mix and react the asphalt binder and ground tire rubber in accordance with the requirements of Table 336-1. Accomplish blending of the asphalt binder and ground tire rubber at the project site or asphalt plant, or at the supplier's terminal.

Table 336-1

Asphalt Rubber Binder

Binder Type	ARB 5	ARB 12	ARB 20
Rubber Type	TYPE A (or B)[1]	TYPE B (or A)[2]	TYPE C (or B or A)[2]
Minimum Ground Tire Rubber (by weight of asphalt binder)	5%	12%	20%
Binder Grade	PG 67-22	PG 67-22	PG 64-22
Temperature Range	300 - 335°F	300 - 350°F	335 - 375°F
Minimum Reaction Time	10 minutes	15 minutes (Type B)	30 minutes (Type C)
Unit Weight @ 60ºF[3]	8.6 lbs/gal.	8.7 lbs/gal.	8.8 lbs/gal.
Viscosity Range[4]	4.0 - 6.0 Poises @ 300°F	10.0 - 15.0 Poises @ 300°F	15.0 - 20.0 Poises @ 350°F

Table 336-1			
Asphalt Rubber Binder			
Binder Type	ARB 5	ARB 12	ARB 20
Rubber Type	TYPE A (or B)[1]	TYPE B (or A)[2]	TYPE C (or B or A)[2]

(1) Use of Type B rubber may require an increase in the mix temperature in order to offset higher viscosity values.
(2) Use of finer rubber could result in the reduction of the minimum reaction time.
(3) Conversions to standard 60ºF are as specified in 300-9.3.
(4) FM 5-548, Viscosity of Asphalt Rubber by Rotational (Dip-N-Read) Viscometer or AASHTO T 316, Viscosity Determination of Asphalt Binder Using Rotational Viscometer.
NOTE: The Contractor may adjust the minimum reaction time if approved by the Engineer depending upon the temperature, size of the ground tire rubber and viscosity measurement determined from the asphalt rubber binder material prior to or during production. Apply the asphalt rubber binder for use in membrane interlayers within a period of six hours, unless some form of corrective action such as cooling and reheating is approved by the Engineer.

336-4 Equipment.

Use blending equipment that is designed for asphalt rubber binder and capable of producing a homogeneous mixture of ground tire rubber and asphalt binder meeting the requirements of Table 336-1. Use a batch type or continuous type blending unit that provides for sampling of the blended and reacted asphalt rubber binder material during normal production and provides for accurate proportioning of the asphalt binder and ground tire rubber either by weight or volume.

In order to meet specification requirements, keep the asphalt rubber uniformly blended while in storage. Equip storage tanks with a sampling device.

336-5 Testing of Asphalt Rubber Binder:

336-5.1 Quality Control Requirements: Test the asphalt rubber binder for the viscosity requirement of Table 336-1 at the following frequencies and situations:

1. One per batch (for batch blending) or two per day (for continuous blending) during blending at the project site or asphalt plant, or the supplier's terminal.

2. Each load delivered to the project site/asphalt plant when blended at the supplier's terminal.

3. Beginning of each day from the storage tank when storing the asphalt rubber binder at the project site or asphalt plant, or the supplier's terminal, obtain the sample for testing from the discharge piping exiting the storage tank.

Obtain the viscosity testing equipment specified in FM 5-548 and make it available to the Engineer for verification purposes at the project site/asphalt plant and supplier's terminal.

336-5.1.1 Action at Project Site or Asphalt Plant: If the asphalt rubber binder does not meet the minimum viscosity requirement at the project site or asphalt plant, stop use of the asphalt rubber binder in the Asphalt Concrete Friction Course and Asphalt Rubber Membrane Interlayer, notify the Engineer, and make the appropriate adjustments as necessary to meet the requirements of Table 336-1 in order to: (1) correct the viscosity of the blended material and (2) correct the blending operation. In the event that the corrective actions taken fail to correct the problem, or the material consistently fails to meet the minimum viscosity requirement, do not use the asphalt rubber binder in storage, and where applicable, stop all asphalt rubber blending operations at the project site or asphalt plant and solve the problem.

Do not use asphalt rubber binder with low viscosity in mix and interlayer construction, or resume blending operations at the project site or asphalt plant until the Engineer grants approval. The Engineer may require that any mix and interlayer placed with low viscosity asphalt rubber binder be evaluated in accordance with 334-5.9.5. In the event that the viscosity of the asphalt rubber binder increases to the extent that plant production or paving operations of the mix are adversely affected (i.e. density or texture problems occur), stop plant operations and resolve the problem to the Engineer's satisfaction.

336-5.1.2 Action at Supplier's Terminal: If the asphalt rubber binder does not meet the minimum viscosity requirement at the supplier's terminal, stop shipment and blending of asphalt rubber binder, and make the appropriate adjustments as necessary to meet the requirements of Table 3361 in order to (1) correct the viscosity of the blended material in the tank, and (2) correct the blending operation. Resume shipment and blending of asphalt rubber binder when a retest indicates the viscosity meets Specifications. Document actions taken in the Quality Control records.

336-5.2 Verification Requirements: The Engineer will test the asphalt rubber in accordance with FM 5-548 or AASHTO T 316 randomly on an as needed basis at the project site or asphalt plant, or the supplier's terminal to ensure conformance with the minimum viscosity requirement as specified in Table 336-1.

336-5.2.1 Action at Project Site or Asphalt Plant: If the asphalt rubber binder does not meet the viscosity requirements at the project site or asphalt plant, stop use of asphalt rubber binder. Do not use asphalt rubber binder with a viscosity outside of the specified range in mix and interlayer construction until corrective actions, as necessary to meet the requirements of Table 336-1, have been made, verified by passing test results, and the Engineer grants approval. The Engineer may require that any mix and interlayer placed with an asphalt rubber binder with a viscosity outside of the specified range be evaluated in accordance with 334-5.9.5. In the event that the viscosity of the asphalt rubber binder adversely affects plant production or paving operations, stop plant and paving operations and resolve the problem to the Engineer's satisfaction.

336-5.2.2 Action at Supplier's Terminal: If the asphalt rubber binder does not meet the viscosity requirements at the supplier's terminal, stop shipment and blending of asphalt rubber binder until corrective actions are made to meet the requirements of Table 336-1.

336-5.3 Asphalt Rubber Binder Blending Quality Control Records: Maintain adequate Quality Control records for the Engineer's review of all blending activities. The Quality Control records shall include at a minimum the following information (for each batch of asphalt rubber binder produced): asphalt rubber binder type, asphalt rubber binder batch quantity, asphalt binder supplier (including QPL number and LOT), asphalt binder quantity in gallons, ground tire rubber supplier (including QPL number and LOT), ground tire rubber quantity in pounds, individual quantities of asphalt rubber binder shipped, financial project number, shipping date, customer name, delivery location, and viscosity test results.

336-5.3.1 Additional Records for Blending at Project Site or Asphalt Plant: Monitor the ground tire rubber content in the asphalt rubber binder on a daily basis based on one of the following methods:

1. Record the weight of the ground tire rubber used and the number of gallons of asphalt rubber binder produced. Calculate the percentage of rubber used and confirm that the minimum rubber requirements are met. Use the unit weight per gallon for the various types of asphalt rubber binder shown in Table 336-1 for the calculations.

2. Record the weight of the ground tire rubber used and the number of gallons of asphalt binder used. Calculate the percentage of rubber used and confirm that the minimum rubber requirements are met.

336-6 Use of Excess Asphalt Rubber.

The Contractor may use excess asphalt rubber in other asphalt concrete mixes requiring the use of a PG 67-22 binder by blending with straight PG 67-22 binder so that the total amount of ground tire rubber in the binder is less than 2.0%. The Contractor may use excess asphalt rubber in asphalt concrete mixtures requiring the use of a recycling agent in a recycled mixture by blending with a recycling agent in such proportions that the total amount of ground tire rubber in the recycling agent is less than 1.0%.

336-7 Certification Requirements for Blending at Suppliers Terminal:

Where blending the asphalt rubber binder at the supplier's terminal, the supplier shall furnish certification on the bill of lading for each load delivered to the project site or asphalt plant that includes: the quantity of asphalt rubber binder, the asphalt rubber binder type, the customer name, the delivery location, and a statement that the asphalt rubber binder has been produced in accordance with and meets the requirements of Section 336. In addition, include, with the certification, copies of the certifications for the asphalt binder and ground tire rubber, as specified in 916-1.3.6 and 919-6, respectively.

336-8 Basis of Payment.

Payment for Asphalt Rubber Binder will be included in Sections 337 and 341, as appropriate.

337 ASPHALT CONCRETE FRICTION COURSES. (REV 5-19-11) (FA 8-4-11) (1-12)

SECTION 337 (Pages 294 - 304) is deleted and the following substituted:

SECTION 337
ASPHALT CONCRETE FRICTION COURSES

337-1 Description.

Construct an asphalt concrete friction course pavement with the type of mixture specified in the Contract, or when offered as alternates, as selected. This Section specifies mixes designated as FC-5, FC-9.5, and FC-12.5.

Meet the plant and equipment requirements of Section 320, as modified herein. Meet the general construction requirements of Section 330, as modified herein.

337-2 Materials.

337-2.1 General Requirements: Meet the requirements specified in Division III as modified herein. The Engineer will base continuing approval of material sources on field performance. 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:
www.dot.state.fl.us/Specificationsoffice/implemented/URLinSpecs/files/WarmMixAsphalt.pdf .

337-2.2 Asphalt Binder: Meet the requirements of Section 336, and any additional requirements or modifications specified herein for the various mixtures. When called for in the Contract Documents, use a PG 76-22 asphalt binder meeting the requirements of 916-1. For projects with a total quantity of FC-5, FC-9.5, or FC-12.5 less than 500 tons, the Contractor may elect to substitute a PG 76-22 for the ARB-12 or ARB-5, meeting the requirements of 916-1.

337-2.3 Coarse Aggregate: Meet the requirements of Section 901, and any additional requirements or modifications specified herein for the various mixtures.

337-2.4 Fine Aggregate: Meet the requirements of Section 902, and any additional requirements or modifications specified herein for the various mixtures.

337-2.5 Hydrated Lime: Meet the requirements of AASHTO M 303, Type 1.

Provide certified test results for each shipment of hydrated lime indicating compliance with the specifications.

337-2.6 Liquid Anti-strip Additive: Meet the requirements of 916-5 and be listed on the Department's Qualified Products List (QPL).

337-2.7 Fiber Stabilizing Additive (Required for FC-5 only): Use either a mineral or cellulose fiber stabilizing additive. Meet the following requirements:

337-2.7.1 Mineral Fibers: Use mineral fibers (made from virgin basalt, diabase, or slag) treated with a cationic sizing agent to enhance the disbursement of the fiber, as well as to increase adhesion of the fiber surface to the bitumen. Meet the following requirements for physical properties:

1. Size Analysis
   - Average fiber length: 0.25 inch (maximum)
   - Average fiber thickness: 0.0002 inch (maximum)
2. Shot Content (ASTM C612)
   - Percent passing No. 60 Sieve: 90 - 100
   - Percent passing No. 230 Sieve: 65 - 100

Provide certified test results for each batch of fiber material indicating compliance with the above tests.

337-2.7.2 Cellulose Fibers: Use cellulose fibers meeting the following requirements:

1. Fiber length: 0.25 inch (maximum)
2. Sieve Analysis
   - a. Alpine Sieve Method
     - Percent passing No. 100 sieve: 60-80
   - b. Ro-Tap Sieve Method
     - Percent passing No. 20 sieve: 80-95
     - Percent passing No. 40 sieve: 45-85
     - Percent passing No. 100 sieve: 5-40
3. Ash Content: 18% non-volatiles (plus or minus±5%)
4. pH: 7.5 (plus or minus±1.0)
5. Oil Absorption: 5.0% (plus or minus±1.0) (times fiber weight)
6. Moisture Content: 5.0% by weight (maximum)

Provide certified test results for each batch of fiber material indicating compliance with the above tests.

337-3 General Composition of Mixes.

337-3.1 General: Use a bituminous mixture composed of aggregate (coarse, fine, or a mixture thereof), asphalt binder, and in some cases, fibers and/or hydrated lime. Size, uniformly grade and combine the aggregate fractions in such proportions that the resulting mix meets the requirements of this Section.

337-3.2 Specific Component Requirements by Mix:

337-3.2.1 FC-5:

337-3.2.1.1 Aggregates: Use an aggregate blend which consists of either 100% crushed granite, 100% crushed Oolitic limestone or 100% other crushed materials (as approved by the Engineer for friction courses per Rule 14-103.005, Florida Administrative Code).

Crushed limestone from the Oolitic formation may be used if it contains a minimum of 12% silica material as determined by FM 5-510 and the Engineer grants approval of the source prior to its use.

A list of aggregates approved for use in friction course may be available on the Department's website. The URL for obtaining this information, if available, is: www.dot.state.fl.us/statematerialsoffice/quality/programs/qualitycontrol/materialslistings/sources/frictioncourse.pdf .

337-3.2.1.2 Asphalt Binder: Use an ARB-12 asphalt rubber binder. If called for in the Contract Documents, use a PG 76-22 asphalt binder.

337-3.2.1.3 Hydrated Lime: Add the lime at a dosage rate of 1.0% by weight of the total dry aggregate to mixes containing granite.

337-3.2.1.4 Liquid Anti-strip Additive: Use a liquid anti-strip additive at a rate of 0.5% by weight of the asphalt binder for mixtures containing limestone aggregate. Other rates of anti-strip additive may be used upon approval of the Engineer.

337-3.2.1.5 Fiber Stabilizing Additive: Add either mineral fibers at a dosage rate of 0.4% by weight of the total mix, or cellulose fibers at a dosage rate of 0.3% by weight of total mix.

337-3.2.2 FC-9.5 and FC-12.5:

337-3.2.2.1: Aggregates: Use an aggregate blend that consists of crushed granite, crushed Oolitic limestone, other crushed materials (as approved by the Engineer for friction courses per Rule 14-103.005, Florida Administrative Code), or a combination of the above. Crushed limestone from the Oolitic formation may be used if it contains a minimum of 12% silica material as determined by FM 5-510 and the Engineer grants approval of the source prior to its use. As an exception, mixes that contain a minimum of 60% crushed granite may either contain: 1) up to 40% fine aggregate from other sources or 2) a combination of up to 20% RAP and the remaining fine aggregate from other sources.

A list of aggregates approved for use in friction course may be available on the Department's website. The URL for obtaining this information, if available, is: www.dot.state.fl.us/statematerialsoffice/quality/programs/qualitycontrol/materialslistings/sources/frictioncourse.pdf .

337-3.2.2.2: Asphalt Binder: Use an ARB-5 asphalt rubber binder. If called for in the Contract Documents, use a PG 76-22 asphalt binder.

337-3.3 Grading Requirements:

337-3.3.1 FC-5: Use a mixture having a gradation at design within the ranges shown in Table 337-1.

Table 337-1 FC-5 Gradation Design Range									
3/4 inch	1/2 inch	3/8 inch	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
100	85-100	55-75	15-25	5-10	--	--	--	--	2-4

337-3.3.2 FC-9.5: Meet the design gradation requirements for a SP-9.5 Superpave fine mix as defined in 334-3.2.2.

337-3.3.3 FC-12.5: Meet the design gradation requirements for a SP-12.5 Superpave fine mix as defined in 334-3.2.2.

337-4 Mix Design.

337-4.1 FC-5: The Department will design the FC-5 mixtures. Furnish the materials and all appropriate information (source, gradation, etc.) as specified in 334-3.2.7. The Department will have two weeks to design the mix.

The Department will establish the design binder content for FC-5 within the following ranges based on aggregate type:

Aggregate Type	Binder Content
Crushed Granite	5.5 - 7.0
Crushed Limestone (Oolitic)	6.5 - 8.0

337-4.2 FC-9.5 and FC-12.5: Provide a mix design conforming to the requirements of 334-3.2 unless otherwise designated in the plans. Develop the mix design using an ARB-5 or PG 76-22 asphalt binder if called for in the Contract Documents.

337-4.3 Revision of Mix Design: For FC-5, FC-9.5 and FC-12.5, meet the requirements of 334-3.3. For FC-5, all revisions must fall within the gradation limits defined in Table 337-1.

337-5 Contractor's Process Control.

Provide the necessary process control of the friction course mix and construction in accordance with the applicable provisions of 320-2, 330-2 and 334-4.

The Engineer will monitor the spread rate periodically to ensure uniform thickness. Provide quality control procedures for daily monitoring and control of spread rate variability. If the spread rate varies by more than 5% of the spread rate set by the Engineer in accordance with 337-8, immediately make all corrections necessary to bring the spread rate into the acceptable range.

337-6 Acceptance of the Mixture.

337-6.1 FC-9.5 and FC-12.5: Meet the requirements of 334-5.

337-6.2 FC-5: Meet the requirements of 334-5 with the following exceptions:

1. The mixture will be accepted with respect to gradation ($P_{-3/8}$, P_{-4}, and P_{-8}), and asphalt binder content (P_b) only.

2. Testing in accordance with AASHTO T 312-08 and FM 1-T 209 (and conditioning prior to testing) will not be required as part of 334-5.1.1.

3. The standard LOT size of FC-5 will be 2,000 tons, with each LOT subdivided into four equal sublots of 500 tons each.

4. The Between-Laboratory Precision Values described in Table 334-6 are modified to include ($P_{-3/8}$, P_{-4}, and P_{-8}) with a maximum difference per FM 1-T 030 (Figure 2).

5. Table 334-5 (Master Production Range) is replaced by Table 337-2.

6. The mixture will be accepted on the roadway with respect to surface tolerance in accordance with 334-5.8. No density testing will be required for these mixtures.

Table 337-2
FC-5 Master Production Range

Characteristic	Tolerance (1)
Asphalt Binder Content (%)	Target ± 0.60
Passing 3/8 inch Sieve (%)	Target ± 7.50
Passing No. 4 Sieve (%)	Target ± 6.00
Passing No. 8 Sieve (%)	Target ± 3.50
(1) Tolerances for sample size of n = 1 from the verified mix design	

337-6.2.1 Individual Test Tolerances for FC-5 Production: Terminate the LOT if any of the following Quality Control failures occur:

1) An individual test result of a sublot for asphalt binder content does not meet the requirements of Table 337-2,

2) Two consecutive test results for gradation on any of the following sieve sizes ($P_{-3/8}$, P_{-4}, and P_{-8}) do not meet the requirements of Table 337-2,

When a LOT is terminated due to a QC failure, stop production of the mixture until the problem is resolved to the satisfaction of the Quality Control Manager(s) and/or Asphalt Plant Level II technician(s) responsible for the decision to resume production after a quality control failure, as identified in 105-8.6.4. In the event that it can be demonstrated that the problem can immediately be or already has been resolved, it will not be necessary to stop production. When a LOT is terminated, make all necessary changes to correct the problem. Do not resume production until appropriate corrections have been made. Inform the Engineer of the problem and corrections made to correct the problem. After resuming production, sample and test the material to verify that the changes have corrected the problem. Summarize this information and provide it to the Engineer prior to the end of the work shift when production resumes.

In the event that a Quality Control failure is not addressed as defined above, the Engineer's approval will be required prior to resuming production after any future Quality Control failures.

Address any material represented by a failing test result in accordance with 334-5.9.5. Any LOT terminated under this Subarticle will be limited to a maximum Pay Factor of 1.00 (as defined in 337-12.3) for each quality characteristic.

337-7 Special Construction Requirements.

337-7.1 Hot Storage of FC-5 Mixtures: When using surge or storage bins in the normal production of FC-5, do not leave the mixture in the surge or storage bin for more than one hour.

337-7.2 Longitudinal Grade Controls for Open-Graded Friction Courses: On FC-5, use either longitudinal grade control (skid, ski or traveling stringline) or a joint matcher.

337-7.3 Temperature Requirements for FC-5:

337-7.3.1 Air Temperature at Laydown: Spread the mixture only when the air

temperature (the temperature in the shade away from artificial heat) is at or above 65ºF. As an exception, place the mixture at temperatures no lower than 60ºF, only when approved by the Engineer based on the Contractor's demonstrated ability to achieve a satisfactory surface texture and appearance of the finished surface. The minimum ambient temperature may be further reduced to 55ºF when using warm mix technology, if agreed to by both the Engineer and the Contractor.

337-7.3.2 Temperature of the Mix: Heat and combine the asphalt binder and aggregate in a manner to produce a mix having a temperature, when discharged from the plant, meeting the requirements of 320-6.3. Meet all requirements of 330-6.1.3 at the roadway. The target mixing temperature shall be established at 320ºF for mixtures utilizing ARB-12 asphalt binder. For mixtures utilizing PG 76-22 asphalt binder, the target mixing temperature shall be established by the Contractor. The target mixing temperature may be reduced when using warm mix technology.

337-7.4 Compaction of FC-5: Provide two, static steel-wheeled rollers, with an effective compactive weight in the range of 135 to 200 PLI, determined as follows:

$$\text{PLI} = \frac{\text{Total Weight of Roller (pounds)}}{\text{Total Width of Drums (inches)}}$$

(Any variation of this equipment requirement must be approved by the Engineer.) Establish an appropriate rolling pattern for the pavement in order to effectively seat the mixture without crushing the aggregate. In the event that the roller begins to crush the aggregate, reduce the number of coverages or the PLI of the rollers. If the rollers continue to crush the aggregate, use a tandem steel-wheel roller weighing not more than 135 lb. per linear inch (PLI) of drum width.

337-7.5 Temperature Requirements for FC-9.5 and FC-12.5:

337-7.5.1 Air Temperature at Laydown: Spread the mixture only when the air temperature (the temperature in the shade away from artificial heat) is at or above 45ºF. The minimum ambient temperature may be reduced by 5ºF when using warm mix technology, if agreed to by both the Engineer and the Contractor.

337-7.5.2 Temperature of the Mix: Heat and combine the asphalt binder and aggregate in a manner to produce a mix having a temperature, when discharged from the plant, meeting the requirements of 320-6.3. Meet all requirements of 330-6.1.3 at the roadway.

337-7.6 Prevention of Adhesion: To minimize adhesion to the drum during the rolling operations, the Contractor may add a small amount of liquid detergent to the water in the roller.

At intersections and in other areas where the pavement may be subjected to cross-traffic before it has cooled, spray the approaches with water to wet the tires of the approaching vehicles before they cross the pavement.

337-7.7 Transportation Requirements of Friction Course Mixtures: Cover all loads of friction course mixtures with a tarpaulin, or waterproof cover, meeting requirements of 320-7.

337-7.8 Asphalt Rubber Binder Requirements: Meet the requirements of Section 336 Asphalt Rubber Binder, particularly noting testing and action requirements to be met at the project site.

337-8 Thickness of Friction Courses.

337-8.1 FC-12.5 and FC-9.5: The thickness of the friction course layer will be the plan thickness as shown in the Contract Documents. For construction purposes, the plan thickness will be converted to spread rate as defined in 334-1.4.

Plan quantities are based on a G_{mm} of 2.540, corresponding to a spread rate of 110 lbs. per square yard per inch. Pay quantities will be based on the actual maximum specific gravity of the mix being used.

337-8.2 FC-5: The total thickness of the FC-5 layer will be the plan thickness as shown in the Contract Documents. For construction purposes, the plan thickness will be converted to spread rate based on the combined aggregate bulk specific gravity of the asphalt mix being used as shown in the following equation:

Spread rate (lbs. per square yard) = t x G_{sb} x 40.5

Where: t = Thickness (in.) (Plan thickness)

G_{sb} = Combined aggregate bulk specific gravity from the verified mix design

The weight of the mixture shall be determined as provided in 320-3.2.

Plan quantities are based on a G_{sb} of 2.635, corresponding to a spread rate of 80 lbs. per square yards. Pay quantities will be based on the actual combined aggregate bulk specific gravity (G_{sb}) of the mix being used.

337-9 Special Equipment Requirements for FC-5.

337-9.1 Fiber Supply System: Use a separate feed system to accurately proportion the required quantity of mineral fibers into the mixture in such a manner that uniform distribution is obtained. Interlock the proportioning device with the aggregate feed or weigh system to maintain the correct proportions for all rates of production and batch sizes. Control the proportion of fibers to within plus or minus 10% of the amount of fibers required. Provide flow indicators or sensing devices for the fiber system, interlocked with plant controls so that the mixture production will be interrupted if introduction of the fiber fails.

When a batch plant is used, add the fiber to the aggregate in the weigh hopper or as approved and directed by the Engineer. Increase the batch dry mixing time by 8 to 12 seconds, or as directed by the Engineer, from the time the aggregate is completely emptied into the pugmill. Ensure that the fibers are uniformly distributed prior to the addition of asphalt rubber into the pugmill.

When a drum-mix plant is used, add and uniformly disperse the fiber with the aggregate prior to the addition of the asphalt rubber. Add the fiber in such a manner that it will not become entrained in the exhaust system of the drier or plant.

337-9.2 Hydrated Lime Supply System: For FC-5 mixes containing granite, use a separate feed system to accurately proportion the required quantity of hydrated lime into the mixture in such a manner that uniform coating of the aggregate is obtained prior to the addition of the asphalt rubber. Add the hydrated lime in such a manner that it will not become entrained in the exhaust system of the drier or plant. Interlock the proportioning device with the aggregate feed or weigh system to maintain the correct proportions for all rates of production and batch sizes and to ensure that all mixture produced is properly treated with hydrated lime. Control the proportion of hydrated lime to within plus or minus 10% of the amount of hydrated lime required. Provide and interlock flow indicators or sensing devices for the hydrated lime system with plant controls so that the mixture production will be interrupted if introduction of the hydrated lime fails. The addition of the hydrated lime to the aggregate may be accomplished by Method (A) or (B) as follows:

337-9.2.1 Method (A) - Dry Form: Add hydrated lime in a dry form to the

mixture according to the type of asphalt plant being used.

When a batch plant is used, add the hydrated lime to the aggregate in the weigh hopper or as approved and directed by the Engineer. Increase the batch dry mixing time by eight to twelve seconds, or as directed by the Engineer, from the time the aggregate is completely emptied into the pugmill. Uniformly distribute the hydrated lime prior to the addition of asphalt rubber into the pugmill.

When a drum-mix plant is used, add and uniformly disperse the hydrated lime to the aggregate prior to the addition of the asphalt rubber. Add the hydrated lime in such a manner that it will not become entrained in the exhaust system of the drier or plant.

337-9.2.2 Method (B) - Hydrated Lime/Water Slurry: Add the required quantity of hydrated lime (based on dry weight) in a hydrated lime/water slurry form to the aggregate. Provide a solution consisting of hydrated lime and water in concentrations as directed by the Engineer. Use a plant equipped to blend and maintain the hydrated lime in suspension and to mix it with the aggregates uniformly in the proportions specified.

337-9.3 Hydrated Lime Pretreatment: For FC-5 mixes containing granite, as an alternative to 337-9.2, pretreat the aggregate with hydrated lime prior to incorporating the aggregate into the mixture. Use a feed system to accurately proportion the aggregate and required quantity of hydrated lime, and mix them in such a manner that uniform coating of the aggregate is obtained. Control the proportion of hydrated lime to within plus or minus 10% of the amount required. Aggregate pretreated with hydrated lime in this manner shall be incorporated into the asphalt mixture within 45 days of pretreatment.

337-9.3.1 Hydrated Lime Pretreatment Methods: Pretreat the aggregate using one of the following two methods:

Pretreatment Method A – Dry Form: Add the required quantity of hydrated lime in a dry form to the aggregate. Assure that the aggregate at the time of pretreatment contains a minimum of 3% moisture over saturated surface dry (SSD) conditions. Utilize equipment to accurately proportion the aggregate and hydrated lime and mix them in such a manner as to provide a uniform coating.

Pretreatment Method B – Hydrated Lime/Water Slurry: Add the required quantity of hydrated lime (based on dry weight) in a hydrated lime/water slurry form to the aggregate. Provide a solution consisting of hydrated lime and water in a concentration to provide effective treatment. Use equipment to blend and maintain the hydrated lime in suspension, to accurately proportion the aggregate and hydrated lime/water slurry, and to mix them to provide a uniform coating.

337-9.3.2 Blending Quality Control Records: Maintain adequate Quality Control records for the Engineer's review for all pretreatment activities. Include as a minimum the following information (for each batch or day's run of pretreatment): pretreatment date, aggregate certification information, certified test results for the hydrated lime, aggregate moisture content prior to blending, as-blended quantities of aggregate and hydrated lime, project number, customer name, and shipping date.

337-9.3.3 Certification: In addition to the aggregate certification, provide a certification with each load of material delivered to the HMA plant, that the material has been pretreated in conformance with these specifications. Include also the date the material was pretreated.

337-10 Failing Material.

Meet the requirements of 334-5.9. For FC-5, use the Master Production Range defined in

Table 337-2 in lieu of Table 334-5.

337-11 Method of Measurement.

For the work specified under this Section (including the pertinent provisions of Sections 320 and 330), the quantity to be paid for will be the weight of the mixture, in tons. The pay quantity will be based on the project average spread rate, limited to a maximum of 105% of the spread rate determined in accordance with 337-8 or as set by the Engineer. The project average spread rate is calculated by totaling the arithmetic mean of the average daily spread rate values for each layer.

The bid price for the asphalt mix will include the cost of the asphalt binder (asphalt rubber (or polymer), asphalt cement, ground tire rubber, anti-stripping agent, blending and handling) and the tack coat application as directed in 300-8, as well as fiber stabilizing additive and hydrated lime (if required). There will be no separate payment or unit price adjustment for the asphalt binder material in the asphalt mix. The weight will be determined as provided in 320-3.2 (including the provisions for the automatic recordation system).

Prepare a Certification of Quantities, using the Department's current approved form, for the certified asphalt concrete friction course pay item. Submit this certification to the Engineer no later than Twelve O'clock noon Monday after the estimate cut-off or as directed by the Engineer, based on the quantity of asphalt produced and accepted on the roadway per Contract. The certification must include the Contract Number, FPID Number, Certification Number, Certification Date, period represented by Certification and the tons produced for each asphalt pay item.

337-12 Basis of Payment.

337-12.1 General: Price and payment will be full compensation for all the work specified under this Section (including the applicable requirements of Sections 320 and 330).

Based upon the quality of the material, a pay adjustment will be applied to the bid price of the material as determined on a LOT by LOT basis. The pay adjustment will be assessed by calculating a Pay Factor for individual quality characteristics. The pay adjustment will be computed by multiplying a Composite Pay Factor for the LOT by the bid price per ton. Perform all calculations with the Department's Asphalt Plant - Pay Factor Worksheets.

337-12.2 FC-9.5 and FC-12.5: Meet the requirements of 334-8.

337-12.3 FC-5: Meet the requirements of 334-8 with the following exceptions:

1. Pay factors will be calculated for asphalt binder content and the percentages passing the 3/8 inch, the No. 4, and the No. 8 sieves only.

2. The Small Quantity Pay Table for FC-5 Mixtures replaces the Small Quantity Pay Table for Dense Graded Mixtures in the Department's Asphalt Plant - Pay Factor Worksheets.

3. Table 337-3 replaces Table 334-7.

4. The Composite Pay Factor equation in 334-8.3 is replaced with the following:

CPF = [(0.20 x PF 3/8 inch) + (0.30 x PF No. 4) + (0.10 x PF No. 8) + (0.40 x PF AC)]

Table 337-3 Specification Limits for FC-5	
Quality Characteristic	Specification Limits

Table 337-3 Specification Limits for FC-5	
Quality Characteristic	Specification Limits
Asphalt Binder Content (%)	Target ± 0.45
Passing 3/8 inch sieve (%)	Target ± 6.00
Passing No. 4 sieve (%)	Target ± 4.50
Passing No. 8 sieve (%)	Target ± 2.50

337-12.4 Payment: Payment will be made under:

Item No. 337- 7- Asphaltic Concrete Friction Course - per ton.

338 VALUE ADDED ASPHALT PAVEMENT.

REV (2-12-10) (FA 2-17-10) (7-10)

ARTICLE 338-1 (Pages 304 and 305) is deleted and the following substituted:

338-1 Description.

Construct Value Added Asphalt Pavement consisting of Asphalt Concrete Structural Course and Asphalt Concrete Friction Course, subject to a three year warranty period after final acceptance of the Contract in accordance with 5-11.

For purposes of this Specification, the Responsible Party, as designated herein, is responsible for performance of the Value Added Asphalt Pavement including continued responsibility for performing all remedial work associated with pavement distresses exceeding threshold values determined in accordance with this Section, and as to which notice was provided to the Responsible Party.

The work specified in this Section will not be paid for directly, but will be considered as incidental to other Contract items.

ARTICLE 338-5 (Pages 306 and 312) is deleted and the following substituted:

338-5 Pavement Evaluation and Remedial Work.

338-5.1 General: The Department's Pavement Condition Survey Program, along with observations by the Engineer, will be used as the basis for determining the extent and the magnitude of the pavement distresses occurring on the project. In the event the level of distress exceeds any of the threshold values defined below, remedial work as described in 338-5.5 by the Responsible Party will be required.

The Department will monitor the pavement for distresses and may require remedial action at any time. For evaluation purposes, the project will be subdivided into LOTs of 0.1 mile per lane. When the segment is less than 0.1 mile, the segment will be called a partial LOT. For purposes of threshold values and remedial work, partial lots and lots will be treated as lots. The Department may conduct a Pavement Condition Survey of the value added pavement following the final acceptance of the project, and at intermediate times throughout the warranty

period with findings provided when considered by the Department to be the obligation of the Responsible Party.

The final survey, if determined by the Engineer to be necessary, will be conducted before the end of the warranty period with results provided to the Responsible Party for those conditions exceeding contract threshold values requiring remedial action that the Department believes to be an obligation of the Responsible Party. The Department will be responsible for all costs associated with the surveys.

If the survey findings, intermediate or final, are to be disputed by the Responsible Party, written notification must be provided to the Engineer within 30 calendar days of the date of receipt of the information from the Department.

During the warranty period, the Responsible Party may monitor the project using nondestructive methods and may participate with the Department in the Pavement Condition Surveys upon request. The Responsible Party shall not conduct any coring, milling or other destructive methods without prior approval by the Engineer.

338-5.2 Category 1 Pavement: For purposes of this Specification, "Category 1 Pavement" is defined as mainline roadways, access roads and frontage roads with a design speed of 55 mph and greater.

Threshold values and associated remedial work for Category 1 Value Added Asphalt Pavement are specified in Table 338-1.

TABLE 338-1 Category 1 Pavements		
Type of Distress	Threshold Values	Remedial Work
Rutting [1]	Depth > 0.25 inch	Remove and replace the distressed LOT(s) to the full depth of all layers and to the full lane width [2]
Ride [3]	RN < 3.5	Remove and replace the friction course layer for the full length and the full lane width of the distressed LOT(s)[4]
Settlement/Depression[5]	Depth ≥ 1/2 inch	Propose the method of correction to the Engineer for approval prior to beginning remedial work
Cracking [6]	Cumulative length of cracking > 30 feet for Cracks > 1/8 inch	Remove and replace the distressed LOT(s) to the full depth of all layers, and to the full lane width [7]
Raveling and/or Delamination affecting the Friction Course [8]	Any length	Remove and replace the distressed area(s) to the full distressed depth and the full lane width for the full distressed length plus 50’ on each end
Pot holes and Slippage Area(s) [8]	Observation by Engineer	Remove and replace the distressed area(s) to the full distressed depth and the full lane width for the full distressed length plus 50’ on each end
Bleeding [9]	Loss of surface texture due to excess asphalt, individual length ≥10 feet and ≥1 foot. in width.	Remove and replace the distressed area(s) to the full distressed depth and the full lane width for the full distressed length plus 50’ on each end

TABLE 338-1 Category 1 Pavements
(1) Rutting: Rut depth to be determined by Laser Profiler in accordance with the Flexible Pavement Condition Survey Handbook. For any LOT that cannot be surveyed by Laser Profiler, the rut depth will be determined manually in accordance with the Flexible Pavement Condition Survey Handbook, with the exception that the number of readings per LOT will be one every 20 feet. For a partial LOT, a minimum of three measurements not exceeding 20 feet apart will be made. When the average of the measurements obtained manually exceeds 0.30 inch or if any individual measurement exceeds 0.6 inch, remedial work will be required. (2) Remedial Work for Rutting: The Contractor may propose removal and replacement of less than the full depth of all layers by preparation and submittal of a signed and sealed engineering analysis report, demonstrating the actual extent of the distressed area(s). Remedial work must be performed in accordance with Table 338-1 unless approved otherwise by the Engineer. (3) Ride: Ride Number (RN) to be established by Laser Profiler in accordance with FM 5-549. (4)If the deficient ride is due to underlying asphalt layers; base, subgrade, or embankment which were constructed by the Responsible Party, propose the method of correction to the Engineer for approval prior to beginning the remedial work. (5)Settlement/Depression: Depth of the settlement/depression to be determined by a 6 foot manual straightedge. (6) Cracking: Beginning and ending of 1/8 inch cracking will be determined as the average of three measurements taken at one foot intervals. The longitudinal construction joint at the lane line will not be considered as a crack. (7) Remedial Work for Cracking: The Contractor may propose removal and replacement of less than the full depth of all layers by preparation and submittal of a signed and sealed engineering analysis report, demonstrating the actual extent of the distressed area(s). Remedial work must be performed in accordance with Table 338-1 unless approved otherwise by the Engineer. (8) Raveling, Delamination, Pot holes, Slippage: As defined and determined by the Engineer in accordance with the examples displayed at the following URL: www2.dot.state.fl.us/specificationsestimates/pavement.aspx (9) Bleeding: Bleeding to be defined and determined by the Engineer in accordance with the examples displayed at the following URL: www2.dot.state.fl.us/specificationsestimates/pavement.aspx

338-5.3 Category 2 Pavement: For purposes of this Specification, ”Category 2 Pavement” is defined as mainline roadways, access roads and frontage roads with a design speed less than 55 mph; approach transition and merge areas at toll booths; ramps; acceleration and deceleration lanes (including tapers); turn lanes; parking areas; rest areas; weigh stations; and agricultural inspection stations.

Threshold values and associated remedial work for Category 2 Value Added Asphalt Pavement are specified in Table 338-2.

TABLE 338-2 Category 2 Pavements		
Type of Distress	Threshold Values	Remedial Work
Rutting(1)	Measured by Laser Profiler: See Table 338-1	See Table 338-1
	Manual Measurement: Avg. Depth > 0.4 inch	Remove and replace 1.5 inch(1a) the full lane width for the area plus 50 feet
Cracking	Cumulative length of cracking > 300 feet for Cracks > 1/8 inch	See Table 338-1
Surface Deterioration (2)	See Table 338-1	See Table 338-1

TABLE 338-2 Category 2 Pavements		
Type of Distress	Threshold Values	Remedial Work
Settlement/Depression(3)	Depth ≥ 1/2 inch	See Table 338-1

(1) Rutting: Rut depth to be determined by Laser Profiler in accordance with the Flexible Pavement Condition Survey Handbook. For any LOT that cannot be surveyed by the Laser Profiler, the rut depth will be determined manually in accordance with the Flexible Pavement Condition Survey Handbook, with the exception that the number of readings per LOT will be one every 20 feet. For partial LOT, minimum of three measurements not exceeding 20 feet apart will be checked. When the average of the measurements obtained manually exceeds 0.40 inch, or if any individual measurement exceeds 0.6 inch, remedial work will be required..
(1a) If pavement has an open graded friction course, remove and replace 2.0 inches.
(2) Surface Deterioration: As used in Table 338-2, Surface Deterioration includes Raveling and/or Delamination affecting the Friction Course; Pot holes; Slippage Area(s); and Bleeding; all as defined and footnoted in Table 338-1.
(3)Settlement/Depression: Depth of the settlement/depression to be determined by a 6 foot manual straightedge.

338-5.4 Category 3 Pavement: For purposes of this Specification, "Category 3 Pavement" is defined as bicycle paths, walking paths, median crossovers, shoulders and other areas as determined by the Engineer.

Threshold values and associated remedial work for Category 3 Value Added Asphalt Pavement are specified in Table 338-3.

TABLE 338-3 Category 3 Pavements		
Type of Distress	Threshold Values	Remedial Work
Rutting	N/A	N/A
Cracking	Cumulative length of cracking > 500 feet for Cracks > 1/8 inch	See Table 338-1
Surface Deterioration (1)	See Table 338-1	See Table 338-1
Settlement/Depression(2)	Depth ≥ 1/2 inch	See Table 338-1

(1) Surface Deterioration: As used in Table 338-3, Surface Deterioration includes Raveling and/or Delamination affecting the Friction Course; Pot holes; Slippage Area(s); and Bleeding; all as defined and footnoted in Table 338-1.
(2) Settlement/Depression: Depth of the settlement/depression to be determined by a 6 foot manual straightedge.

338-5.5 Remedial Work: The Responsible Party will perform all necessary remedial work described within this Section at no cost to the Department. If the pavement distresses exceed threshold values and it is determined that the cause of the distress is due to the embankment, subgrade, base or other activities performed by the Contractor, the Responsible Party will be responsible for performing all remedial work associated with the pavement distress. Should an impasse develop in any regard as to the need for remedial work or the extent required, the Statewide Disputes Review Board will render a final decision by majority vote.

Remedial work will not be required if any one of the following conditions is found to apply:

a. Determination that the pavement thickness design as provided by the Department is deficient. The Department will make available a copy of the original pavement thickness design package and design traffic report to the Responsible Party upon request. The Responsible Party is responsible for performing all remedial work associated with the pavement distress if the pavement design is provided by the Contractor.

b. Determination that the Accumulated ESALs (Number of 18 Kip Equivalent Single Axle Loads in the design lane) has increased by 25% or more than the Accumulated ESALs used by the Department for design purposes for the warranty period for the pavement design life. In calculating ESALs, the Average Annual Daily Traffic (AADT) will be obtained from the Department's traffic count data and the T24 (Percent Heavy Trucks during a 24 hour period) will be obtained from the Department's traffic classification survey data.

c. Determination that the deficiency was due to the failure of the existing underlying layers that were not part of the Contract work.

d. Determination that the deficiency was the responsibility of a third party or its actions, unless the third party was performing work included in the Contract.

If a measured distress value indicates remedial action is required per Table 338-1, Table 338-2 and/or Table 338-3, the Responsible Party must begin remedial work within 45 calendar days of notification by the Department or a ruling of the Statewide Disputes Review Board. The Disputes Review Board will determine the allowable duration for the completion of the remedial work, but not to exceed 6 months.

In the event remedial action is necessary and forensic information is required to determine the source of the distress, the Department may core and/or trench the pavement. The Responsible Party will not be responsible for damages to the pavement as a result of any forensic activities conducted by the Department.

As applicable to distress criteria for rutting, ride and cracking for Category 1 and Category 2 pavements, when two LOTs requiring remedial action are not separated by three or more LOTs not requiring remedial action, the remedial work shall be required for the total length of all such contiguous LOTs, including the intermediate LOTs not requiring remedial action.

Additionally, for Category 1 and Category 2 pavements, where such areas of remedial action are required due to raveling, slippage or bleeding are separated by less than 1,000 feet, the remedial work will be required for the entire area contiguous to the distressed areas, including intermediate areas otherwise requiring no remedial action.

The Responsible Party has the first option to perform all remedial work that is determined by the Department to be their responsibility. If, in the opinion of the Engineer, the problem poses an immediate danger to the traveling public and the Responsible Party cannot provide temporary mitigation for the defect within 4 hours of written notification and restore the pavement to its original design condition within 72 hours of written notification, the Engineer has the authority to have the remedial work performed by other forces. Temporary mitigation includes the use of traffic control systems such as barricades, drums, or other approved devices to secure the area including lane closures if necessary, and constructing temporary repairs making it safe for the roadway user until the defect can be restored to its original design condition. The Responsible Party is responsible for all incurred costs of the work performed by other forces should the problem (remedial work) be determined to be the responsibility of the

Responsible Party. Remedial work performed by other forces does not alter any of the requirements, responsibilities or obligations of the Responsible Party.

The Responsible Party must complete all remedial work to the satisfaction of the Engineer. Any disputes regarding the adequacy of the remedial work will be resolved by the Statewide Disputes Review Board. Approval of remedial work does not relieve the Responsible Party from continuing responsibility under the provisions of this Specification.

Notify the Engineer in writing prior to beginning any remedial work. Meet the requirements of the Department's Standard Specifications for Road and Bridge Construction and implemented modifications thereto when performing any remedial work. Perform all signing and traffic control in accordance with the current edition of the Department's Design Standards for Design, Construction, Maintenance and Utility Operations on the State Highway System. Provide Maintenance of Traffic during remedial work at no additional cost to the Department. Lane closure restrictions listed in the original Contract will apply to remedial work. Written request(s) to obtain permission for lane closure(s) for either forensic investigation or remedial work must be made to the Engineer 48 hours in advance of any lane closures. Do not perform any lane closures until written permission is given by the Engineer.

If remedial work necessitates a corrective action to overlying asphalt layers, pavement markings, signal loops, adjacent lane(s), roadway shoulders, or other affected Contract work, perform these corrective actions using similar products at no additional cost to the Department.

339 MISCELLANEOUS ASPHALT PAVEMENT – METHOD OF MEASUREMENT. (REV 5-19-11) (FA 8-4-11) (1-12)

ARTICLE 339-7 (Page 313) is deleted and the following substituted:

339-7 Method of Measurement.

The quantity to be paid for will be the weight, in tons, determined by an electronic weighing system as described in 320-3.2. The pay quantity will be based on the average spread rate of the area shown on the plans or authorized by the Engineer or dimensions for the project, limited to a maximum of 105% of the plan thickness quantity. For calculation, a weight of 100 lbs/yd^2 per inch thickness of asphalt will be used.

Prepare a Certification of Quantities, using the Department's current approved form, for the certified miscellaneous asphalt pavement pay item. Submit this certification to the Engineer no later than Twelve O'clock noon Monday after the estimate cut-off or as directed by the Engineer, based on the quantity of asphalt produced and accepted on the Contract. The certification must include the Contract Number, FPID Number, Certification Number, Certification Date, period represented by Certification and the tons produced for each asphalt pay item.

341 ASPHALT RUBBER MEMBRANE INTERLAYER.
(REV 7-29-09) (FA 8-11-09) (1-10)

ARTICLE 341-4 (Pages 314 and 315) is deleted and the following substituted:

341-4 Contractor's Quality Control.

Provide the necessary quality control of the asphalt rubber binder, and interlayer construction in accordance with the Contract requirements. Provide in the Quality Control Plan procedures for monitoring and controlling of rate of application. If the rate of application varies by more than 5% from the rate set by the Engineer in accordance with 341-6, immediately make all corrections necessary to bring the spread rate into the acceptable range. The Engineer may take additional measurements at any time. The Engineer will randomly check the Contractor's measurement to verify the spread rate.

ARTICLE 341-5 (Page 315) is deleted and the following substituted:

341-5 Preparation of Asphalt Rubber Binder.

Meet the requirements of Section 336 Asphalt Rubber Binder, particularly noting testing and action requirements to be met at the project site/asphalt plant. Combine the materials as rapidly as possible for such a time and at such a temperature that the consistency of the binder approaches that of a semi-fluid material. The Engineer will be the sole judge of when the material has reached application consistency and will determine if an extender oil or diluent is needed for that purpose. After reaching the proper consistency, proceed with application immediately. Never hold the mixture at temperatures over 350ºF for more than six hours after reaching that temperature.

346 PORTLAND CEMENT CONCRETE.
(REV 3-28-11) (FA 5-18-11) (1-12)

SECTION 346 (Pages 317 - 340) is deleted and the following substituted:

SECTION 346
PORTLAND CEMENT CONCRETE

346-1 Description.

Use concrete composed of a mixture of portland cement, aggregate, water, and, where specified, admixtures, pozzolan and ground granulated blast furnace slag. 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 list of Producers with Accepted Quality Control Programs. Producers seeking inclusion on the list shall meet the requirements of 105-3. If the concrete production facility's Quality Control Plan is suspended, the Contractor is solely responsible to obtain the services of another concrete production facility with an accepted Quality Control Plan or await the re-acceptance of the affected concrete production facility's Quality Control Plan prior to the placement of any further concrete on the project. There will be no changes in the contract time or completion dates. Bear all delay costs and other costs

associated with the concrete production facility's Quality Control Plan acceptance or re-acceptance.

346-2 Materials.

346-2.1 General: Meet the following requirements:

Coarse Aggregate..... Section 901
Fine Aggregate*..... Section 902
Portland Cement..... Section 921
Water..... Section 923
Admixtures**..... Section 924
Pozzolans and Slag ..... Section 929

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

**Use products listed on the Department's Qualified Products List (QPL).

Do not use materials containing hard lumps, crusts or frozen matter, or that is contaminated with dissimilar material.

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

Use only the types of cements designated for each environmental condition in structural concrete. A mix design for a more aggressive environment may be substituted for a lower aggressive environmental condition.

TABLE 1			
BRIDGE SUPERSTRUCTURES			
Component	Slightly Aggressive Environment	Moderately Aggressive Environment	Extremely Aggressive Environment
Precast Superstructure and Prestressed Elements	Type I or Type III	Type I, Type II, Type III, Type IP, or Type IS	Type II (MH)
Cast In Place	Type I	Type I, Type II, Type IP, or Type IS	Type II (MH)
BRIDGE SUBSTRUCTURE, DRAINAGE STRUCTURES AND OTHER STRUCTURES			
All Elements	Type I or Type III	Type I, Type II, Type IP, or Type IS	Type II (MH)

346-2.3 Pozzolans and Slag: Use fly ash or slag materials as a cement replacement, on an equal weight replacement basis, in all classes of concrete with the following limitations:

(1) Mass Concrete:

a. Fly Ash - Ensure that the quantity of cement replaced with fly ash is 18% to 50% by weight, except where the core temperature is expected to rise above 165°F. In that case, ensure that the percentage of fly ash is 35% to 50% by weight.

b. Slag - Ensure that the quantity of cement replaced with slag is 50% to 70% by weight. Ensure that slag is 50% to 55% of total cementitious content by weight when used in combination with silica fume, ultrafine fly ash and/or metakaolin.

c. Fly Ash and Slag - Ensure that there is at least 20% fly ash by weight and 40% portland cement by weight for mixes containing portland cement, fly ash and slag.

(2) Drilled Shaft:

a. Fly Ash - Ensure that the quantity of cement replaced with fly ash is 33% to 37% by weight.

b. Slag - Ensure that the quantity of cement replaced with slag is 58% to 62% by weight.

(3) Precast Concrete – Ensure that the precast concrete has a maximum of 25% fly ash or a maximum of 70% slag. In extremely aggressive environments, ensure that the precast concrete has a minimum of 18% fly ash or a minimum of 50% slag.

(4) For all other concrete uses not covered in (1), (2) and (3) above,

a. Fly Ash - Ensure that the quantity of cement replaced with fly ash is 18% to 22% by weight.

b. Slag - Ensure that the quantity of cement replaced with slag is 25% to 70% for slightly and moderately aggressive environments and 50% to 70% by weight when used in extremely aggressive environments. Ensure that slag is 50% to 55% of total cementitious content by weight when used in combination with silica fume, ultra fine fly ash and/or metakaolin.

c. Fly Ash and Slag - Ensure that there is at least 20% fly ash by weight and 40% portland cement by weight for mixes containing portland cement, fly ash and slag.

d. Class I and Class II concrete, excluding Class II (Bridge Deck), are not required to meet the minimum fly ash or slag requirements in slightly and moderately aggressive environments. The fly ash content shall be less than or equal to 25% by weight of cement and the slag content shall be less than or equal to 70% by weight of cement.

(5) Blended Cements:

a. Type IS - Ensure that the quantity of slag in Type IS is less than or equal to 70% by weight.

b. Type IP - Ensure that the quantity of the pozzolan in Type IP is less than or equal to 40% by weight.

(6) Silica Fume, Metakaolin and Ultrafine Fly Ash - When silica fume, metakaolin or ultrafine fly ash is used, it must be used in combination with fly ash or slag.

a. Silica Fume - Ensure that the quantity of cementitious material replaced with silica fume is 3% to 9% by weight.

b. Metakaolin - Ensure that the quantity of cementitious material replaced with metakaolin is 8% to 12% by weight.

c. Ultrafine Fly Ash - Ensure that the quantity of cementitious material replaced with ultrafine fly ash is 8% to 12% by weight.

d. Cure in accordance with the manufacturer's recommendation and as approved by the Engineer.

346-2.4 Coarse Aggregate Gradation: Produce all concrete using Size No. 57, 67 or 78 coarse aggregate. With the Engineer's approval, Size No. 8 or Size No. 89 may be used either alone or blended with Size No. 57, 67 or 78 coarse aggregate. The Engineer will consider requests for approval of other gradations individually. Submit sufficient statistical data to establish production quality and uniformity of the subject aggregates, and establish the quality and uniformity of the resultant concrete. Furnish aggregate gradations sized larger than nominal maximum size of 1.5 inch as two components.

For Class I and Class II, excluding Class II (Bridge Deck), the coarse and fine aggregate gradation requirements set forth in Sections 901 and 902 are not applicable and the

aggregates may be blended; however, the aggregate sources must be approved by the Department. Do not blend the aggregate if the size is smaller than Size No. 78.

346-2.5 Admixtures: Use admixtures in accordance with the requirements of this subarticle. Chemical admixtures not covered in this subarticle may be approved by the Department. Submit statistical evidence supporting successful laboratory and field trial mixes which demonstrate improved concrete quality or handling characteristics.

Use admixtures in accordance with the manufacturer's recommended dosage rate. Do not use admixtures or additives containing calcium chloride (either in the raw materials or introduced during the manufacturing process) in reinforced concrete.

346-2.5.1 Water-Reducer/Water-Reducer Retardant Admixtures: When a water-reducing admixture is used, meet the requirements of a Type A. When a water-reducing and retarding admixture is used, meet the requirements of a Type D.

346-2.5.2 Air Entrainment Admixtures: Use an air entraining admixture in all concrete mixes except counterweight concrete. For precast concrete products, the use of air entraining admixture is optional for Class I and Class II concrete.

346-2.5.3 High Range Water-Reducing Admixtures:

346-2.5.3.1 General: When a high range water-reducing admixture is used, meet the requirements of a Type F or Type I. When a high range water-reducing and retarding admixture is used, meet the requirements of a Type G or Type II. Do not use Type I, II, F or G admixtures in drilled shaft concrete. When silica fume or metakaolin is incorporated into a concrete mix design, the use of a high range water-reducing admixture Type I, II, F or G is mandatory.

346-2.5.3.2 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 C 1610 except allow for minimal vibration for consolidating the concrete. The maximum allowable difference between the static segregation is less than or equal to 15 percent. Add the flowing concrete admixtures at the concrete production facility.

346-2.5.4 Corrosion Inhibitor Admixture: Use only with concrete containing Type II cement, or Type II (MH) cement, and a water-reducing retardant admixture, Type D, or High Range Water-Reducer retarder admixture, Type G, to normalize the setting time of concrete. Ensure that all admixtures are compatible with the corrosion inhibitor admixture.

346-2.5.5 Accelerating Admixture for Precast Concrete: The use of non-chloride admixtures Type C or Type E is allowed in the manufacturing of precast concrete products that are used in slightly aggressive environments.

346-3 Classification, Strength, Slump and Air Content.

346-3.1 General: The separate classifications of concrete covered by this Section are designated as Class I, Class II, Class III, Class IV, Class V and Class VI. Strength, slump, and air content of each class are specified in Table 2.

Substitution of a higher class concrete in lieu of a lower class concrete may be allowed when the substituted concrete mixes are included as part of the Contractor's Quality Control Plan, or for precast concrete, the Precast Concrete Producer's Quality Control Plan. The substituted higher class concrete must meet or exceed the requirements of the lower class concrete and both classes must contain the same types of mix ingredients. When the compressive strength acceptance data is less than the minimum compressive strength of the higher design

mix, notify the Engineer. Acceptance is based on the requirements in Table 2 for the lower class concrete.

TABLE 2			
Class of Concrete	Specified Minimum Strength (28 day) (psi)	Target Slump Value (inches) (c)	Air Content Range (%)
STRUCTURAL CONCRETE			
I (a)	3,000	3 (b)	1.0 to 6.0
I (Pavement)	3,000	2	1.0 to 6.0
II (a)	3,400	3 (b)	1.0 to 6.0
II (Bridge Deck)	4,500	3 (b)	1.0 to 6.0
III (e)	5,000	3 (b)	1.0 to 6.0
III (Seal)	3,000	8	1.0 to 6.0
IV	5,500	3 (b) (d)	1.0 to 6.0
IV (Drilled Shaft)	4,000	8.5	0.0 to 6.0
V (Special)	6,000	3 (b) (d)	1.0 to 5.0
V	6,500	3 (b) (d)	1.0 to 5.0
VI	8,500	3 (b) (d)	1.0 to 5.0

(a) 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 (b). The Contractor is permitted to use concrete meeting the requirements of ASTM C 478 4,000 psi in lieu of Class I or Class II concrete for precast endwalls, inlets, manholes and junction boxes.

(b) The Engineer may allow a higher target slump when a Type F, G, I or II admixture is used, except when flowing concrete is used. The maximum target slump shall be 7 inches.

(c) For a reduction in the target slump for slip-form operations, submit a revision to the mix design to the Engineer.

(d) When the use of silica fume, ultrafine fly ash, or metakaolin is required as a pozzolan in Class IV, Class V, Class V (Special) or Class VI concrete, ensure that the concrete exceeds a resistivity of 29 KOhm-cm at 28 days, when tested in accordance with FM 5-578. Submit three 4 x 8 inch cylindrical test specimens to the Engineer for resistivity testing before mix design approval. Take the resistivity test specimens from the concrete of the laboratory trial batch or from the field trial batch of at least 3 yd^3. Verify the mix proportioning of the design mix and take representative samples of trial batch concrete for the required plastic and hardened property tests. Cure the field trial batch specimens similar to the standard laboratory curing methods. Submit the resistivity test specimens at least 7 days prior to the scheduled 28 day test. The average resistivity of the three cylinders, eight readings per cylinder, is an indicator of the permeability of the concrete mix.

(e) When precast three-sided culverts, box culverts, endwalls, inlets, manholes or junction boxes require a Class III concrete, the minimum cementitious materials is

470 lb/yd^3. Do not apply the air content range and the maximum target slump shall be 6 inches, except as allowed in (b).

346-3.2 Drilled Shaft Concrete: When drilled shaft concrete is placed in any wet shaft, provide concrete in accordance with the following specified slump loss requirements.

Test each load of concrete for slump to ensure the concrete is within the limits of 346-6.4. Ensure that the slump loss is gradual as evidenced by slump loss tests described below. The concrete elapsed time is the sum of the mixing and transit time, the placement time, the time required for removal of any temporary casing that causes or could cause the concrete to flow into the space previously occupied by the temporary casing and bolt/embedment installation.

346-3.2.1 Slump Loss Test Requirements: Provide slump loss tests before drilled shaft concrete operations begin, demonstrating that the drilled shaft concrete maintains a slump of at least 5 inches throughout the concrete elapsed time. Inform the Engineer at least 48 hours before performing such tests. Perform slump loss testing of the drilled shaft mix using personnel meeting the requirements of Section 105. The Engineer may require a new slump loss test in the event that the ambient temperature changes more than plus or minus 15°F, the environmental conditions change or the volume increases.

Perform the following procedures for slump loss tests:

(1) Begin all elapsed times when water is initially introduced into the mixer. Ensure that the initial slump does not exceed 10 inches.

(2) The slump loss test is performed at a temperature consistent with the highest ambient and concrete temperatures expected during actual concrete placement. This test may be used for lower ambient temperature placements without any admixture adjustments.

(3) Ensure that the mix is at least 3 cubic yards and is mixed in a truck mixer with a valid mixer identification card.

(4) After initial mixing, determine the slump, ambient and concrete temperatures and air content. Ensure that the concrete properties are within the required limits as specified in 346-3.1, Table 2.

(5) Verify the water to cementitious materials ratio and other delivery ticket data meet design mix requirements.

(6) Mix the concrete intermittently for 30 seconds every 5 minutes, at a speed greater than or equal to the midrange of the manufacturer's recommended mixing speed. When concrete is not being mixed, agitate the mixer at the midrange of the manufacturer's recommended agitating speed.

(7) Determine slump, ambient and concrete temperatures at 30 minute intervals until the slump is 5 inches or less. Remix the mix for one minute at the mixing speed of the mixer before these tests are run.

(8) Ensure that the concrete maintains a slump of at least 5 inches for the anticipated elapsed time.

(9) Cast cylinders to determine when 500 psi compressive strength is obtained for the purpose of transporting field samples to the laboratory.

(10) Obtain the Engineer’s approval of slump loss test results in terms of elapsed time before concrete placements.

346-3.3 Mass Concrete: When mass concrete is designated in the Contract Documents, provide an analysis of the anticipated thermal developments in the mass concrete elements for all

expected project temperature ranges using the selected mix design, casting procedures, and materials.

Use a Specialty Engineer competent in the design and temperature control of concrete in mass elements. The Specialty Engineer shall follow the procedure outlined in Section 207 of the ACI Manual of Concrete Practice to formulate, implement, administer and monitor a temperature control plan, making adjustments as necessary to ensure compliance with the Contract Documents. The Specialty Engineer shall select the concrete design mix proportions that will generate the lowest maximum temperatures possible to ensure that a 35°F differential temperature between the concrete core and the exterior surface is not exceeded. The mass concrete maximum allowable temperature is 180°F. If either the differential temperature or the maximum allowable temperature is exceeded, the Specialty Engineer shall be available for immediate consultation.

Describe the measures and procedures intended for use to maintain a temperature differential of 35°F or less between the interior core center and exterior surface(s) of the designated mass concrete elements during curing. Submit both the mass concrete mix design and the proposed mass concrete plan to monitor and control the temperature differential to the Engineer for acceptance. Provide temperature monitoring devices to record temperature development between the interior core center and exterior surface(s) of the elements in accordance with the accepted mass concrete plan.

The Specialty Engineer, or a qualified technician employed by the Specialty Engineer, must personally inspect and approve the installation of monitoring devices and verify that the process for recording temperature readings is effective for the first placement of each size and type mass component. Submit to the Engineer for approval the qualification of all technicians employed to inspect or monitor mass concrete placements. For placements other than the first, designate an employee(s) approved by the Specialty Engineer, as qualified to inspect monitoring device installation, to record temperature readings, to be in contact at all times with the Specialty Engineer if adjustments must be made as a result of the temperature differential or the maximum allowable temperature being exceeded, and to immediately implement adjustments to temperature control measures as directed by the Specialty Engineer. Read the monitoring devices and record the readings at intervals no greater than 6 hours. The readings will begin when the mass concrete placement is complete and continue until the maximum temperature differential and the temperature is reached and a decreasing temperature differential is confirmed as defined in the temperature control plan. Do not remove the temperature control mechanisms until the core temperature is within 50°F of the ambient temperature. Furnish a copy of all temperature readings to the Engineer as they are recorded, the determined temperature differentials and a final report within three days of completion of monitoring of each element.

If the 35°F differential or the 180°F maximum allowable temperature has been exceeded, take immediate action as directed by the Specialty Engineer to retard further growth of the temperature differential. Describe methods of preventing thermal shock in the temperature control plan. Use a Specialty Engineer to revise the previously accepted plan to ensure compliance on future placements. Do not place any mass concrete until the Engineer has accepted the mass concrete plan(s). When mass concrete temperature differentials or maximum allowable temperature has been exceeded, provide all analyses and test results deemed necessary by the Engineer for determining the structural integrity and durability of the mass concrete element, to the satisfaction of the Engineer. The Department will make no compensation, either monetary or time, for the analyses or tests or any impacts upon the project.

346-3.4 Flowing Concrete for Precast/Prestressed Concrete: Produce flowing concrete mix with target slump of 9 inches.

Subsequent to the laboratory trial batch, perform a field demonstration of the proposed mix design by production and placement of at least three batches, 3 yd^3 minimum size each, of concrete containing flowing concrete HRWR admixture. Take representative samples from each batch and perform slump, air content, density (unit weight), and temperature tests on these samples. Cast specimens from each sample for compressive strength tests. Record the ambient air temperature during the test. Ensure that the concrete properties are within the required specification limits. The plants that are producing concrete with batch sizes of less than 3 yd^3 are required to produce and place at least a total amount of 9 yd^3 and perform the aforementioned tests on at least three randomly selected batches.

Determine the workability of the demonstration concrete batches by performing the slump tests on the samples taken at 15 minute intervals from each batch. Continue sampling and testing until the slump measures 6 inches or less. From the plot of slump versus time, determine the time for each batch when the slump is at 7.5 inches. The shortest time period determined from three consecutive batches, at 7.5 inches slump, is considered the cutoff time of the proposed concrete mix. For production concrete, ensure that the time between the batching and depositing of each load of concrete is less than the cutoff time of the mix and also does not exceed the allowable time limit specified in this Section.

Ensure that the demonstration concrete is mixed, delivered, placed, consolidated and cured in accordance with the proposed method and sequence. Produce the flowing concrete batches at slumps between 7.5 inches to 10.5 inches.

Perform inspection of the demonstration concrete during batching, delivery, placement and post placement. During placement, ensure that the concrete batches meet all plastic property requirements of the specifications and maintain their cohesive nature without excessive bleeding, segregation, or abnormal retardation.

Dispose of concrete produced for demonstration purposes at no expense to the Department. Subject to the Engineer's approval, the Contractor may incorporate this concrete into non-reinforced concrete items and may be included for payment, provided it meets Contract requirements for slump, entrained air, and strength.

After removal of the forms, perform the post-placement inspection of the in-place concrete. Observe for any signs of honeycombs, cracks, aggregate segregation or any other surface defects and ensure that the hardened concrete is free from these deficiencies. The Engineer may require saw cutting of the mock-up products to verify the uniform distribution of the aggregates within the saw cut surfaces and around the reinforcing steel and prestressing strands. The Engineer will require saw cutting of the demonstration mock-up products for plants that are demonstrating the use of the flowing concrete for the first time. Obtain core samples from different locations of mock-up products to inspect the aggregate distribution in each sample and compare it with the aggregate distribution of other core samples. Perform surface resistivity tests on the core samples or test cylinders at 28 days.

Submit the results of the laboratory trial batch tests and field demonstration of verified test data and inspection reports to the Engineer, along with certification stating that the results of the laboratory trial batch tests and field demonstration tests indicate that the proposed concrete mix design meets the requirements of the specifications. For the proposed mix design, state the anticipated maximum time limit between the batching and when the concrete of each batch is deposited during the production.

Upon the review and verification of the laboratory trial batch, field demonstration test data, inspection reports and contractor's certification statement, the Department will approve the proposed mix design.

The Department may approve proposed flowing concrete mixes, centrally mixed at the placement site, without the production of demonstration batches, provided that the proposed mix meets the following two criteria:

(1) A previously approved flowing concrete mix of the same class has demonstrated satisfactory performance under the proposed job placing conditions with a minimum of fifteen consecutive Department acceptance tests, which met all plastic and hardened concrete test requirements.

(2) The cementitious materials and chemical admixtures, including the flowing concrete HRWR admixture, used in the proposed mix are the same materials from the same source used in the previously approved mix, (1) above.

Do not produce or place concrete until the design mixes have been approved.

346-4 Composition of Concrete.

346-4.1 Master Proportion Table: Proportion the materials used to produce the various classes of concrete in accordance with Table 3:

TABLE 3

Class of Concrete	Minimum Total Cementitious Materials Content lb/yd^3	*Maximum Water to Cementitious Materials Ratio lb/lb
I	470	0.53
I (Pavement)	470	0.50
II	470**	0.53
II (Bridge Deck)	611	0.44
III	611**	0.44
III (Seal)	611	0.53
IV	658**	0.41***
IV (Drilled Shaft)	658**	0.41
V (Special)	752	0.37***
V	752	0.37***
VI	752	0.37***

*The calculation of the water to cementitious materials ratio (w/cm) is based on the total cementitious material including cement and any supplemental cementitious materials that are used in the mix.
**The maximum total cementitious materials for mass concrete is 752 lb/yd^3. In cases where a higher class of concrete is substituted for a lower class of concrete, the maximum total cementitious materials for mass concrete is limited to 752 lb/yd^3.
***When the use of silica fume or metakaolin is required, the maximum water to cementitious material ratio will be 0.35. When the use of ultrafine fly ash is required, the maximum water to cementitious material ratio will be 0.30.

346-4.2 Chloride Content Limits for Concrete Construction:

346-4.2.1 General: Use the following maximum chloride content limits for the concrete application and/or exposure environment shown:

TABLE 4		
Application/Exposure Environment		Maximum Allowable Chloride Content, lb/yd^3
Non Reinforced Concrete		No Test Needed
Reinforced Concrete	Slightly Aggressive Environment	0.70
	Moderately or Extremely Aggressive Environment	0.40
Prestressed Concrete		0.40

346-4.2.2 Control Level for Corrective Action: If chloride test results exceed the limits of Table 4, suspend concrete placement immediately for every mix design represented by the failing test results, until corrective measures are made. Perform an engineering analysis to demonstrate that the material meets the intended service life of the structure on all concrete represented by the failing chloride test results. Supply this information within 30 business days of the failing test results from a Professional Engineer, registered in the State of Florida and knowledgeable in the areas of corrosion and corrosion control.

346-5 Sampling and Testing Methods.

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

TABLE 5	
Description	Method
Slump of Hydraulic Cement Concrete	ASTM C 143
Air Content of Freshly Mixed Concrete by the Pressure Method*	ASTM C 231
Air Content of Freshly Mixed Concrete by the Volumetric Method*	ASTM C 173
Making and Curing Test Specimens in the Field	ASTM C 31
Compressive Strength of Cylindrical Concrete Specimens**	ASTM C 39
Obtaining and Testing Drilled Core and Sawed Beams of Concrete	ASTM C 42
Early Sampling of Fresh 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 C 138
Temperature of Freshly Mixed Portland Cement Concrete	ASTM C 1064
Sampling Freshly Mixed Concrete	ASTM C 172
Static Segregation of Self Consolidating Concrete using Column Techniques	ASTM C 1610
Slump Flow of Self Consolidating Concrete	ASTM C 1611
Passing Ability of Self Consolidating Concrete by J-Ring	ASTM C 1621
Concrete Resistivity as an Electrical Indicator of its Permeability	FM 5-578

TABLE 5	
Description	Method
*Use the same type of meter for QC tests as the Department uses for Verification 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. **Use 4 x 8 or 6 x 12 inch cylinders for determination of the compressive strength.	

346-6 Control of Quality.

346-6.1 General: Develop a Quality Control Plan (QCP) as specified in Section 105. Meet the requirements of the approved QCP and Contract Documents. Ensure the QCP includes the necessary requirements to control the quality of the concrete.

Perform QC activities to ensure materials, methods, techniques, personnel, procedures and processes utilized during production meet the specified requirements. For precast/prestressed operations, ensure that the QC testing is performed by the producer.

Accept the responsibility for QC inspections on all phases of work. Ensure all materials and workmanship incorporated into the project meet the requirements of the Contract Documents.

When concrete plastic properties (slump, air content and temperature) could be significantly affected by handling between the point of delivery and the point of final placement, including the use of pumps, conveyor belts, troughs, chutes, barge transport or other means, include provisions in the QCP to sample the plastic concrete for all testing at the point of final placement.

Ensure the QCP includes any anticipated requirements for adjusting the concrete at the placement site. Include the testing procedures that will be implemented to control the quality of the concrete and ensure that concrete placed is within the tolerance range. Also, include provisions for the addition of water to concrete delivered to the placement site at designated level areas, to ensure the allowable amount of water stated on the concrete delivery ticket or the maximum water to cementitious materials ratio on the approved design mix are not exceeded. Ensure the anticipated ranges of jobsite water additions are described and the proposed methods of measuring water for concrete adjustments are included.

Failure to meet the requirements of this Specification or the QCP will automatically void the concrete portion of the QCP. To obtain QCP re-approval, implement corrective actions as approved by the Engineer. The Engineer may allow the Contractor to continue any ongoing concrete placement but the Engineer will not accept concrete for any new placement until the QCP re-approval is given by the Engineer.

346-6.2 Concrete Design Mix: Provide concrete that has been produced in accordance with a Department approved design mix, in a uniform mass free from balls and lumps. 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 both with and without silica fume, ultrafine fly ash, metakaolin or calcium nitrite in a continuous placement. Produce these concretes using separate design mixes. 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 compatible 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.

346-6.3 Delivery Certification: Ensure that an electronic delivery ticket is furnished with each batch of concrete before unloading at the placement site. The delivery ticket may be proprietary software or in the form of an electronic spreadsheet, but shall be printed. Ensure that the materials and quantities incorporated into the batch of concrete are printed on the delivery ticket. Include the following information on the Delivery Ticket:

(1) Arrival time at jobsite,
(2) Time that concrete mix has been completely placed,
(3) Number of revolutions upon arrival at the jobsite,
(4) Total gallons of water added at the jobsite,
(5) Additional mixing revolutions when water is added,
(6) Total number of revolutions at mixing and agitating speed.

Items 3 through 6 do not apply to non-agitating concrete transporting vehicles.

Ensure the batcher responsible for production of the batch of concrete signs the delivery ticket, certifying the batch of concrete was produced in accordance with the Contract Documents.

Verify that the chloride test results on the delivery ticket meet the requirements of Table 4.

Sign the delivery ticket certifying that the design mix maximum specified water to cementitious materials ratio was not exceeded due to any jobsite adjustments to the batch of concrete, and that the batch of concrete was delivered and placed in accordance with the Contract Documents.

346-6.4 Plastic Property Tolerances: Do not place concrete with a slump more than plus or minus 1.5 inches from the target slump value specified in Table 2.

Reject concrete with slump or air content that does not fall within the specified tolerances and immediately notify the concrete production facility that an adjustment of the concrete mixture is required so that it will fall within specified tolerances. If a load does not fall within the tolerances, test each subsequent load and the first adjusted load. If failing concrete is not rejected or adjustments are not implemented, the Engineer may reject the concrete and terminate further production until the corrections are implemented.

Do not allow concrete to remain in a transporting vehicle to reduce slump. Water may be added only upon arrival of the concrete to the jobsite and not thereafter.

346-7 Mixing and Delivering Concrete.

346-7.1 General Requirements: Operate all concrete mixers at speeds and volumes per the manufacturer's design or recommendation as stipulated on the mixer rating plate.

346-7.2 Transit Mixing: When water is added at the jobsite, mix the concrete 30 additional drum mixing revolutions. When the total number of drum mixing revolutions exceeds 160, do not make additional mix adjustments. Discharge all concrete from truck mixers before total drum revolutions exceed 300. Seek approval from the Engineer prior to using a central mixer and depositing the batch into a truck mixer.

346-7.3 Mixing at the Site: Include provisions in the QCP for the mixing at the site. Use a mixer of sufficient capacity to prevent delays that may be detrimental to the quality of the

work. Ensure that the accuracy of batching equipment is in accordance with requirements of this Section.

346-7.4 Concreting in Cold Weather: Do not mix or place concrete when the air temperature is below 45ºF. Protect the fresh concrete from freezing until the concrete reaches a minimum compressive strength of 1,500 psi unless the concrete is to be heat cured. The requirements of concreting in cold weather are not applicable to precast concrete mixing and placement operations occurring in a temperature controlled environment.

346-7.5 Concreting in Hot Weather: Hot weather concreting is defined as the production, placing and curing of concrete when the concrete temperature at placing exceeds 85ºF but is less than 100ºF.

Unless the specified hot weather concreting measures are in effect, reject concrete exceeding 85ºF at the time of placement. Regardless of special measures taken, reject concrete exceeding 100ºF. Predict the concrete temperatures at placement time and implement hot weather measures to avoid production shutdown.

346-7.6 Transit Time: Ensure compliance with the following maximum allowable time between the initial introduction of water into the mix and depositing the concrete in place:

TABLE 6	
Non-Agitator Trucks	Agitator Trucks
45 minutes	60 minutes
75 minutes*	90 minutes*
*When a water-reducing and retarding admixture (Type D, Type G or Type II) is used.	

346-7.7 Adding Water to Concrete at the Placement Site: Perform an initial slump test before the addition of water at the jobsite. If the slump, as delivered, is outside the tolerance range, reject the load. If the slump is within the tolerance range, that load may be adjusted by adding water provided the addition of water does not exceed the water to cementitious materials ratio as defined by the mix design. After adjusting the slump, perform a slump test to confirm the concrete is within the slump tolerance range. Perform a slump test on the next load to ensure the concrete is within the slump tolerance range. Do not place concrete represented by slump test results outside of the tolerance range. Include water missing from the water storage tanks upon arrival at the project site in the jobsite water added.

346-7.8 Sample Location: Describe concrete placement and sampling methods in the QCP. Obtain samples from the point of final placement.

Where concrete buckets are used to discharge concrete directly to the point of final placement or into the hopper of a tremie pipe, samples will be obtained from the discharge of the bucket. When the concrete is discharged directly from the mixer into the bucket, within 25% of the total allowable transit time before discharge of the bucket, samples may be obtained from the discharge of the mixer.

Where conveyor belts, troughs, pumps, or chutes are used to transport concrete directly to the point of final placement or into the hopper of a tremie pipe, samples will be obtained from the discharge end of the entire conveyor belt, trough, pump, or chute system.

Where concrete is placed in a drilled shaft or other element using a tremie pipe and a concrete pump, samples will be obtained from the discharge of the pump line at the location of the tremie hopper.

Where a concrete pump is used to deposit concrete directly into a drilled shaft which is a wet excavation without the use of a tremie, or other applications as approved by the Engineer, ensure the discharge end of the pump line remains immersed in the concrete at all times after starting concrete placement.

Obtain Department approval for sampling at the discharge of the mixer in lieu of sampling at the point of final placement. Use the following sampling correlation procedure when sampling at the discharge of the mixer:

a. Develop a comparative sampling correlation between the discharge of the mixer and the end of the pump line for slump and air results. Obtain one sample from the discharge of the pump line using the full length of pump line and one sample from the discharge of the mixer for five different loads. Average the five samples from each sample location and compare the two averages to establish the comparative sampling correlation. Ensure the plastic properties of the concrete sampled from the pump line are within the tolerance range.

b. Once the comparative sampling correlation is established, and approved by the Engineer, apply this correlation to the plastic properties tolerances for samples obtained from the discharge of mixer.

c. Obtain all other samples from the discharge of the mixer delivering concrete to the pump. Ensure the plastic properties of the concrete being delivered to the pump compare with the comparative sampling correlation.

d. If the ambient temperature changes by more than 10°F, or the configuration of the pumping system changes, the Engineer may require a new comparative sampling correlation.

346-8 Plastic Concrete Sampling and Testing.

QC tests include air content, temperature, slump, and preparing compressive strength cylinders for testing at later dates. In addition, calculate the water to cementitious materials ratio in accordance with FM 5-501 for compliance to the approved mix design.

Ensure that each truck has a rating plate and a valid mixer identification card issued by the Department. Ensure that the revolution counter on the mixer is working properly, and calibration of the water dispenser has been performed within the last twelve months. Reject any concrete batches that are delivered in trucks that do not have mixer identification cards. Remove the mixer identification card when a truck mixer is discovered to be in noncompliance and the mixer deficiencies cannot be repaired immediately. When the mixer identification card is removed for noncompliance, make note of the deficiency or deficiencies found, and forward the card to the District Materials and Research Engineer who has Producer QC Plan acceptance authority.

Perform plastic concrete tests on the initial delivery of each concrete design mix each day. Ensure QC technicians meeting the requirements of Section 105 are present and performing tests throughout the placement operation. Ensure one technician is present and performing tests throughout the placement operation at each placement site. If a placement site has multiple concrete trucks, identify the number of technicians in the Quality Control Plan. If a placement site has multiple trucks placing concrete, then have at least two technicians present at that site. Ensure that the equipment used for delivery, placement and finishing meets the requirements of this Specification. Do not proceed with the placement operation until QC tests confirm that the delivered concrete complies with the plastic properties specified. When a truck designated for QC testing arrives at the site of discharge, subsequent trucks may not discharge until QC testing

results are known. Reject non-complying loads at the jobsite. Ensure that corrections are made on subsequent loads.

Furnish sufficient concrete of each design mix as required by the Engineer for verification testing. When the Engineer's verification test results do not compare with the QC plastic properties test results, within the limits defined by the Independent Assurance (IA) checklist comparison criteria, located in Materials Manual Chapter 5, disposition of the concrete will be at the option of the Contractor.

On concrete placements consisting of only one load of concrete, perform initial sampling and testing in accordance with this Section. The acceptance sample and plastic properties tests may be taken from the initial portion of the load.

If any of the QC plastic properties tests fail, reject the remainder of that load, terminate the LOT and notify the Engineer. Make cylinders representing that LOT from the same sample of concrete.

Following termination of a LOT, obtain samples from a new load, and perform plastic properties tests until such time as the water to cementitious materials ratio, air content, temperature and slump comply with the Specification requirements. Initiate a new LOT once the testing indicates compliance with Specification requirements.

Suspend production when any five loads in two days of production of the same design mix are outside the specified tolerances. Make the necessary revisions to concrete operations and increase the frequency of QC testing in the QCP to bring the concrete within allowable tolerances. Obtain the Engineer's approval of the revisions before resuming production. After production resumes, obtain the Engineer's approval before returning to the normal frequency of QC testing.

If concrete placement stops for more than 90 minutes, perform initial plastic properties testing on the next batch and continue the LOT. Cylinders cast for that LOT will represent the entire LOT.

When the Department performs Independent Verification, the Contractor may perform the same tests on the concrete at the same time. The Department will compare results based on the Independent Assurance Checklist tolerances.

When the Department's Independent Verification test results do not meet the requirements of this Section, the Engineer may require the Contractor to revise the QCP.

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 verification plastic properties tests and cast a set of verification cylinders. The verification 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.

The Department may perform inspections in lieu of plastic properties tests of the precast plants producing Class I and II concrete.

For each set of QC cylinders verified by the Department, cast one additional cylinder from the same sample, and identify it as the QC "hold" cylinder. The Department will also cast one additional "hold" cylinder from each Verification sample. Provide curing facilities that have the capacity to store all QC, Verification, "hold" and Independent Verification cylinders simultaneously for the initial curing. 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 QC "hold" cylinder to the final curing facility in accordance with ASTM C 31. At this same time, the Department will deliver the Verification samples, including the Verification "hold" cylinder, to their final curing facility.

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

The QC testing laboratory will input the compressive strength test results into the Department's sample tracking database within 24 hours. When the QC testing laboratory cannot input the compressive strength test results into the Department's sample tracking database within 24 hours, the QC testing laboratory will notify the Verification testing laboratory within 24 hours of testing the cylinder and provide the Verification testing laboratory the compressive strength test results. Ensure the compressive strength results are input into the Department's sample tracking database within 72 hours of determining the compressive strength of the cylinders.

The Department will average the QC compressive strength test data, average the Verification compressive strength test data, and compare the averages. In the event that one set of compressive strength data for a set of cylinders falls outside the range of the other set of cylinders, use the lower Range of Average Compressive Strength to determine the comparison criteria. Based on this comparison, the Department will determine if the Comparison Criteria as shown in Table 7 has been met. When the difference between QC and Verification are less than or equal to the Comparison Criteria, the QC data is verified. When the difference between QC and Verification data exceeds the Comparison Criteria, the Engineer will initiate the resolution procedure.

Table 7	
Range of Average Compressive Strength	Comparison Criteria
Less than 3500 psi	420 psi
3,501 – 4,500 psi	590 psi
4,501 – 6,500 psi	910 psi
6,501 – 8,500 psi	1,275 psi
Greater than 8,500 psi	1,360 psi

346-9.2 Sampling Frequency:

As a minimum, sample and test concrete of each design mix for water to cementitious materials ratio, air content, temperature, slump and compressive strength once per LOT as defined by Table 8. When a mix design is used for a different application, the LOT is defined by the application. When more than one concrete production facility is used for the same mix design, describe the method of sampling, testing and LOT numbering in the QC Plan. The Engineer will randomly verify one of every four consecutive LOTs of each design mix based on a random number generator. The Department may perform Independent Verification testing to verify compliance with specification requirements. All QC activities, calculations, and inspections will be randomly confirmed by the Department.

TABLE 8

Class Concrete	Maximum LOT Size
I	one day's production
I (Pavement)	250 lane ft, or one day's production, whichever is less
II, II (Bridge Deck), III, IV, V (Special), V, VI	50 yd^3, or one day's production, whichever is less
IV (Drilled Shaft)	50 yd^3, or two hours between placements, whichever is less
III (Seal)	Each Seal placement

346-9.2.1 Reduced Frequency for Acceptance Tests: When ten consecutive strength test results from the same mix design for a Class IV or higher class of concrete are produced at the same concrete production facility, on a given Contract have all been verified and have attained an average strength greater than two standard deviations above the specified minimum, then the LOT may represent a maximum production quantity of 100 yd^3. When five consecutive strength test results from the same mix design for a mix design lower than a Class IV is produced at the same concrete production facility on a given Contract have all been verified and have attained an average strength greater than two standard deviations above the specified minimum, the LOT may represent a maximum production quantity of 100 yd^3.

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 data must also represent the same prime/subcontractor. The tests from the previous Department project must be within the last 60 calendar days 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. Submit the test data to the Engineer and obtain Department approval before beginning reduced frequency LOT's.

If at any time a strength test is not verified and/or the average strength of the previous ten or five consecutive samples based on the class of concrete described above, from the same mix design and the same production facility is less than the specified minimum plus two standard deviations, the maximum production quantity represented by the LOT will return to 50 yd^3. In order to reinitiate reduced frequency, a new set of strength test results will be required.

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:

Accept or reject concrete on the basis of plastic property results in accordance with 346-6.4.

Ensure that the hardened concrete strength test results are obtained in accordance with 346-9.3. 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, 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, damaged or destroyed, the Contractor will core the structure at no additional expense to the Department to determine the compressive strength.

Acceptance of LOT may be based on verification 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 cylinder that is lost, 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 verification data will require the element to be cored and a penalty 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.

When QC compressive strength test results are not verified, the resolution procedure will be used to accept or reject the concrete. Maintain the "hold" cylinders until the verification of the compressive strength test results.

When QC test results are 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.

346-9.5 Resolution Procedure: The Department may initiate an IA review of sampling and testing methods. 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. Core samples of the hardened concrete may be required.

The Engineer will determine through the resolution procedure whether the QC strength test results or the verification strength test results can be relied upon. When the Engineer cannot determine that either the QC or verification strength test results are in error, the concrete represented by the four consecutive LOTs will be evaluated based on the QC data. The Engineer will inform the QC and the Verification lab within four working days of the acceptance compressive strength test to transport their "hold" cylinders to the resolution lab. The QC and Verification laboratories will transport their own hold cylinder to the resolution testing laboratory within 72 hours after the Engineer notifies the Contractor that a resolution is required. In addition, the Engineer will ensure that the QC and verification "hold" cylinders are tested within seven days of the acceptance strength tests.

The resolution investigation will determine the strength test results for each of the four or less LOTs. When the QC strength test results are deemed to be the most accurate, the QC strength test results will represent the four or less consecutive LOTs and the Department will pay for the resolution testing and investigation. When the verification strength test results are deemed to be the most accurate, the Department will assess a 5 percent reduction of payment for the quantity represented by the Resolution Investigation.

The results of the resolution procedure will be forwarded to the Contractor within five days after completion of the investigation. If the Department finds deficiencies based on the Contractor's QCP, the Engineer may suspend that part of the QCP. When the QC plan is suspended, submit corrective actions for approval to the Engineer. The Engineer may take up to five working days to review corrective actions to the QCP. The Engineer will not allow changes to contract time or completion dates. Incur all delay costs and other costs associated with QC plan suspension and re-approval.

346-9.6 Small Quantities of Concrete: When a project has a total plan quantity of less than 50 yd^3, that concrete will be accepted based on the satisfactory compressive strength of the QC cylinders. Provide certification to the Engineer that the concrete was batched and placed in accordance with the Contract Documents. Submit a quality control plan for the concrete

placement operation in accordance with Section 105. In addition, the Engineer may conduct Independent Verification (IV) testing as identified in 346-9. Evaluate the concrete in accordance with 346-10 at the discretion of the Engineer.

346-10 Investigation of Low Strength Concrete for Structural Adequacy.

346-10.1 General: When a concrete acceptance strength test result falls more than 500 psi below the specified minimum strength, from the specified minimum strength, and the Department determines that an investigation is necessary, make an investigation into the structural adequacy of the LOT of concrete represented by that acceptance strength test result at no additional expense to the Department. The Engineer may also require the Contractor to perform additional strength testing as necessary to determine structural adequacy of the concrete.

Furnish either a structural analysis performed by the Specialty Engineer to establish strength adequacy or drilled core samples as specified in 346-10.3 to determine the in-place strength of the LOT of concrete in question at no additional expense to the Department. Obtain the Engineer's approval before taking any core samples. When the concrete is deemed to have low strength, obtain and test the cores and report the data to the Engineer within 14 days of the 28 day compressive strength tests. 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 final and used in lieu of the cylinder strength test results for determination of structural adequacy and any pay adjustment. 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.

346-10.2 Determination of Structural Adequacy: If core strength test results are less than 500 psi below the specified minimum strength, consider the concrete represented by the cores structurally adequate. If the core strength test results are more than 500 psi below the specified minimum strength, the Department will consider the concrete represented by the cores structurally questionable. Submit a structural analysis performed by the Specialty Engineer. If the results of the structural analysis indicate adequate strength to serve its intended purpose with adequate durability, and is approved by the Department, 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.

346-10.3 Coring for Determination of Structural Adequacy: Furnish three undamaged core samples taken from the same approximate location where the questionable concrete is represented by the low strength concrete test cylinders. Select the 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 approval of the core location prior to coring.

346-10.4 Core Conditioning and Testing: The Department will test the cores in accordance with ASTM C 2. The Engineer will make the determination whether to test the cores in a dry or wet condition. If the Engineer decides to test the cores in a wet condition, immerse the cores in water for at least 40 hours, and test the cores wet. The cores will be tested after obtaining the samples within three days for wet cores and within six days for dry cores.

346-11 Pay Adjustments for Low Strength Concrete.

346-11.1 General: Any LOT of concrete failing to meet the 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: When an acceptance strength test result falls more than 500 psi below the specified minimum strength, core samples may be obtained in accordance with ASTM C 42 from the respective LOT of concrete represented by the low acceptance strength test result for determining pay adjustments. Price adjustment will be applied to the certified invoice price the Contractor paid for the concrete or the precast product.

Do not core hardened concrete for determining pay adjustments when the 28 day acceptance cylinder strength test results are less than 500 psi below the specified minimum strength.

Submit acceptable core samples to the Engineer for testing for determination of payment reductions based upon the results of the strength tests. The results of strength tests of the drilled cores, subject to 346-11.5 and 346-11.6, will be accepted as final and will be used in lieu of the cylinder strength test results for determining pay adjustments.

In precast operations, excluding prestressed, ensure that the producer submits acceptable core samples to the Engineer for testing. The producer may elect to use the products in accordance with 346-11. 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 Coring for Determination of Pay Adjustments: Obtain the cores in accordance with 346-10.3.

346-11.4 Core Conditioning and Testing: The Department will test the cores in accordance with 346-10.4.

346-11.5 Core Strength Representing Equivalent 28 Day Strength: For cores tested no later than 42 days after the concrete was cast, the Engineer will accept the core strengths obtained as representing the equivalent 28 day strength of the LOT of concrete in question. The Engineer will calculate the strength value to be the average of the compressive strengths of the three individual cores. The Engineer will accept this strength at its actual measured value.

346-11.6 Core Strength Adjustments: For cores tested later than 42 days after the concrete was cast, the Engineer will establish the equivalency between 28 day strength and strength at ages after 42 days based on test data developed by a Department approved testing laboratory to relate strength at the actual test age to 28 day strength for the particular class of concrete and design mix represented by the cores. Obtain such data at no additional expense to the Department. When such data is not available and cannot be produced, as determined by the Department, the Engineer will determine the equivalent 28 day strength by adjusting the tested core strengths according to the following relationship:

346-11.6.1 Portland Cement Concrete without Pozzolan or Slag:

Equivalent 28 Day Strength, f'c (28) = 1/F (Average Core Strength) x 100,

where:

$F = 4.4 + 39.1 (\ln x) - 3.1 (\ln x)^2$ (Type I Cement)

$F = -17.8 + 46.3 (\ln x) - 3.3 (\ln x)^2$ (Type II Cement)

$F = 48.5 + 19.4 (\ln x) - 1.4 (\ln x)^2$ (Type III Cement)

x = number of days since the concrete was placed

ln = natural log

346-11.6.2 Pozzolanic-Cement Concrete:

Equivalent 28 day compressive strength = $f'_C(28)$, where:

$$f_c'(28) = 0.490 \quad f_c'(t)e^{\left(\frac{8.31}{t}\right)^{0.276}} \quad \text{(Type I Cement)}$$

$$f_c'(28) = 0.730 \quad f_c'(t)e^{\left(\frac{2.89}{t}\right)^{0.514}} \quad \text{(Type II Cement)}$$

$$f_c'(28) = 0.483 \quad f_c'(t)e^{\left(\frac{5.38}{t}\right)^{0.191}} \quad \text{(Type III Cement)}$$

$f'_c(t)$ = Average Core Strength at time t (psi)

t = time compressive strength was measured (days)

346-11.6.3 Slag-Cement Concrete:

Equivalent 28 day compressive strength = $f'_C(28)$, where:

$$f_c'(28) = 0.794 \quad f_c'(t)e^{\left(\frac{7.06}{t}\right)^{1.06}} \quad \text{(Type I Cement)}$$

$$f_c'(28) = 0.730 \quad f_c'(t)e^{\left(\frac{6.02}{t}\right)^{0.747}} \quad \text{(Type II Cement)}$$

$$f_c'(28) = 0.826 \quad f_c'(t)e^{\left(\frac{2.36}{t}\right)^{0.672}} \quad \text{(Type III Cement)}$$

$f'_c(t)$ = Average Core Strength at time t (psi)

t = time compressive strength was measured (days)

346-11.7 Calculating Pay Adjustments: The Engineer will determine payment reductions for low strength concrete accepted by the Department and represented by either cylinder or core strength test results below the specified minimum strength, in accordance with the following:

Reduction in Pay is equal to the reduction in percentage of concrete cylinder strength (specified minimum strength minus actual strength divided by specified minimum strength).

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.

346-12 Pay Reduction for Plastic Properties

If concrete is placed even when the result of plastic properties testing requires its rejection, the payment for concrete represented by the plastic property tests will be reduced by twice the invoice price per cubic yard for all concrete in the load that is placed. If the Engineer authorizes placement of the concrete, there will be no pay reduction.

347 PORTLAND CEMENT CONCRETE – CLASS NS.
(REV 11-10-10) (FA 11-22-10) (7-11)

Subarticle 347-2-1 (Page 340) is deleted and the following substituted:

347-2.1 General: Certify that all materials used in concrete are from Department approved sources, and free from frozen or other detrimental matter.

Meet the following requirements:

Portland Cement	Section 921
Coarse Aggregate	Section 901
Fine Aggregate	Section 902
Water	Section 923
Chemical Admixtures	Section 924
Pozzolans and Slag	Section 929

Subarticle 347-4.1 (Page 342) is deleted and the following substituted:

347-4.1 Concrete Mix Design: Before producing any concrete, submit the proposed mix design to the Engineer on a form provided by the Department. A similar form containing the same information may be used. Also submit three compressive strength test results tested in accordance with ASTM C 39 demonstrating the mix meets the minimum 28 day compressive strength requirement. The test results must be within twelve months of the submittal of the mix design. Use only concrete mix designs having prior approval of the Engineer.

Materials may be adjusted provided that the theoretical yield requirement of the approved mix design is met. Show all required original approved design mix data and batch adjustments and substituted material on the Department concrete delivery ticket. The Engineer may disqualify any concrete production facility for non-compliance with Specification requirements.

350 CEMENT CONCRETE PAVEMENT.
(REV 1-12-11) (FA 1-24-11) (7-11)

ARTICLE 350-1 (Pages 343 – 344) is deleted and the following substituted:

350-1 Description.

Construct Portland cement concrete pavement in one course, on a prepared subgrade. Use either the fixed-form or the slip-form method of construction. When reinforced cement concrete

pavement is specified or required, use concrete reinforced with steel bars or steel fabric, in accordance with details shown in the plans. The Engineer may require a demonstration of equipment and paving operations.

If any uncontrolled cracks appear during the life of the Contract, remove and replace the cracked concrete at no expense to the Department. Investigate and implement immediate effective solutions to eliminate further cracks, in consultation with, and subject to the approval of the Engineer.

Furnish the following information in the Quality Control Plan (QCP) as required in Section 105:

1. A detailed sequence and schedule of concrete placement operations including, but not limited to, width of pavement to be placed, proposed equipment, production rates, working hours, concrete hauling, and placement, curing, sawing, and sealing methods. Identify backup equipment and the procedures that will be followed in the case of a breakdown of equipment.

2. A method to ensure the proper placement of reinforcing steel, tie bars and dowel bars.

3. A traffic control plan that includes provisions for the placement and maintenance of barriers required to protect the pavement from traffic, for a minimum of 14 days after concrete placement.

4. Defined provisions for adequate lighting for all work done at night, including finishing, curing, and sawing joints.

5. A method for ensuring pavement thickness is met and a consolidation procedure is identified.

6. If forms are to be utilized define the material, dimensions, type, connections, and staking of the forms.

7. Define the procedure for the protection of the fresh concrete pavement from inclement weather.

SUBARTICLE 350-3.3 (Page 345) is deleted and the following substituted:

350-3.3 Vibratory Units: Consolidate the concrete for the full width of the strip being placed with either surface pan type or internal type vibrators. Use a vibration method with sufficient intensity and duration to ensure complete consolidation of the concrete without causing segregation of the materials.

For the surface vibrators, use a frequency of not less than 3,500 impulses per minute. For internal type vibrators, use a frequency of not less than 5,000 impulses per minute for tube vibrators and not less than 7,000 impulses per minute for spud vibrators. When using spud-type internal vibrators adjacent to forms, either hand-operated or attached to spreaders or finishing machines, use a frequency of not less than 3,500 impulses per minute. Measure and record the frequency of internal vibrators in plastic concrete and submit data to the Engineer. Mount spud vibrators such that the free tip trails, and space spud vibrators at a maximum interval of 30 inches.

Provide an amplitude of vibration with spud vibrators that is sufficient for the vibration to be perceptible on the surface of the concrete along the entire width of the strip being placed. Measure and record the actual frequency of vibrations and submit data to the Engineer.

Control all vibration by the forward movement of the spreader or finishing machine so that vibration automatically ceases when stopping the forward movement of the spreader.

SUBARTICLE 350-5.4 (Page 347) is deleted and the following substituted:

350-5.4 Cleaning Forms: Thoroughly clean the forms after each use and before placing concrete against them. Apply a release agent in accordance with the manufacturer's recommendations.

ARTICLE 350-6 (Page 347) is deleted and the following substituted:

350-6 Protection from Weather.

Meet the requirements of 400-7.1 when placing concrete. When rain appears imminent, stop all paving operations, and cover the surface of the unhardened concrete with the protective covering.

SUBARTICLE 350-7.2 (Page 347) is deleted and the following substituted:

350-7.2 Fabric: Place welded wire reinforcement at right angles to the centerline of the pavement and accurately to the position and location shown in the plans. Lap adjacent sheets of welded wire reinforcement not less than 6 inches. Make the laps only in the longitudinal members.

SUBARTICLE 350-9.1 (Pages 348 and 349) is deleted and the following substituted:

350-9.1 General Requirements: Immediately after placing the concrete, strike-off, consolidate, and finish it to produce a finished pavement in accordance with the cross-section, width, and surface finish required by the Contract Documents. Perform the sequence of operations as follows: strike-off; vibratory consolidation; screeding; floating; removal of laitance; straightedging; and final surface finish. Except as specified, perform strike-off, consolidation, screeding, and floating by the machine method.

Use equipment that is fully and accurately adjustable to produce a pavement meeting project requirements. Use equipment that is capable of operating in a consistent and smooth manner under all conditions of use.

As soon as possible after screeding while the concrete is plastic, correct all flaws such as cavities, blemishes, marks, or scratches that will not be removed by planing. .

Provide a concrete surface true to grade, cross slope and superelevation, and free of irregularities. If the Engineer permits adding water to assist the finishing operations, apply water as a fog spray by means of approved spray equipment.

SUBARTICLE 350-12.4 (Pages 352 – 353) is deleted and the following substituted.

350-12.4 Load-Transfer Devices: Provide dowel load-transfer devices in all transverse joints. Firmly hold dowel bars in a position parallel to the surface and the centerline of the slab, by approved steel supports and spacers of a type shown in the plans. The Engineer may approve the use of dowel bar supports or assemblies other than those specifically detailed in the plans. Allow the dowels to be free to move in one slab as the concrete contracts and expands. Paint each dowel with one coat of zinc rich primer or red oxide alkyd based primer meeting the requirements of SSPC Paint 25 Type I or Type II. Wait a minimum of 7 days before coating one-half of the dowel with a petroleum based lubricant grease to inhibit bonding to the concrete. Provide a cap for the free end of expansion joint dowels.

Position each dowel such that its final deviation from parallel to the surface of the pavement and parallel to the longitudinal centerline of the pavement does not exceed 1/2 inch. Position each dowel such that its final deviation from being centered on the joint does not exceed 2 inches. Position each dowel such that at no point in its length does it deviate from the surface of the pavement as shown in the plans in excess of 1 inch. Confirm the position of dowel bars by suitable means acceptable to the Engineer, which may include non-destructive testing methods.

SUBARTICLE 350-18 (Pages 357 - 358) is deleted and the following substituted:

350-18 Basis of Payment.

Prices and payments will be full compensation for all work specified in this Section, including any preparation of the subgrade not included in the work to be paid for under another Contract item; all transverse and longitudinal joint construction, including tie-bars and dowel bars; the furnishing of test specimens; repair of core holes; and all incidentals necessary to complete the work.

Payment will be made under:

Item No. 350- 1-	Plain Cement Concrete Pavement - per square yard.
Item No. 350- 2-	Reinforced Cement Concrete Pavement - per square yard.
Item No. 350- 72-	Cleaning and Resealing Joints - per foot.
Item No. 350- 78-	Cleaning and Sealing Random Cracks - per foot.

352 GRINDING CONCRETE PAVEMENT.
(REV 12-21-10) (FA 1-3-11) (7-11)

SECTION 352 (Pages 358 – 362) is deleted and the following substituted:

SECTION 352
GRINDING CONCRETE PAVEMENT

352-1 Description.

Grind existing concrete pavement in the areas designated on the plans.

Grind new concrete pavement the full width of the travel lanes. Do not grind shoulders unless indicated on the plans or required to promote drainage.

352-2 Equipment.

Identify all equipment for grinding concrete pavement in the Quality Control Plan (QCP) as required in Section 105. Provide a power driven self-propelled machine that is specifically designed to grind portland cement concrete pavement with diamond-impregnated grinding blades. Provide, operate, and maintain in working condition all necessary equipment to ensure performance of the work in the allotted time. Use equipment of the size, shape, and dimensions that does not restrict the movement of traffic in areas outside the designated limits of construction. The equipment will be of a size that can cut or plane at least 3 feet wide or as approved by the Engineer. Use equipment that is capable of grinding specified surfaces without causing spalls at cracks, joints, or other locations. The equipment will be capable of removing any slurry or residue resulting from the grinding operation.

352-3 Construction Methods.

Schedule and proceed with the construction operation in a manner that produces a uniform finished surface. Grind in a manner that eliminates joint or crack faults while providing positive lateral drainage by maintaining a constant cross-slope between grinding extremities in each lane. Grind transition, auxiliary or ramp lane as required from the mainline edge to provide positive drainage and an acceptable riding surface.

Grind parallel to the centerline until the pavement surfaces of adjacent sides of transverse joints and cracks are in the same plane. Grind the concrete pavement to eliminate the faulting at joints and cracks, maintain the overall smoothness within the limits specified, and texture over the majority of the pavement surface. Take all necessary precautions to minimize the number of minor depressions in the first place and only resolve to grind such areas if necessary. Continue grinding if accumulated total areas of minor depressions exceed 30% of the total area of a 0.1 mile section or if directed by the Engineer. Maintain the cross slope of the pavement as shown in the plans.

Establish and obtain the Engineer's approval for a means to continuously remove grinding residue.

Remove solid residue from pavement surfaces before traffic action or wind blows such residue. Do not allow residue to flow across lanes or shoulders used by public traffic or into gutters or other drainage facilities. Do not allow the discharge of any residue runoff into adjacent rivers, streams, lakes, ponds, or other bodies of water.

352-4 Final Surface Finish.

After the curing period, use a grinding process that produces a pavement surface that is true to grade and uniform in appearance with a longitudinal line type texture. Provide a line type texture that contains parallel longitudinal corrugations that present a narrow ridge with a corduroy type appearance. Provide a surface finish with the peaks of the ridges approximately 1/32 inch higher than the bottoms of the grooves and with approximately 60 evenly spaced grooves per foot.

Grind to produce areas of uniform and neat surface appearance, beginning and ending at lines perpendicular to the pavement centerline.

352-5 Acceptance Testing for Surface Tolerance.

Test the pavement surface for smoothness with a 10 foot long straightedge, a 10 foot long rolling straightedge, or a California Type Profilograph while the Engineer observes the

operations as described below. For pavement surfaces not meeting the smoothness requirements, provide corrective work and retesting to ensure conformity approved by the Engineer.

(a) Testing with a 10 foot straightedge: Use this straightedge for longitudinal profiling, parallel to centerline, within 15 feet of a bridge approach or existing pavement which is being joined. Use it for all transverse profiling of cross slopes, approaches, and as otherwise directed with respect to (b) or (c) below.

Furnish and operate a 10 foot straightedge. When portland cement concrete pavement abuts bridge approaches or pavement not under this Contract, ensure that the longitudinal slope deviations of the finished pavement do not exceed 1/8 inch in 10 foot length.

Produce transverse slope deviations of the finished pavement that do not exceed 1/8 inch with the straightedge laid in a direction perpendicular to the centerline.

(b) Testing with a 10 foot rolling straightedge: Use this straightedge for longitudinal profiling of short pavement sections up to 250 feet long, including mainline and non-mainline sections on tangent sections and on horizontal curves with a centerline radius of curve less than 1,000 feet and the pavement within the superelevation transition of such curves, turn lanes, ramps, tapers, and other non-mainline pavements as directed.

Furnish and operate the straightedge. Provide and operate a 10 foot rolling straightedge of a design acceptable to the Engineer, able to accurately measure surface irregularities exceeding 1/8 inch in a 10 foot effective length of the straightedge.

When tested with a straightedge, ensure that the finished pavement profile provides a uniform surface with no deviation greater than 1/8 inch in a 10 foot length. Perform the profiling in lines parallel to the centerline, at not more than 4 foot transversal spacing, and extending across the transverse joints.

The Contractor may confine checking through traffic lanes with the straightedge to joints and obvious irregularities as directed.

(c) Testing With A California Type Profilograph:

1. General: Use the profilograph on all longitudinal profiling of mainline full width pavement lanes longer than 250 feet and as otherwise directed.

The following terms are defined:

a. Profilograph: A longitudinal profile testing apparatus used to measure a pavement's surface profile deviations.

b. Profile Trace or Profilogram: A surface profile record generated along the individual wheel paths using a profilograph. Such a record is analyzed to determine the rate of roughness (or smoothness) and to identify changes in the longitudinal pavement surface elevation that exceed a specified threshold along the pavement length traversed by the profilograph.

c. Profile Index (PI): A profile measurement is a series of numbers representing elevation relative to a specified reference. A Profile Index (PI) is a summary value calculated from these numbers above and below a blanking band over a specified length of pavement.

d. Blanking Band: A band of 0.2 inch uniform height with its longitudinal center positioned optimally between the highs and the lows of the profilogram depicting at least 100 ft of pavement.

2. Equipment: Furnish, calibrate, and operate a California Type Profilograph device in accordance with FM 5-558E. The electronic model of a California Type

Profilograph performs computerized data analysis, and is manufactured by Cox and Sons, Inc. of Colfax, California - Model CS 8200 or better.

3. Surface Test: Produce a riding surface meeting the requirements of FM 5-558E and having a Profile Index meeting the requirements herein. Start and terminate the profile 15 feet from each bridge approach or existing pavement, which is being joined.

Take at least two pavement profile traces with bump option turned on. Locate the position of the profiles in the traffic wheel paths. Take the profiles in the direction of the traffic and parallel to and approximately 3 feet from the outside edges of each traffic lane. The Contractor may take additional profiles to define the limits of an out-of-tolerance surface variation.

Upon completion of each day's testing, submit the profilograms to the Engineer for review to determine the pavement section in compliance with these requirements. The Engineer will retain those profilograms meeting these requirements. The Engineer will return profilograms with deficiencies to the Contractor for use to correct section deficiencies. The Engineer will retain the corrected profilograms, along with the deficient profilograms, for comparison purposes of the circumstances between the two profilograms.

Ensure that pavement tested meets the Profile Index requirements and is applicable to the profilogram for each profile trace:

a. Ensure that pavement on tangent alignment and horizontal curves having a centerline radius of curve 2,000 feet or more has a Profile Index of 5 inches per mile or less.

b. Ensure that pavement on horizontal curves having a centerline radius of curve 1,000 feet or more but less than 2,000 feet and pavement within the superelevation transition of such curves has a Profile Index of 7 inches per mile or less.

c. Ensure that the pavement riding surfaces have all deviations in excess of 0.3 inch in 25 feet removed.

The Engineer will evaluate the pavement in 0.1 mile consecutive sections. Grind all areas represented by individual points having deviations in excess of 0.3 inch in 25 feet or less pavement length, until such points do not exceed 0.3 inch.

After removing all individual deviations in excess of 0.3 inch in 25 feet, perform additional grinding as necessary to reduce the Profile Index to the specified requirements.

Surface smoothness tests with a California Type Profilograph on bridges are specified in 400-15. Ensure that the pavement within 15 feet of a bridge approach (or existing pavement which is being joined) complies with the testing requirements of a 10 foot straightedge.

Visually inspect transverse joints and random cracks to ensure that the adjacent surfaces are in the same plane. Where misalignment of the planes of the surfaces on adjacent sides of the joints or cracks is in excess of 1/16 inch, grind the pavement until the surfaces are flush.

352-6 Surface Corrections.

After the curing period, test the surface for pavement surface smoothness in accordance with 352-5. Plainly mark all variations from the required tolerances. Where pavement surfaces do not meet the smoothness requirements, the Engineer will require corrective work and retesting to ensure conformity.

Eliminate high spots exceeding 1/8 inch in 10 feet, but not in excess of 0.3 inch in 25 feet, by grinding either with an approved machine or with a carborundum brick and water. Do not use bush-hammering or other destructive means for removing irregularities. As directed by the Engineer, retexture corrected high areas to give skid resistance comparable to the surrounding area.

Operate all milling, cutting, or grinding equipment to produce a reasonably uniform finished surface without spalling the pavement joints within corrected areas. The Engineer will not require extra grinding to eliminate minor depressions in order to provide 100% texturing of the pavement surface. Maintain the cross slope of the pavement as shown in the plans. Repair all joint seals destroyed by grinding at no expense to the Department.

Remove and replace any area of pavement which, after grinding, still shows a deviation in excess of the allowable tolerance. Ensure that the area removed and replaced is the full length between transverse joints and the full width of the lane involved. Replace any area of concrete pavement with concrete that meets the requirements of Sections 353.

Bear the costs of all surface corrections required and of all required removal and replacement of defective surface concrete. If the grinding operation removes more than a total length of 100 consecutive feet of the grooves, then re-groove the entire width of the pavement for the deficient area.

352-7 Method of Measurement.

The quantity to be paid for will be the area, in square yards, determined by calculation, completed and accepted.

352-8 Basis of Payment.

Price and payment will be full compensation for all work and materials specified in this Section, including furnishing all labor, materials, tools, equipment, testing, and incidentals and for doing all work involved in grinding existing or new concrete pavement, removing residue, and cleaning the pavement, including necessary disposal of residue and furnishing any water or air used in cleaning the pavement.

Contract Unit Price adjustments will be made in accordance with the following schedule(s).

Average Profile Index (inches/mile) per 0.1 mile Section		Contract Unit Price Adjustments Percent of Pavement Unit Bid Price
Curvature Radius ≥2,000 ft	1,000 ft ≤ Curvature Radius < 2,000 ft	
PI ≤ 2	PI ≤ 4	103
2 < PI ≤ 5	4 < PI ≤7	100
PI > 5	PI > 7	Corrective work required

Pay (Price) Adjustments for Incentives will be based on the initial measured average Profile Index, prior to any corrective work.

The Unit Bid Adjusted Price will be computed using the area of grinding concrete pavement. This Unit Bid Price will apply to the total area of the 0.1 mile section for the lane width represented by the profilograms for the average Profile Index.

Payment will be made under:

Item No. 352- 70- Grinding Concrete Pavement - per square yard.

353 CONCRETE PAVEMENT SLAB REPLACEMENT.
(REV 12-17-10) (FA 1-3-11) (7-11)

ARTICLE 353-2 (Page 363) is deleted and the following substituted:

353-2 Materials.

Meet the following requirements:

Portland Cement Concrete	Section 346
Coarse Aggregate	Section 901
Fine Aggregate	Section 902
Portland Cement	Section 921
Water	Section 923
Admixtures	Section 924
Curing Materials	Section 925
Epoxy Compounds	Section 926
Pozzolans and Slags*	Section 929
Embedded Items	Section 931
Calcium Chloride	AASHTO M-144, Type 1

*For concrete pavement slab replacement, the use of pozzolans and slag is optional.

Concrete pavement containing only dowel bars will be considered non-reinforced concrete.

SUBARTICLE 353-3.1 (Page 363) is deleted and the following substituted:

353-3.1 Mixture Proportions: Designate the actual proportions to be used to produce a concrete with a minimum 6-hour compressive strength of 2,200 psi and a minimum 24-hour compressive strength of 3,000 psi.

Prior to producing concrete, submit the design mix for approval on a form acceptable to the Department. Ensure the 24-hour acceptance strength has a minimum over design of 400 psi. Indicate slump before and after addition of accelerator. Use mixes approved by the Department and from an approved concrete production facility meeting the requirements of Section 105.

When an accelerating admixture is used in solution, the amount of water in the solution is considered to be part of the mixing water. Make necessary adjustment to the concrete mix-water to account for the amount of water in the accelerating admixture solution. Test the concrete for consistency subject to the following values from the approved mix design values:

Slump Tolerance**	plus or minus 1.5 inches
Entrained Air**	1% to 6%
Temperature not to exceed 100ºF	

**For values as specified in the approved Design Mix prior to the addition of accelerating admixture.

355 VALUE ADDED PORTLAND CEMENT CONCRETE PAVEMENT. REV (2-12-10) (FA 2-17-10) (7-10)

SECTION 355-1 (Page 368) is deleted and the following substituted:

355-1 Description.

Construct Value Added Portland Cement Concrete Pavement (Concrete Pavement), subject to a five year warranty period after final acceptance of the Contract in accordance with 5-11. This Section applies only to new pavements, including added lanes.

Furnish a copy of each mix design to the Engineer at least 14 days prior to any paving work.

Perform all the associated work specified in this Section including continued responsibility for performing all remedial work associated with pavement distresses exceeding threshold values determined in accordance with this Section and as to which notice was provided to the Contractor.

The work specified in this Section will not be paid for directly, but will be considered as incidental to other Contract items.

SECTION 355-4 (Pages 368 - 370) is deleted and the following substituted:

355-4 Pavement Evaluation and Remedial Work.

355-4.1 General: The Department's Pavement Condition Survey Program along with observations by the Engineer will be used as the basis for determining the extent and the magnitude of the pavement distresses occurring on the project. In the event the level of distress exceeds any of the threshold values defined below, remedial work as described in 355-5 by the Contractor will be required.

The Department will monitor the pavement for distresses and may require remedial action at any time. The Department may conduct a Pavement Condition Survey of the value added pavement following the final acceptance of the project, and at intermediate times throughout the warranty period with findings provided when considered by the Department to be the obligation of the Contractor.

The final survey, if determined by the Engineer to be necessary, will be conducted before the end of the warranty period with results provided to the Contractor for those conditions exceeding contract threshold values requiring remedial action that the Department believes to be an obligation of the Contractor. The Department will be responsible for all costs associated with the surveys.

If the survey findings, intermediate or final, are to be disputed by the Contractor, written notification must be provided to the Engineer within 30 calendar days of the date of receipt of the information from the Department.

During the warranty period, the Contractor may monitor the pavement using nondestructive methods and may participate with the Department in the Pavement Condition Surveys upon request. Do not conduct any coring, milling or other destructive methods without prior approval by the Engineer.

355-4.2 Distress Indicators: The Department will use Ride, Spalling and Cracking, as distress indicators in accordance with the Rigid Pavement Condition Survey Handbook to evaluate the Concrete Pavement. Ride Number (RN) will be established by Laser Profiler in accordance with FM 5-549. For ride evaluation purposes, the project will be subdivided into lots of 0.1 mile per lane and partial lots which are segments that are less than 0.1 mile. For the purposes of threshold values and remedial work, partial lots and lots will be treated as lots.

355-4.3 Threshold Values and Remedial Work: Threshold values and associated remedial work for the Concrete Pavement are specified in Table 355-1.

TABLE 355-1
Concrete Pavement Threshold Values and Remedial Work

Type of Distress	Threshold Values	Remedial Work
Ride	Ride Number < 3. 50	Grind all deficient lots and partial lots in accordance with Section 352.
Spalling in the wheel path	Four areas in any Lane Mile exceeding 1 inch in width and exceeding 6 inches in length OR any single area exceeding 3 inches in width.	Full depth slab replacement for a minimum of 6 feet in length and the full width of the slab in accordance with Section 353.
Spalling outside the wheel path	Four areas in any Lane Mile exceeding 1 1/2 inches in width and 12 inches in length OR any single area exceeding 3 inches in width and 12 inches in length.	Full depth slab replacement for a minimum of 6 feet in length and the full width of the slab in accordance with Section 353.
Cracking	Four Cracks in any Lane Mile with width exceeding 1/8 inch OR any Crack exceeding 3/16 inch.	Full depth slab replacement for a minimum of 6 feet in length and the full width of the slab in accordance with Section 353.
Shattered Slab	Cracking patterns that divide the slab into three or more segments	Full slab replacement in accordance with Section 353.

SECTION 355-5 (Pages 370 and 371) is deleted and the following substituted:

355-5 Remedial Work.

Perform all necessary remedial work described in this Section at no cost to the Department. Should an impasse develop in any regard as to the need for remedial work or the extent required, the Statewide Disputes Review Board will render a final decision by majority vote.

Remedial work will not be required if any one of the following conditions is found to apply:

a. Determination that the pavement thickness design as provided by the Department is deficient. The Department will make available a copy of the original pavement thickness design package and design traffic report to the Contractor upon request. The Contractor will be responsible for performing all remedial work associated with the pavement distress if the pavement design is provided by the Contractor.

b. Determination that the Accumulated ESALs (Number of 18 Kip Equivalent Single Axle Loads in the design lane) have increased by 25% or more than the Accumulated ESALs used by the Department for design purposes for the warranty period for the pavement design life. In calculating ESALs, the Average Annual Daily Traffic (AADT) will be obtained from the Department's traffic count data and the T24 (Percent Heavy Trucks during a 24 hour period) will be obtained from the Department's traffic classification survey data.

c. Determination that the deficiency was due to the failure of the existing underlying layers that were not part of the Contract work.

d. Determination that the deficiency was the responsibility of a third party or its actions, unless the third party was performing work included in the Contract.

If a measured distress value indicates remedial action is required per Table 355-1, begin remedial work within 45 calendar days of notification by the Department or a ruling of the Statewide Disputes Review Board. The Statewide Disputes Review Board will determine the allowable duration for the completion of the remedial work, but not to exceed 6 months.

If remedial action is necessary and forensic information is required, it is the responsibility of the Contractor to determine the source of the distress. The Contractor will not be responsible for damages to the pavement as a result of any forensic activities conducted at the discretion of the Engineer.

As applicable to distress criteria for ride, when two lots requiring remedial action or a partial lot and a lot are not separated by three or more lots not requiring remedial action, the remedial work shall be required for the total length of all such contiguous lots and partial lots, including the intermediate lots not requiring remedial action.

The Contractor has the first option to perform all remedial work, as determined by the Department. If, in the opinion of the Engineer, the problem poses an immediate danger to the traveling public and the Contractor cannot provide temporary mitigation for the defect within 4 hours of written notification and restore the pavement to its original design condition within 72 hours of written notification, the Engineer has the authority to have the remedial work performed by other forces. Temporary mitigation includes the use of traffic control systems such as barricades, drums, or other approved devices to secure the area including lane closures if necessary, and constructing temporary repairs making it safe for the roadway user until the defect can be restored to its original design condition. The Contractor is responsible for all incurred costs of the work performed by other forces should the problem (remedial work) be determined to be the responsibility of the Contractor. Remedial work performed by other forces does not alter any of the requirements, responsibilities or obligations of the Contractor.

Complete all remedial work to the satisfaction of the Engineer. Any disputes regarding the adequacy of the remedial work will be resolved by the Statewide Disputes Review Board. Approval of remedial work does not relieve the Contractor from continuing responsibility under the provisions of this Specification.

Notify the Engineer in writing prior to beginning any remedial work. Meet the requirements of the Department's Standard Specifications for Road and Bridge Construction and implemented modifications hereto when performing any remedial work. Perform all signing and

traffic control in accordance with the Department's Design Standards for Design, Construction, Maintenance and Utility Operations on the State Highway System. Provide Maintenance of Traffic during remedial work at no additional cost to the Department. Lane closure restrictions listed in the original Contract will apply to remedial work. Written request(s) to obtain permission for lane closure(s) for either forensic investigation or remedial work must be made to the Engineer 48 hours in advance of any lane closures. Do not perform any lane closures until written permission is given by the Engineer.

If remedial work necessitates a corrective action to the pavement markings, adjacent lane(s), or roadway shoulders, perform these corrective actions using similar products at no cost to the Department.

370 BRIDGE APPROACH EXPANSION JOINTS.
(REV 6-21-10) (FA 7-29-10) (1-11)

ARTICLE 370-2 (Page 371 – 372) is deleted and the following substituted:

370-2 Materials.

Bar Reinforcement: Use bar reinforcing steel meeting the requirements of 931-1.1.

Concrete: For the expansion joint subslab, use concrete meeting the requirements of Section 347.

Galvanized Sheet Metal: Use galvanized sheet metal meeting the requirements shown in the plans.

Seal: Use compression seals in accordance with Section 932 and Design Standards Index No. 306.

400 CONCRETE STRUCTURES
(REV 6-14-10) (FA 7-29-10) (1-11)

ARTICLE 400-1 (Page 373) is deleted and the following substituted:

400-1 Description.

Construct concrete structures and other concrete members, with the exception of pavement and incidental concrete construction (which are specified in other Sections).

Refer to Section 450 for prestressed construction requirements additional to the requirements of this Section.

For precast concrete structures meet the requirements of Section 450 for inserts and lifting devices, handling, storage, shipping, and erection.

Obtain incidental precast products from a plant that is currently on the list of Producers with Accepted Quality Control Programs. Producers seeking inclusion on the list shall meet the requirements of 105-3.

SUBARTICLE 400-5.7.1 (Pages 376 - 379) is deleted and the following substituted:

400-5.7.1 General: Utilization of stay-in-place metal forms is permitted in lieu of removable forms to form concrete bridge decks between beams and between the webs of individual box girders when designated in the plans. Stay-in-place metal forms may be of the cellular, non-cellular or non-cellular with top cover sheet type. The flutes of non-cellular stay-in-place metal forms may be filled with polystyrene foam or concrete. When polystyrene foam is used to fill the forms, fill form flutes completely; do not allow any portion of the polystyrene foam to extend beyond the limits of the flutes. Ensure that the polystyrene foam remains in its required position within flutes during the entire concrete placement process. Do not use reinforcing steel supports or other accessories in such a manner as to cause damage to the polystyrene foam. Replace all damaged polystyrene foam to the satisfaction of the Engineer.

Apply polymer sheeting to stay-in-place metal forms in accordance with the requirements in the following table. Apply polymer sheeting to all faces and edges (including sheared edges) of support angles used on bridges with Moderately and Extremely Aggressive Superstructure Environmental Classifications (as shown in the Plans). No polymer sheeting is required for beam attachment straps or clips partially embedded in concrete, and for support angles used on bridges with a Slightly Aggressive Superstructure Environmental Classification. Use polymer sheeting materials and application methods as described herein.

Polymer Sheeting Usage Requirements				
Form Type		Superstructure Environmental Classification (as shown in Plans)		
		Slightly Aggressive	Moderately Aggressive	Extremely Aggressive
Non-cellular form with concrete filled flutes		No polymer sheeting required	Polymer sheeting required on bottom side	Polymer sheeting required on bottom side
Non-cellular form with polystyrene foam filled flutes		Polymer sheeting required on inside	Polymer sheeting required on both sides*	Polymer sheeting required on both sides*
Non-cellular form with Top Cover Sheet	Top Cover Sheet	Polymer sheeting required on bottom side	Polymer sheeting required on bottom side	Polymer sheeting required on bottom side
	Non-cellular form	Polymer sheeting required on top side	Polymer sheeting required on both sides*	Polymer sheeting required on both sides*
Cellular form		No polymer sheeting allowed or required	Not permitted	Not permitted
* Polymer sheeting not required on bottom side of form located within box girders and U-beams.				

Prior to using stay-in-place metal forms, submit detailed plans for approval of the forming system, including method of support and attachment and method of protecting the supporting structural steel components from welding effects. Submit design calculations for the forming system, which have been signed and sealed by the Specialty Engineer. Detail stay-in-place metal forms such that they in no way infringe upon the concrete

outline of the slab shown on the plans. Use stay-in-place metal forms that provide and maintain the dimensions and configuration of the original slab in regards to thickness and slope.

Do not weld stay-in-place metal form supports and connections to the structural steel components. Do not connect polymer coated angles or other hardware that support polymer coated metal forms to the beam attachment straps or clips by welding. Electrical grounding to reinforcing steel is prohibited.

Protect structural steel components from damage by using a shield to guard against weld splatter, weld overrun, arc strikes, or other damaging effects of the welding process. Upon completion of welding, rest the metal form support flush on the supporting steel component. Should any weld spatter, weld overrun, arc strike, or other effects of the welding process be evident or occur to the structural steel component, immediately stop in-place welding of the metal form supports for the remainder of the work. In this event, weld all metal form supports off of the structure and erect the forms after prefabrication, or use an alternate approved method of attaching the form supports. Remove improper weldment, repair the supporting steel component for any improper welding. Perform all required verification and testing at no expense to the Department and to the satisfaction of the Engineer.

Do not use stay-in-place metal forms until the forming system has been approved by the Engineer. The Contractor is responsible for the performance of the stay-in-place forms.

Structures designed, detailed, and dimensioned for the use of removable forms: Where stay-in-place metal forms are permitted, the Contractor is responsible and shall obtain the approval of the Engineer for any changes in design, etc. to accommodate the use of stay-in-place forms. The Engineer will compute pay quantities of the various components of the structure which are paid on a cubic yard basis from the design dimensions shown on the plans with no allowance for changes in deflection or dimensions necessary to accommodate the stay-in-place forms or concrete to fill the form flutes. The Engineer will limit pay quantities of other Contract items that the Contractor increases to accommodate the use of stay-in-place forms to the quantity required for the original plan design.

Submit all changes in design details of bridge structural members that support stay-in-place forms, showing all revisions necessary to enable the supporting components to withstand any additional weight of the forms and the weight of any extra concrete that may be required to fill the forms. Include with the design calculations a comparative analysis of the stresses in the supporting components as detailed on the Contract plans and as modified to support the forms. Use the identical method of analysis in each case, and do not allow the stresses in the modified components to exceed those of the component as detailed in the Contract plans. Include with the design the adjusted cambers for any changes in deflection over those shown on the original plans. Modify the beams to provide additional strength to compensate for the added dead loads imposed by the use of stay-in-place forms. Obtain the additional strength by adding strands to the pre-stressed beams or by adding steel material to increase the section modulus of steel girders. Substantiate the added strength by the comparative calculations. Do not use stay-in-place forms until the forming system and all necessary design revisions of supporting members have been approved by the Engineer.

Structures designed, detailed, and dimensioned for the use of stay-in-place metal forms:

Prior to using stay-in-place metal forms, submit detailed plans for approval of the forming system (including method of support and attachment) together with

design calculations. Include an analysis of the actual unit weight of the proposed forming system over the projected plan area of the metal forms. If the weight thus calculated exceeds the weight allowance for stay-in-place metal forms and concrete required to fill the forms shown on the plans, then modify the supporting components to support the excess weight as specified by the Contractor's Specialty Engineer.

For all structures utilizing structural steel supporting components, paint the vertical sides of the top flange prior to installation of the stay-in-place metal forms in accordance with Section 560.

For non-polymer sheeting form surfaces, use zinc paint coating in accordance with Section 562 to all accessories cut from galvanized sheets, which are not embedded in concrete.

SUBARTICLE 400-7.13.2 (page 389) is deleted and the following substituted:

400-7.13.2 Screed Demonstration: Subsequent to the placement of all reinforcing steel and prior to placing any slab or deck concrete, demonstrate that the proposed equipment and methods can finish the concrete to the specified grades while maintaining the specified cover over the reinforcement. Provide the demonstration over the entire length and width of the spans to be placed.

SUBSECTION 400-11.3 (Page 394) is deleted.

SUBSECTION 400-11.4 (Page 394) is the deleted and the following substituted:

400-11.3 Bearing Pads: Use bearing pads for seating bridge shoes, ends of beams, and slabs of the types specified or required in the plans.

Furnish and install Composite Neoprene Pads as detailed in the plans. Place neoprene pads, where specified or required, directly on masonry surfaces finished in accordance with the requirements of this Article. Ensure that pads, bearing areas of bridge seats, and metal bearing plates are thoroughly cleaned and free from oil, grease, and other foreign materials.

Exercise care in fabrication of related metal parts to avoid producing conditions detrimental to the performance of the pads, such as uneven bearing, excessive bulging, etc.

ARTICLE 400-14 (Page 394- 395) is deleted and the following substituted:

400-14 Removal of Forms.

Use the table below as the criterion for minimum time or compressive strength required before removal of forms or supports.

When using the time period criterion, include in the time period all days except days in which the temperature falls below 40ºF.

Use the specified 28-day minimum compressive strength value as stated in 346-3.1 for each Class of Concrete utilized.

Location of Concrete Placement	Minimum Time for Form Removal for any Strength Concrete*	Minimum (%) of 28-day Compressive Strength for Form Removal
(1) Deck slabs, top slabs of culverts and bottom of caps, forms under sidewalks, and safety curb overhangs extending more than 2 feet		
(a) Class II (Bridge Deck)	7 days**	75**
(b) Class II (Other than Bridge Deck)	7 days	75
(c) Class III	7 days	70
(d) Class IV	7 days	60
(e) Class V	7 days	50
(2) Walls, piers, columns, sides of beams and other vertical surfaces	24 hours***	50***
(3) Front face form of curbs	6 hours	70

* For mass concrete, remove forms in accordance with 346-3.3
** Reference 400-16.4
***Do not place additional load on the section until 70% of the specified 28-day concrete strength is attained. Also, refer to 400-7.4.

When using the percent of required strength, cast test cylinders for each mix for compressive strength determination or develop a curing concrete strength versus time curve (S/T Curve) which can be used in lieu of multiple test cylinders to determine when percent of required strength has been met.

Prior to curve use; obtain the Engineer's approval of the S/T Curve and its supporting data. An approved testing laboratory may be used to provide this information with approval of the Engineer. Plot S/T Curves using at least three different elapsed times that begin once test cylinders are cast; however, one of the elapsed times must be prior to the Contractor's intended form removal. Each elapsed time plotted must have a corresponding compressive strength computed by averaging the compressive strength of two test cylinders.

Cure such test cylinders as nearly as practical in the same manner as the concrete in the corresponding structural component, and test them in accordance with ASTM C 39 and ASTM C 31. Perform cylinder casting, curing, and testing at no expense to the Department and under the observation of the Engineer. When the S/T Curve indicates a compressive strength equal to or greater than the percentage of specified strength shown in the table above for form removal, the Contractor may remove the forms. When the ambient air temperature falls 15ºF or more below the ambient air temperature that existed during development of a S/T Curve, use a S/T Curve that corresponds to the lower temperature and that is developed in accordance with this section.

Do not remove forms at any time without the consent of the Engineer. Even when the Engineer provides consent to remove the forms, the Contractor is responsible for the work.

SUBARTICLE 400-15.2.5.1 (page 397) is deleted and the following substituted:

400-15.2.5.1 General: Apply a Class 4 finish on bridge decks and concrete approach slabs. On Short Bridges (bridges having a length less than or equal to 100 ft), and on Miscellaneous Bridges (Pedestrian, Trail and Movable Spans) regardless of length, meet

the finish and smoothness requirements of 400-15.2.5.2 and 400-15.2.5.4. On Long Bridges (bridges having a length greater than 100 ft) meet the finish and smoothness requirements of 400-15.2.5.3 and 400-15.2.5.5. When an existing bridge deck is widened, see the plans for the finish and smoothness requirements of the existing bridge deck and its new widened section. After meeting the screeding requirements of 400-7.13 and curing requirements of 400-16 and the smoothness requirements, herein, groove the bridge deck and approach slabs.

Regardless of bridge length, finish decks with less than 2 1/2 inches of top cover in accordance with the requirements for Short Bridges.

SUBARTICLE 400-15.2.5.5 (pages 398 – 399) is deleted and the following substituted:

400-15.2.5.5 Smoothness Evaluation and Concrete Surface Planing, Long Bridges (including approach slabs): Prior to planing, provide a smoothness evaluation of the completed bridge deck and exposed concrete surfaces of approach slabs by a computerized Cox California-type profilograph in accordance with the criteria herein and FM 5-558E. Furnish this evaluation through an independent provider approved by the Engineer, using equipment calibrated by the Engineer. All bridge deck and concrete approach slab surfaces to within 2 feet of gutter lines are subject to this smoothness evaluation.

Prior to initial profilograph testing, complete work on the bridge deck and approach slabs. Thoroughly clean and clear the bridge deck and approach slab areas to be evaluated for smoothness of all obstructions and provide the smoothness evaluation. Ensure that no radio transmissions or other activities that might disrupt the automated profilograph equipment are allowed during the evaluation.

Average the Profile Index Value for the bridge deck, including the exposed concrete surfaces of the approach slabs, for the left and right wheel path of each lane. The maximum allowable Profile Index Value for acceptable smoothness is 10 inches per mile utilizing the 0.2 inch blanking band. Apply these criteria to a minimum of 100 feet of each lane. Additionally, correct individual bumps or depressions exceeding a cutoff height of 0.3 inch from a chord of 25 feet (see ASTM E-1274) on the profilograph trace. Ensure that the surface meets a 1/4 inch in 10 feet straightedge check made transversely across the deck and approach slabs if determined necessary by the Engineer. Provide additional profilograph testing as necessary following longitudinal planing and any other actions taken to improve smoothness, until a profile meeting the acceptance criteria is obtained.

Regardless of whether expansion joints are installed before or after deck planing is complete, plane off the concrete deck surface to a minimum depth of 1/4 inch and also meet or exceed the profilograph smoothness criteria. Longitudinally plane the entire bridge deck and exposed concrete surfaces of the approach slabs using a self-propelled planing machine with gang mounted diamond saw cutting blades specifically designed for such work. Use the profilograph generated smoothness data, to establish the optimum planing machine settings. Plane the deck surface to within 2 feet of the gutter line so that there is a smooth transition, without vertical faces or sudden surface discontinuities, from the fully planed surface to the unplaned surface. Use a machine with a minimum wheel base length of 15 feet, constructed and operated in such manner that it does not cause strain or damage to deck or approach slab surfaces, excessive ravels, aggregate fractures or spalling. The equipment shall be approved by the Engineer. Perform longitudinal planing parallel to the roadway centerline, and

provide a consistent, textured surface. Clean the surface of all slurry/debris generated during this work concurrently with operation of the machine.

After the deck has been planed the minimum 1/4 inch, reevaluate the surface smoothness using the profilograph testing described above. Perform cycles of planing and profilograph retesting as necessary until the deck and exposed concrete surfaces of approach slabs are in compliance with the smoothness criteria but do not exceed the maximum concrete removal depth of 1/2 inch.

SUBARTICLE 400-21.2 (page 407) is deleted and the following substituted:

400-21.2 Investigation, Documentation and Monitoring: The Engineer will inspect concrete surfaces as soon as surfaces are fully visible after casting, with the exception of surfaces of precast concrete products produced in offsite plants, between 7 and 31 days after the component has been burdened with full dead load, and a minimum of 7 days after the bridge has been opened to full unrestricted traffic. The Engineer will measure the width, length and depth of each crack and establish the precise location of the crack termination points relative to permanent reference points on the member. The Engineer will determine if coring of the concrete is necessary when an accurate measurement of crack depth cannot be determined by use of a mechanical probe. The Engineer will monitor and document the growth of individual cracks at an inspection interval determined by the Engineer to determine if cracks are active or dormant after initial inspection. The Engineer will perform all final bridge deck crack measurements once the deck is free of all debris and before transverse grooves are cut and after planing is complete for decks that require planing.

Provide the access, equipment and personnel needed for the Engineer to safely perform this work at no expense to the Department. Core cracks for use by the Engineer in locations and to depths specified by the Engineer at no expense to the Department.

SUBARTICLE 400-21.3 (page 407) is deleted and the following substituted:

400-21.3 Classification of Cracks: The Engineer will classify cracks as either nonstructural or structural and determine the cause. In general, nonstructural cracks are cracks 1/2 inch or less deep from the surface of the concrete; however, the Engineer may determine that a crack greater than 1/2 inch deep is nonstructural. In general, structural cracks are cracks that extend deeper than 1/2 inch. A crack that is fully or partially underwater at any time during its service life will be classified as a structural crack unless the Environment note on the General Notes sheet in the plans categorizes the substructure as slightly aggressive, in which case, the nonstructural crack criteria may apply as determined by the Engineer.

Review and comment on the Engineer's crack classification; however, the Engineer will make the final determination.

410 PRECAST CONCRETE BOX CULVERT.
(REV 6-8-10) (FA 7-29-10) (1-11)

SUBARTICLE 410-3.1 (Page 416) is deleted and the following substituted:

410-3.1 General: Meet the requirements of Section 346, except as modified herein:

Prepare, cure, and test the test cylinders in accordance with ASTM C-31 and ASTM C-39 test methods. Follow the alternative method of compaction, in accordance with ASTM C-497, if the consistency of concrete is too stiff for compaction by rodding or internal vibrations. Expose shipping strength test cylinders to the same curing conditions as the precast concrete box sections. Cure the 28-day strength test cylinders in accordance with Section 346.

Perform all concrete quality control testing and inspections in accordance with 346-9.2.

For training and other qualifications meet the requirements of Section 105. Test all QC samples for compressive strength in a laboratory meeting the requirements of Section 105.

SUBARTICLE 410-6.1 (Page 419) is deleted and the following substituted:

410-6.1 Casting: Cast precast elements in unyielding beds and forms. Ensure bearing surfaces in casting forms are level and straight, and vertical surfaces are plumb prior to casting. Ensure surfaces within the forms against which concrete will be cast, are clean and free from rust and hardened residual concrete. Provide full concrete cover clearance to all form wires and other miscellaneous pieces of metal, except as permitted by Section 415. Bend all tie wires away from the form surface to provide maximum concrete cover. Provide inserts and lifting devices in accordance with 450-9.2.1.

415 REINFORCING STEEL – BAR SUPPORTS.
(REV 1-4-11) (FA 2-14-11) (7-11)

SUBARTICLE 415-5.10.1 (Pages 436 – 437) is deleted and the following substituted:

415-5.10.1 Supports:

(a) Bottom Mats: In general, support the bottom mats of steel by one row of slab bolsters placed 6 inches from the edge of the slab and by two rows down each panel between beams. In general, bottom mat slab bolsters may not have rails in contact with removable or stay-in-place forms; however, if the environmental classification is slightly aggressive, bolster rails may be in contact with stay-in-place forms if in compliance with 415-5.13.2 and 415-5.13.3. Do not allow the spacing between rows to exceed 4 feet, measured center to center.

As an exception, when deemed satisfactory by the Engineer, the Contractor may use concrete blocks in lieu of slab bolsters. Use blocks 2 by 2 inches by clearance dimensions. Space concrete blocks 4 feet on center as a maximum. If at any time, however, the Engineer judges that the concrete blocks do not provide the proper support, he may

require using slab bolsters.

(b) Top Mats: Support the top mats of steel by either continuous high chairs or individual high chairs. Support continuous high chairs along both sides of each beam and approximately 6 inches back from the edge of the beam. Place the outside row of high chairs 6 inches from the edge of the slab. If using individual high chairs, space them transversely, as specified for the continuous high chair, and do not allow the longitudinal spacing to be greater than 4 feet.

As an alternate to the above, on prestress beam construction, the Contractor may support the top mat of steel on the shear connectors bent to the proper elevation with one line of high chairs centered between the beams.

(c) Truss Bars: Support truss bars at each end of the top bends by continuous high chairs or by individual high chairs spaced longitudinally at not more than 4 feet.

SUBARTICLE 415-5.13(Pages 438-439) is deleted and the following substituted

415-5.13 Bar Supports:

415-5.13.1 General: Provide reinforcing steel bar supports manufactured in accordance with all requirements of the CRSI Manual of Standard Practice. Use bar supports of adequate strength to withstand a 300 pound concentrated load without permanent deformation or breakage, with the deformation being less than 5% of the support height.

Ensure that no more than 5% of the reinforcing steel bar supports exhibit unsatisfactory performance, breakage, or permanent deformation during rebar tying and/or concrete placement operations. If a bar support does not achieve this level of performance, reduce the average spacing between bar supports by 15%, or remove that product from use on the job.

Ensure that bar supports do not move during concrete placing operations. To prevent movement, tie supports to the reinforcing steel.

When using bar supports on corrugated metal stay-in-place forms, use supports specifically designed for the form being used.

For structural elements located in extremely aggressive environments, do not use metal bar supports in contact with forms or floor surfaces to support reinforcing steel.

415-5.13.2 Metal Bar Supports: For metal bar supports in contact with steel stay-in-place forms and metal bar supports in contact with boundary surfaces of concrete to be cast, provide supports constructed with molded plastic legs or plastic protected steel legs or bolster rails. Do not allow any portion of the bar support other than the molded plastic leg or plastic protected portion of the steel leg or bolster rail to be closer than 1/2 inch from the boundary surface of concrete to be cast.

Certify that all metal bar supports meet the following requirements:

(1) That they are manufactured from cold drawn steel wire in accordance with the wire sizes and geometrical dimensions shown in the CRSI Manual of Standard Practice, Chapter 3, Table II.

(2) That the plastic used for protection of the steel legs or bolster rails has a thickness of 3/32 inch or greater at points of contact with the form work.

Provide plastic protection by a dipping operation, by adding premolded plastic tips to the legs of the support or by molding plastic to the top wire of the support. Ensure that the plastic material used for protection of steel legs does not chip, crack, deform, or peel

under ordinary job conditions. Provide molded plastic legs that have sufficient strength to carry the weight of the supported reinforcing steel in its required position without deformation and relaxation under job conditions.

415-5.13.3 Plastic Bar Supports and Spacers: Use non-stackable bar supports and spacers comprised of either reinforced or non-reinforced virgin or recycled plastic. Bar supports shall be able to meet the concentrated load requirements of 415-5.13.1 within a working temperature range of 20 to 150°F. Spacers shall be able to provide sufficient strength to support reinforcing steel in the required position without deformation and relaxation under job conditions. For drilled shafts, use wheel spacers with a smooth perimeter surface.

Provide protection from sunlight until placed in the form and mold in a configuration which does not restrict concrete flow and consolidation. Do not use bolster rails in direct contact with concrete surfaces.

All plastic bar supports and spacers shall have a maximum water absorption of 0.5% at 7 days as per ASTM D 570. Plastic bar supports and spacers made of recycled plastic products must meet the additional requirements of Section 972.

Provide to the Engineer independent lab test data and certification that the plastic spacers meet the requirements specified herein.

Use plastic bar supports listed on the Department's Qualified Products List. Provide each individual bar support with an identification number unique to the particular model permanently marked on the surface as included in the Qualified Products List. Manufacturers seeking evaluation of products for inclusion on the Qualified Products List must submit an application in accordance with Section 6 and include certified test reports from an independent laboratory showing that the plastic bar supports meet all the requirements specified herein.

416 INSTALLATION OF POST-INSTALLED ANCHOR SYSTEMS AND DOWELS FOR STRUCTURAL APPLICATIONS IN CONCRETE ELEMENTS. (REV 8-8-11) (FA 8-10-11) (1-12)

SECTION 416 (Pages 440 - 442) is deleted and the following substituted:

SECTION 416
INSTALLATION OF POST-INSTALLED ANCHOR SYSTEMS AND DOWELS FOR STRUCTURAL APPLICATIONS IN CONCRETE ELEMENTS.

416-1 Description.

Prepare and install post-installed anchor systems and dowels in hardened concrete as indicated in the Plans, as directed by the Engineer, and in accordance with the manufacturer's instructions and this Section.

Post-installed anchors and dowels in this Section are intended for use in structural applications where designated in the plans.

416-2 Materials.

416-2.1 Adhesive Bonded Anchors and Dowels: Use adhesive bonding material systems which meet the requirements of Section 937 and are included on the Qualified Products List. Use anchors and dowels installed in positions ranging from vertically downward to horizontal.

416-2.1.1 Type HV Adhesives: Use Type HV adhesive bonding materials for all installations other than constructing doweled pile splices. Do not use Type HV adhesives as a substitute for Type HSHV adhesives.

416-2.1.2 Type HSHV Adhesives: Use higher strength Type HSHV adhesive bonding materials for installation of traffic railing reinforcement and anchor bolts into existing concrete bridge decks and approach slabs. Type HSHV adhesives may be used as a substitute for Type HV adhesives provided the length and diameter of the anchor bolt and drilled hole remain as designed for the Type HV adhesive.

416-2.1.3 Storage of Materials: Store materials delivered to the job site in the original unopened containers within an appropriate facility capable of maintaining storage conditions consistent with the manufacturer's recommendations.**416-3 Equipment.**

Install adhesive-bonded anchor systems with equipment conforming to the manufacturer's recommendation for the type of system installed.

416-4 Preparing of Concrete Members.

416-4.1 Adhesive-Bonded Anchors and Dowels: Ensure that concrete members receiving adhesive-bonded anchors or dowels are structurally sound and free of cracks in the vicinity of the anchor or dowel to be installed. Unless other equipment is recommended by the adhesive manufacturer, drill holes to the diameter required by the manufacturer, but as a minimum, not less than 105% of the diameter including deformations, nor more than 150% of the nominal diameter of the steel bar anchor or dowel, using a rotary hammer drill and bit.

Use a metal detector specifically designed for locating steel in concrete to avoid conflicts with existing steel reinforcement whenever placement tolerances and edge clearances permit. Perform core drilling through existing steel reinforcement only when approved by the Engineer. Dry the drilled holes completely prior to cleaning and installing the anchors or dowels.

Clean and prepare drilled holes in accordance with the manufacturer's recommendations, but as a minimum, use oil free compressed air to remove loose particles from drilling, brush inside surface to free loose particles trapped in pores, then use compressed air again to remove the remaining loose particles. Use a non-metallic bristle brush and avoid over-brushing to prevent polishing the inside surface of the drilled hole.

416-5 Installation Methods.

416-5.1 Adhesive-Bonded Anchors and Dowels: Remove all debris, oils, and any other deleterious material from the anchors and dowels to avoid contamination of the adhesive bonding material. Install anchors or dowels in accordance with the details shown on the Plans and the manufacturer's instructions, with particular attention to requirements and limitations due to anchor position, dampness, ambient temperature, and curing.

Use adequate quantities of the adhesive bonding material to fill the drilled hole to within 1/4 inch of the concrete surface measured after placement of the steel bar or anchor. For horizontal and downwardly inclined installations, provide temporary supports to maintain the anchors or dowels in the center of the drilled holes until the adhesive bonding material has cured.

416-6 Field Testing of Post-Installed Anchor Systems and Dowels.

416-6.1 General: Provide an independent testing agency to perform field testing of post-installed anchors or dowels under the direction of a Professional Engineer registered in the State of Florida. Submit test reports for each LOT signed and sealed by the Professional Engineer. Perform restrained static tension tests to prevent damage to the surrounding concrete. A restrained test is defined as a test conducted in accordance with ASTM E-488 except that the test equipment support clearance requirements of ASTM E-488 do not apply. The opening in the reaction base shall be approximately equal to the drilled hole diameter for the anchor to preclude concrete or masonry failure, but allow bond failure for the adhesive-bonded anchors and dowels. Displacement measurement for field testing is not required.

Divide the post-installed anchors or dowels into LOTs for testing and acceptance. Each LOT must contain a maximum of 100 anchors or dowels, of the same type, manufacturer, diameter, embedment length and adhesive bonding material system (if applicable) installed on the same day. Randomly select four of the anchors or dowels in each LOT for testing, except if there are three or less in the LOT, in which case, test all anchors or dowels, unless otherwise directed by the Engineer. If three consecutive LOTs have no failing tests, sample the next three LOTs at a 2% rate, rounded up to the nearest whole number, and if these LOTs have no failing tests, sample at a rate of 1%, rounded up to the nearest whole number, for the remaining LOTs unless there is a failure; however, regardless of LOT size, sample at least one anchor or dowel per LOT. For every failed field test, perform two additional field tests on adjacent untested anchors or dowels within the LOT. Continue additional field tests until no more test failures occur, or all anchors or dowels within the LOT are tested. For the next LOT after a failed LOT, randomly select four of the anchors or dowels in each LOT for testing, except if there are three or less in the LOT, test all anchors or dowels unless otherwise directed by the Engineer then conform to the sampling rate procedure above including rate reductions as appropriate for subsequent LOTs.

416-6.1.1 Adhesive-Bonded Anchors: Field test installed anchors and dowels for traffic railing applications using Type HSHV adhesives. The Engineer may also require testing of installed anchors and dowels for other applications.

Test individual anchors and dowels by proof loading in tension to 85% of the specified bond strength in accordance with Section 937 based on the nominal anchor or dowel diameter and embedment depth, but not more than 90% of the yield strength of the anchor or dowel, unless otherwise shown in the Contract Documents.

416-6.2 Removal & Replacement of Failed Test Specimens: Remove all anchors and dowels that fail the field test, in accordance with the manufacturer's recommendation and without damage to the surrounding concrete. For adhesive-bonded anchors, redrill holes to remove adhesive bonding material residue and clean in accordance with 416-4. Reinstall new anchors and dowels in accordance with 416-5. Do not reuse the failed anchors and dowels unless approved by the Engineer. Assign reinstalled anchors into new LOTs only containing reinstalled anchors or dowels of the same diameter, embedment length and adhesive bonding material system, and field test in accordance with 416-6.

416-7 Acceptance.

The Engineer will base acceptance of post-installed anchor systems on determining that the material requirements of Section 937, the installation and testing requirements of this Section and the placement requirements of the Plans have been met.

416-8 Basis of Payment.

The work specified in this Section will not be paid for directly, but will be considered as incidental work.

443 FRENCH DRAINS.
(REV 6-4-10) (FA 8-17-10) (1-11)

SUBARTICLE 443-2.3 (Page 464) is deleted and the following substituted:

443-2.3 Select Fill: Use select fill meeting the requirements of either Section 911, 913, 913A or 915.

ARTICLE 443-5 (Page 464) is deleted and the following substituted:

443-5 Placing Coarse Aggregate and Backfilling.

After placing the pipe and without disturbing the pipe, carefully place the coarse aggregate around the pipe to a depth shown in the plans. Fold the filter fabric over the coarse aggregate. Backfill and compact as described below.

443-5.1 French Drains Under Pavement: Fill the area above the coarse aggregate with select fill material meeting the requirements of this Section. Place and compact the select fill according to the requirements for pipe as specified in Section 125. The Department will allow use of additional coarse aggregate over the top of the pipe instead of select fill material. In this case, the filter fabric shall be extended to wrap the additional course aggregate. The top of the coarse aggregate shall not be higher than the bottom of the base, unless shown in the plans. The Department will not pay additional costs associated with substituting coarse aggregate for select fill.

443-5.2 French Drains not Under Pavement: Fill and compact the area above the coarse aggregate according to the requirements for pipe in Section 125, unless specific procedures are described in the plans as specified in Section 125.

ARTICLE 443-6 (Page 464) is deleted and the following substituted:

443-6 Method of Measurement.

The quantity of French Drains to be paid for under this Section will be the length in feet, measured in place, completed and accepted as specified on Design Standards, Index No. 285 for French Drains.

ARTICLE 443-7 (Pages 464 – 465) is deleted and the following substituted:

443-7 Basis of Payment.

The quantities determined as provided above will be paid for at the Contract unit price per foot for French Drains. Such prices and payments will be full compensation for all the work specified in this Section and will include all materials and all excavation, and will also include sheeting or shoring, if required, the disposal of surplus material, pavement restoration, backfilling and tamping, but will not include payment for items paid for elsewhere in the specifications.

Payment shall be made under:

Item No. 443- 70- French Drains - per foot.

446 EDGEDRAIN (DRAINCRETE) – CONTROL OF QUALITY. (REV 1-15-10) (2-19-10) (7-10)

ARTICLE 446-3 (Pages 438 – 439) is deleted and the following substituted:

446-3 Control of Quality.

446-3.1 Concrete Design Mix: Submit the proposed design mix prior to production, on the "Concrete Mix Design" form, for the Engineer's approval. Use only draincrete design mixes having prior approval of the Engineer. Do not change the design mix component materials except as per 446-3.2.

The Department will verify the proposed mix design and may witness the trial batching. Meet the unit weight requirements as determined in accordance with FM 5-530, and the drain rate in accordance with FM 5-570. Also, provide one of the following with the design mix submittal:

(1) Evidence from three sets of production data, either from Department acceptance tests or independently verifiable commercial mixes, that draincrete produced in accordance with the proposed design mix meets the requirements of this Section.

(2) Test data from a single trial batch of 0.10 yd^3 minimum is required, which demonstrates that the draincrete produced using the proposed mix, designated ingredients, and designated water-cement ratio meets the requirements of this Section.

446-3.2 Batch Adjustment - Materials: Meet the theoretical yield requirements of the approved mix design. Inform the Engineer of any adjustments to the approved mix design. Note any batch adjustments and record the actual quantities incorporated into the mix, on the concrete "Delivery Ticket/Certification" form.

446-3.3 Delivery Certification: Furnish to the Engineer a complete "Delivery Ticket/Certification" form with each batch of draincrete prior to unloading at the site.

450 PRECAST PRESTRESSED CONCRETE CONSTRUCTION. (REV 8-3-11) (FA 8-10-11) (1-12)

SECTION 450 (Pages 471 – 500) is deleted and the following substituted:

SECTION 450
PRECAST PRESTRESSED CONCRETE CONSTRUCTION

450-1 Description.

Fabricate, store, transport and erect precast/prestressed concrete members prestressed by the pretensioning method. Pretensioned precast prestressed concrete products are products prestressed by the pretensioning method. In this method, steel components are stressed and anchored; the concrete for the product is then cast and cured, and finally the stress in the steel components is released from the anchorages to the concrete through bond, after the concrete has attained its specified release strength.

A precast prestressed concrete plant, hereinafter called plant, is an independent operating facility capable of performing all the operations necessary to fabricate precast/prestressed concrete products.

Obtain precast/prestressed products from a plant that is currently on the Department's list of Producers with Accepted Quality Control Programs. Producers seeking inclusion on the list shall meet the requirements of 105-3.

When the plant's Quality Control Program is suspended, accept responsibility of either obtaining precast/prestressed products from a precast/prestressed concrete plant with an accepted Quality Control Program, or await re-approval of the concrete plant's Quality Control Program. The Engineer will not allow changes in Contract Time or completion dates as a result of the concrete plant's Quality Control Program suspension. Accept responsibility for all delay costs or other costs associated with the plant's Quality Control Program suspension.

450-2 Quality Control Program.

450-2.1 General: Develop a Quality Control Program as specified in 105-3.

Meet the requirements of the accepted Quality Control Program, Contract Documents, and Precast/Prestressed Concrete Institute (PCI) Manual for Quality Control for plants and production of structural precast concrete products. The requirements of the Contract Documents will govern, when there is a discrepancy between the PCI Manual and the Contract Documents.

Accept responsibility for performing daily Quality Control (QC) inspections of all phases of work ensuring all materials and workmanship incorporated into the product meet the requirements of the Contract Documents. Also, maintain a daily activity report detailing the results of the daily Quality Control Program activities. Ensure these daily reports and minutes of the weekly meetings with the Engineer and the plant's production personnel are maintained at the plant. During the weekly meetings, discuss the results of the QC inspections.

Inspect the product for conformance with the product dimension tolerances shown in Appendix B of PCI Manual MNL-116 (Manual for Quality Control for Plants and Production of Structural Precast Concrete Products), 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-girders, excluding sweep tolerance, when inspecting the product for conformance with dimension tolerances. For Florida U-Beam diaphragms, the

tolerance for the thickness of the intermediate and end diaphragms is plus 1 inch and minus 1/2 inch, and the location of intermediate diaphragms, relative to design plan positions, is plus or minus 3 inches. The tolerance of the thickness of end diaphragms shall be plus 3 inches and minus 1/2 inch.

Limit sweep to 1/2 inch for U-Beams and Inverted-T Beams. The maximum allowable sweep for I Beams is 1/8 inch per 10 foot length, but not to exceed 1.5 inch. The maximum allowable sweep for piling is 1/8 inch per 10 feet, but not to exceed 1.0 inch.

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. Apply the tolerances during and after the fabrication of prestressed products. Do not reduce the concrete cover for reinforcing steel, prestressing steel or any other metallic objects specified in the plans more than 1/4 inch. Do not reduce the concrete cover for reinforcing steel, prestressing steel or any other metallic objects when the cover specified in the plans is minimum cover.

Ensure the QC inspector is present during concrete placements and performs inspection during all fabrication of precast prestressed concrete products, including the inspection of the operations before, during and after the placement of concrete.

Ensure the Plant QC Manager, or the QC inspectors under his/her direction, examine all precast prestressed concrete products within five working days of detensioning to ensure their dimensions conform to the specified tolerances and to determine if there are any deficiencies. This process control shall be listed on the Plant's QC Plan.

450-2.2 Plant: Ensure each plant has an onsite QC Manager meeting the requirements of 105-8.9.

450-2.3 Product Certification: Ensure the QC inspector inspects all completed products at the plant not less than 24 hours before shipment to verify that all Contract Documents requirements are met. Upon verification that all Contract Document requirements have been met and all necessary repairs have been satisfactorily completed, the product will be stamped with the approved QC Manager stamp identified in the QC Plan.

Attach to each monthly request for payment, certification that the listed precast prestressed products have been produced under the QC Plan and meet the Contract Document requirements. Ensure the certification is signed by a legally responsible person of the plant and is provided on the plant's letterhead.

450-2.4 Documentation: Ensure that a system of records is maintained in each plant which will provide all information regarding the certification and testing of prestressing steel, reinforcing steel, concrete materials and concrete, curing materials, embedded items, tensioning, concrete proportioning, pre-placement, placement, post-placement inspections, curing, and disposition of products. Include in the record keeping the deficiencies found as a result of the inspection and testing. Keep certified test reports for all materials incorporated into the production of precast prestressed concrete products.

Ensure that the printout or manual record of the tensioning operations is maintained and reflects the identification of the bed, type of fabricated products, the complete Financial Project Identification Number, jack identification number, date prestressing strands

were stressed, temperature at the time of stressing, and signature of the qualified tensioning machine operator.

Ensure the proposed method and format for documenting required information is included in the QC Plan.

Maintain records until all the precast prestressed products for a project have been fabricated then submit all the records to the Engineer. Ensure records are available at all times for the Engineer's inspection.

450-2.5 Quality Assurance Inspection and Testing: The Engineer will perform periodic inspections, sampling, and testing to ensure of the quality and acceptability of the materials, methods, techniques, procedures and processes being utilized by the Contractor in the fabrication of precast prestressed concrete products.

450-3 Materials.

450-3.1 General: Meet the following requirements:

Concrete	Section 346
Steel Strands*	Section 933
Steel Bars	Section 933
Steel Accessories	Section 933
Reinforcing Steel and Metal Fabric**	Sections 415 and 931
Embedded Duct Enclosures	Section 462
Membrane Curing compounds***	Section 925
Epoxy Resin Compounds	Section 926
Burlap	Section 925
Curing Blanket	400-16
Penetrant sealer***	Section 413
Methacrylate	Section 413
Epoxy Injection of Cracks	Section 411

* Do not use strands from more than one source in any individual prestressed element, with the exception of the partially tensioned strands (dormant strands).

** The steel spirals for reinforcing in concrete piling may be manufactured from stock meeting the requirements of any grade of reinforcing steel, as shown in ASTM A 615 for steel bars, or ASTM A 82 for steel wire.

*** Use membrane curing compounds and sealers that are compatible with coating or other materials that are applied to concrete surface.

Use inserts in accordance with the recommendations of the manufacturers and within their certified capacities and application qualifications. Do not use aluminum inserts.

Use draped strand devices of sufficient rigidity having adequate support to retain the position of the strand unchanged under the induced load. Do not allow the devices to induce friction to the tendons such that the required jacking force and elongation cannot be attained.

450-3.2 Strand Chucks and Splice Chucks: For pretensioning, use strand chucks that are capable of anchoring the strands without slippage after seating and ensure against strand failure within the grips at loads less than 95% of ultimate strength.

Provide manufacturer's certification that splice chucks used to transmit the prestressing force from one prestressing tendon to another are capable to hold at least 95% of the ultimate tensile strength of the prestressing strand.

Do not use wedges that become worn, cracked, deformed, or that allow dead end seating in excess of 3/8 inch. Use components from the same manufacturer to make up chucks and to provide proper wedge fit.

Use chucks as complete units. Clean, inspect, and lubricate the chucks between each use. Use wedges and housing that are compatible and made for the specific type and size of prestressing strand that are being used, avoid improper fit and improper seating of wedges on the strands.

The Engineer will allow one splice per strand subject to the following:

(1) Splices are located outside the concrete products (except for precast piling where up to two splices are permitted to be used in each pile, so long as they are not located in the same vertical cross section, perpendicular to longitudinal axis of the pile).

(2) Strands which are being spliced have the "lay" or "twist" in the same direction.

450-4 Material Acceptance and Testing.

450-4.1 Concrete: Perform the QC sampling and testing of concrete in accordance with the requirements of Section 346.

450-4.2 Reinforcing Steel, Welded Wire Reinforcement and Prestressing Steel for Pretensioning:

450-4.2.1 General: Identify all reinforcing steel, welded wire reinforcement and prestressing steel for pretensioning by LOTs. A LOT of reinforcing steel or welded wire is a shipment of material from the same manufacturer and heat. A LOT of prestressing steel is a shipment of material of the same size, production grade and heat from the same manufacturer.

Acceptance of reinforcing steel, welded wire reinforcement and prestressing steel for pretensioning is based on manufacturer's certification and the Department's verification tests. The sampling for verification testing will be performed by the Department at each precast plant, on at least two LOTs per year, additional samples may be taken at the manufacturing source of reinforcing steel, welded wire reinforcement and prestressing strands.

When products contain the material that has failed to meet the requirements of 450-3, reject the unused material of the failed LOT. The Engineer may require the evaluation of the products, which contain the failed material, in accordance with 450-14.

450-4.2.2 Reinforcing Steel and Welded Wire Reinforcement: Obtain and maintain for each LOT a certified mill analysis, physical property test report and the manufacturer's assigned LOT number with the heat of the material represented. Verify that the report represents the steel received and that the steel meets the Contract Documents requirements. Reject all unidentified reinforcing steel or welded wire reinforcement received at the plant or job site.

Provide the manufacturer's certified mill analysis and three 7 foot long, randomly selected samples from the designated LOT of reinforcing steel and three randomly selected samples from the designated LOT of welded wire reinforcement when requested by Engineer. Ensure each sample of welded wire reinforcement covers an area of four intersections of transverse and longitudinal bars. Ensure the transverse wires of each piece of welded wire reinforcement extend approximately 6 inches to both sides.

450-4.2.3 Prestressing Steel for Pretensioning: Obtain and maintain for each LOT of material received, the manufacturer's assigned LOT number, certified test values for specified material properties together with a representative load-elongation curve and the modulus of elasticity value based upon strand nominal area. Provide and support by records

maintained by the strand manufacturer, production tolerances applied in selection of the reported strand modulus. Verify that documents provided represent the shipment received and meets the Contract Documents requirements.

Reject all unidentified prestressing steel received at the plant or job site.

Provide the manufacturer's certified mill analysis and three 5 foot long randomly selected samples from the designated LOT of material when requested by the Engineer.

450-4.2.4 Strand Chucks and Splice Chucks: Obtain and maintain certified test results certifying that the material meets the requirements of 450-3.

450-4.2.5 Steel Accessories: Use only steel accessories meeting the requirements of 450-3.

450-4.2.6 Ducts: Obtain and maintain certified test results certifying that the material meets the requirements of 450-3.

450-5 Shop Drawings.

Submit shop drawings when the Contract Documents do not contain all the detailed information necessary to fabricate and erect the pretensioned prestressed concrete product. Ensure the submitted shop drawings meet the requirements of 5-1 and any additional Contract Document requirements.

Shop drawings are not required to depict supplemental reinforcing steel used to facilitate fabrication of products.

In lieu of shop drawings, furnish one copy of the following to the Engineer:

1. A copy of the Framing Plan with product designations for all superstructure components.
2. Strand detensioning schedule.
3. Tensioning and elongation calculations.
4. Details of supplemental steel that remains as part of the finished product.
5. When proposing to use materials and/or methods that differ from the requirements of the Contract Documents, submit full plan details and Specifications for the alternate materials and methods. Ensure the alternate materials and methods meet the following requirements:

a. The provisions of the Contract Documents.

b. The AASHTO LRFD Bridge Design Specifications, edition with interims as referenced in plans.

c. The recommendations of the material manufacturer.

d. Any materials change proposed by the Contractor and approved by the Engineer.

e. Net compressive stress in the concrete due to prestressing acting alone, after all losses, is not less than that provided by the stranding shown in the plans.

f. Ultimate strength of the structure with the proposed changes is not less than the ultimate strength of the original design.

g. The provisions of the Departments Structures Design Guidelines.

450-6 Forms.

450-6.1 General: Use metal side and bottom forms, unless otherwise specified in the Contract Documents. For members with special shapes such as corner sheet piles, wood forms are permitted. Slab units and sheet piles may be cast on concrete surfaces meeting the profile

dimensional tolerances of 450-6.3. Apply release agents in accordance with the manufacturer's recommendations. Liquid membrane curing compounds may be used to prevent bonding of slab products and sheet piles to the existing concrete surface, when applied in two or more coating. Ensure the last application of liquid membrane is applied immediately before placement of the slab or sheet pile.

For all beam members, use side forms designed to be removed without damaging the top flange of the beam. Remove the forms horizontally away from the beam by a method that prevents any contact of the form with the top flange after release of the form. Do not subject the top flange to any vertical force at any time. Include the form details and method of removal in the QC Plan.

For all Florida-I Beams, use forms that do not have more than two horizontal joints.

Use void forms of a type for which service adequacy has been demonstrated, having sufficient strength to provide stability during handling and placing and to withstand hydrostatic pressures and other forces imposed upon them during concrete placement. Use form material that is neutral with respect to the generation of products harmful to the physical and structural properties of the concrete. Ensure that the presence of the form materials does not cause any detrimental effect to the concrete or other materials within the member. Positively vent all voids to the outside of the member. For end headers and inside forms, other materials capable of resisting the pressure from concrete are permitted.

Use end headers so designed that they can be placed and maintained in correct position between the side forms. Hold the headers in place with devices capable of being removed or loosened after the concrete has attained its initial set allowing free form expansion during curing methods that involve heat. Use end headers with openings conforming to the prestressing steel pattern to permit passage of the prestressing steel. Locate the openings accurately within 1/8 inch of planned location of prestressing steel elements.

Construct circular openings for strands a maximum of 1/4 inch larger than the nominal strand diameter. Construct square or rectangular openings a maximum of 1/4 inch larger, horizontally and vertically, than the nominal strand diameter. Ensure that all headers are mortar tight.

450-6.2 Supports: Use forms of sufficient thickness, with adequate external bracing and stiffeners, which are anchored to withstand the forces due to placement and vibration of concrete. Ensure that joints in forms are mortar tight. Support bottom forms on concrete pallets with metal stiffeners, wales or shims. Do not use timber elements between the bottom metal form and concrete pallets.

450-6.3 Alignment: Make and maintain during their use, forms and centering true to the shapes and dimensions for the product being produced. Plumb, align, and secure forms for each product in position before each reuse.

Apply the following tolerances to form alignment and pallets or beds used in prestressed construction:

1. Horizontal Alignment (horizontal deviation of side forms either side of a vertical plane within the length of a product) = 1/8 inch,
2. Vertical Alignment (vertical deviation of the bed or pallet from a horizontal plane within the length of a product) = 1/8 inch,
3. For vertical joints, Offset Between Adjacent Form Sections = 1/8 inch.

4. For horizontal joints, Offset Between Adjacent Form Sections = 1/16 inch.

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 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.

450-6.4.2 Cold Weather: Provide a distance of at least 5 feet from the end header to the stressing anchorage, when the ambient temperature is expected to be below 55ºF between the time of tensioning and detensioning. When the ambient temperature is expected to be below 55ºF between the time of tensioning and detensioning and the products' exposed strands between the stressing anchorages are not protected, maintain a 25 foot minimum free length of stressed strands, between the end header and the stressing anchorage at each end of a bed line. When cold weather concrete conditions as specified in 450-10.1 are in effect, protect all exposed strands between stressing anchorages regardless of length. When the products and strands between stressing anchorages are protected, provide protection adequate to maintain the ambient temperature of the air around the strands at or greater than 55ºF until the products are detensioned.

450-6.5 Surface Conditions: Use clean, rust free form surfaces against which concrete is to be cast. Inspect forms and, if necessary, recondition them.

450-6.6 Form Ties: Ensure that no form wires or metal pieces are left within 2 inches of the surface of the finished concrete.

450-6.7 Corners, Angles and Joints: Ensure corners and angles are chamfered, mitered, or rounded with a radius of 3/4 inch, unless otherwise specified or shown on the plans. Provide smooth mortar tight joints between panel forms within the alignment tolerances.

450-6.8 Form Release Agent: Before placing concrete, treat the facing of all forms with a form release agent in accordance with the manufacturer's requirements. Ensure the application of form release agents does not contaminate prestressing strands and/or reinforcing steel.

450-7 Protection and Placement of Prestressing Steel.

450-7.1 Protection of Prestressing Steel: Maintain and store prestressing steel above the ground surface on platforms, skids, or other supports, to prevent contamination from below, and protect them from mechanical injury. Do not use any packaging or wrapping material that retains moisture at the bottom of the reel. Clean contaminated prestressing steel before use or otherwise reject it. Handle prestressing steel carefully to prevent nicks or kinks and do not expose it to temperatures greater than 200ºF at any time. Do not use arc welding equipment, including welding electrode lines, within 2 feet of prestressing steel. Do not perform any welding on forms that have been set in place after the prestressing steel is placed in the bed. Reject prestressing steel that has sustained any physical damage at any time.

450-7.2 Placing Prestressing Steel: Use care during placement of prestressing steel to avoid physical damage and contamination. Reject damaged strands. Do not use prestressing steel containing nicks, kinks, or former chuck grip marks. Do not use steel showing evidence of scale formation or which has become pitted. Remove and replace any damaged prestressing steel in the bed.

450-7.3 Cleanliness of Prestressing Steel: Inspect the prestressing steel for any evidence of contamination. Use steel that is free of deleterious materials such as grease, oil, wax, dirt, paint (except that used for marking identification) or other similar contaminants. Remove any

contaminants detected from the steel before proceeding with fabrication activities. Rust on prestressing steel that can be removed by light rubbing is acceptable. Streaks or spots which may remain after rust removal are acceptable if no pitting is present.

450-7.4 Debonded Strands: Extend the tubular debonding material (sheathing) through the header for debonded prestressing steel. Tie and tape the debonding material at the terminus located at the inside of the member. Seal openings between strand and sheathing for debonded strands with 100% silicone sealant within seven calendar days of detensioning. The sealing of openings between strand and sheathing is not required for beams with ends not be encased in permanent concrete diaphragms per 450-11.5 and strand protection per 450-11.6. Use sheathing that is tubular non-slit, high-density plastic with a minimum wall thickness of 0.025 inch, and an inside diameter exceeding the maximum outside diameter of the pretensioning strand by 0.025 inch to 0.14 inch, which does not react with concrete, coating, or steel and prevents the intrusion of water or cement paste during concrete placement.

Do not use strands debonded over the full length of a product.

450-8 Tensioning Equipment and Operations.

450-8.1 Equipment: Use a hydraulic jacking system that is adjustable to the automatic application and sustaining of a predetermined load, together with a pressure transducer or load cell built into the hydraulic system. Connect such pressure gage or transducer to a dial or digital readout and printer (manual recording of the tensioning operations is permitted) which will provide an instantaneous readout and record of the applied load in pounds. Use a jacking system with the capacity to induce the required load. Base the use of this system on demonstrated accuracy and repeatability of plus or minus 2% of anticipated load verified through comparison with loads indicated by an independent load cell.

Calibrate all jacking systems before using and repeat calibration at intervals not exceeding 12 months. Calibrate and recalibrate in accordance with the equipment manufacturer's recommendations, by qualified calibration agency or by plant personnel under the supervision of a Specialty Engineer.

Calibrate gages, jacks and pumps as a system in the same manner they are used in tensioning operations with the cylinder extension in the approximate position that it will be in actual use at final jacking force. In multi-strand tensioning systems, gages may be calibrated against a master gage of known accuracy, provided that the other units of the system are calibrated against the same master gage. Ensure calibrations cover the load ranges that will be used during production. Verify the accuracy setting of the automatic cutoff valves by running the desired cutoff load. Ensure a certified calibration curve accompanies each tensioning system. Load readings can be used directly if the calibration determines a reading is within plus or minus 2% tolerance of anticipated load. Ensure calibration of load cells or proving rings used to calibrate jacking systems are on compression force testing equipment that has been calibrated in accordance with ASTM E 74.

When any jack or gage appears to be giving erratic results, or if the jack force and elongation do not compare within specified limits and differences cannot be justified while work is in progress, recalibrate the equipment. Also verify the accuracy of the equipment after internal jacking system repairs or when gage and jacking units are switched.

Calibrate or recalibrate in accordance with ASTM E 4 using equipment that is calibrated in accordance with ASTM E 74. After calibration or recalibration has been completed, prepare a certificate and have it signed by the person in responsible charge of the verifications as outlined in ASTM E 4 and ASTM E 74. Ensure that the calibration report includes, the serial

number of the equipment that is calibrated, calibration chart in a graph or tabular form, calibration date, temperature, full range of readings before and after calibration, National Institute of Standards and Technology's (NIST's) traceable number of calibration device, method of calibration, calibration agency, and laboratory or Engineer supervising the calibration.

Verify the accuracy of the jacking and recording system a minimum of once each week during tensioning operations by either an independently calibrated load cell, or by comparison with calculated strand elongation. When weekly verification is to be performed by comparison with calculated strand elongation, check a minimum of ten strands and the difference in the indicated load and the load determined from the elongation must agree within 5% of the computed theoretical load values. If the differences are greater than 5%, suspend the tensioning operation, evaluate the tensioning operation by qualified personnel and correct any deficiencies before proceeding.

When weekly verification is done by load cell, perform a minimum of five spot checks to the maximum anticipated load of strands. Use a load cell or proving ring that is calibrated in accordance with ASTM E 74 and the accuracy of the force must be traceable to NIST. Maintain written records of readings obtained from the force recording system and verifying standard. Ensure the weekly verification record includes the serial number of the equipment, verification date, verification agency, NIST traceable number of calibration standard, and name of the person making the spot checks. The load reading from the recording system must agree within plus or minus 2% of the anticipated load indicated by the load cell or proving ring that are calibrated annually.

450-8.2 Operations:

450-8.2.1 General: The tensioning operations consist of the application of the final force or load which is the force required by the plans and with the adjustments for abutment rotation, bed shortening, anchorage header movement, live end seating, dead end seating, splice chuck seating, friction in the jacking system and any other elements as applicable for the type of bed and anchorage being used. Also, adjust the force required by the plans when the temperature differential between the ambient temperature at time of stressing and the expected concrete temperature at time of placement is greater than 25ºF. Increase the force at the rate of 1% for each 10ºF increment that the ambient temperature at time of stressing is below the expected concrete temperature at time of placing. Decrease the force at the rate of 1% for each 10ºF that the ambient temperature at time of stressing is above the expected concrete temperature at the time of placing. Do not allow the stress in the prestressing steel to exceed 80% of the specified tensile strength of the strand, after seating. During each tensioning operation, for the verification of the live and dead end seating, check the seating of at least 4 strands or a minimum of 10% of the total number of strands, whichever is greater. Maintain a printed or manual record of the tensioning operation.

Compensation for temperature differential and abutment rotation are not required for self-stressing beds. However, adjust the final load for the effects of bed shortening due to the load from all the strands.

If the placement of concrete is delayed for more than seven calendar days after the completion of the stressing operation, check and adjust the final strand load as necessary before placement of concrete and maintain a printed or manual record of the stressing operation.

Accomplish tensioning by either single strand tensioning or multiple strand tensioning, and ensure that it is symmetrical about the vertical axis of the product. Tensioning methods, in general, consist of tensioning to the required loads indicated by the

jacking system, or tensioning to the required load while monitoring the elongation of the prestressing steel.

450-8.2.2 Single Straight Strand Tensioning: Apply an initial force of 5% to 25% of the final force to eliminate slack in the system. When single straight strand tensioning is used, tension the prestressing steel until the required final force is attained. Measure and record the force and elongation.

450-8.2.3 Multiple Straight Strand Tensioning: Apply the initial uniform tensioning load to each individual strand before the application of full tensioning load to the group of strands. The amount of the initial load will be influenced by the length of the casting bed and the size of strands in the group to be tensioned. The minimum initial tensioning load will be 5% of the required final load. Increase the magnitude of this load if deemed necessary but do not allow it to exceed 25% of the required final load. Then tension the strands by multiple strand tensioning to final load by pulling to elongation and checking against the jack load. Allow the required elongation to control the tensioning. The actual jack load must agree within 5% of the required load.

For uniform application of load to strands, the face of anchorage at final load must be in a plane parallel to its position under initial load. Verify this by measurement of movement on opposite sides of the anchorage and check its plumb position before and after application of the final load. During tensioning, allow the anchorage to move without restraint.

450-8.2.4 Draped Strand Tensioning: Tension draped strands by either partial tensioning and subsequent strains or by final tensioning in draped position.

Partial stressing and subsequent strains applies when the strands are tensioned through a combination of applied jack loads and strand uplift. To verify the final force, place a load cell between the tensioning anchorage and anchor chucks at the dead end on at least two draped strands. Other methods as approved by the Engineer may be used to verify the final force in the dead end. Bring the partially draped strand to an initial tension using a force in the range of 5% to 25% of the required final tensioning force. After application of the initial force, establish reference marks for measuring elongation. Apply a pre-calculated jacking force and measure elongations on a minimum of four strands. The average measured elongation must agree within 5% of the theoretical elongation for strand force measured by jack load, or the factors contributing to the difference must be identified and corrected before proceeding. Allow the load indicated by the jacking system to control the tensioning for the pre-calculated load. Obtain the required final force by lifting or depressing the strand simultaneously at all pickup or hold down points or in an approved sequence as shown on the shop drawings. On each different bed setup, after lifting or depressing the strands to their final position, check the final force at the dead end of at least two strands on the bed. If the load is below the required tensioning force by more than 5%, adjust it to the final load.

When the final stressing is performed in the draped position, apply the tensioning load in two increments with the tendons being held in their draped positions. To verify the final force, place a load cell between the tensioning anchorage and anchor chucks at the dead end on at least two draped strands. Other methods as approved by the Engineer may be used to verify the final force in the dead end. Bring each strand to an initial tension of 5% to 25% of the final load before the application of the required final load. After application of the initial load, establish reference marks for measuring elongation. Then tension the strands to final load and measure the elongation. Allow the load indicated by the jacking system to control the tensioning for the initial and final loads. The measured elongation must agree within 5% of the

theoretical elongation for the strand force measured by jack load, or the factors contributing to the difference must be identified and corrected before proceeding. When the jacking is performed at one end of the bed, check the applied load on two draped strands at the other end of the bed. If the load on the end opposite the jacking end is below the required value by more than 5%, adjust the load to the required final load.

450-8.2.5 Wire Breakage: Limit wire breakage to 2% of the total area of the strands in any product and verify that breakage is not indicative of a more extensive distress condition, otherwise reject all stranding. Replace individual strands with more than one wire failure.

450-8.2.6 Position of Prestressing Steel: Position prestressing steel as shown in the plans within the tolerances allowed in 450-2.1. Fix the required vertical and horizontal position of each prestressing strand at the ends of each product and at intervals within each product not exceeding 30 feet. Use the method of fixing the prestressing steel shown in the QC Plan. When blocks are to be used for supporting prestressing steel, use those cast from concrete of the same mix design as used in the prestressed product. Stagger the location of blocks with an offset of 12 inches or greater and do not stack them.

450-9 Placement of Reinforcing Steel and Other Embedded Materials.

450-9.1 Reinforcing Steel: Tie and/or support in position all reinforcing steel in each product with other reinforcing steel in a manner that will accurately position the steel throughout the fabrication process. Use types of ties and methods of tying recommended by the CRSI, including lacing. Do not tie reinforcing steel to debonded prestressing steel within the limits of the sheathing material.

Tie or lace beam stirrup bars at a minimum of three points. Tie reinforcing steel, other than stirrup bars in beam ends, as a minimum, at every other intersection. Either tie or lace spiral wire in piling at all four corners in the 1 inch pitch area, at the top corners and bottom center in the 3 inch pitch area, and at the top corners in the center area. Tie the bottom center in the pile center area as necessary to maintain concrete cover. Bend all tie wires away from the form surface to provide maximum concrete cover.

When shown on the plans, weld reinforcing steel in accordance with the requirements of AWS Structural Welding Code D 1.4. Do not weld in the prestressing bed.

450-9.2 Other Embedded Materials:

450-9.2.1 Inserts and Lifting Devices:

450-9.2.1.1 Placement: Locate inserts and lifting devices in accordance with the tolerances listed in 450-2.1.

450-9.2.1.2 Corrosion Protection: Provide corrosion protection for embedded metal lifting devices that would remain exposed after construction.

After lifting operations using recessed metal lifting devices are complete, backfill block-outs with a Type F epoxy compound meeting the requirements of Section 926 for a minimum distance of 2 inches beyond the perimeter of the metal device as measured parallel to the exposed concrete surface. If the block-out extends less than 2 inches beyond the perimeter of the metal device, extend the epoxy compound beyond the block-out along the concrete surface. If Type 304 or 316 stainless steel lifting devices are used, non-shrink grout meeting the requirements of Section 934 may be used to backfill the block-out within its limits.

After lifting operations using flush or protruding metal lifting devices are complete, cut the lifting devices back to a minimum depth of 1 inch below the

concrete surface and patch with a Type F epoxy compound meeting the requirements of Section 926. For all square prestressed piling, concrete sheet piling and concrete poles, cut and patch lifting devices before transporting from the casting yard.

450-9.2.2 Placement of Bearing Assemblies: Set bearing assemblies designed to transmit reaction forces to the concrete in the position shown in the plans. Place bearing plate assemblies or shoes which are to be cast in a product within appropriate tolerances as provided in 450-2.1. Check the assemblies for position after stripping from the forms.

450-10 Concrete Operations.

450-10.1 Temperature Restrictions:

450-10.1.1 Cold Weather Concreting: When the temperature of the surrounding air is expected to be below 40ºF within 24 hours after placing concrete, the temperature of the plastic concrete as placed must be 55ºF or greater. Maintain the temperature of the concrete after placement at or above 55ºF for the first 24 hours or until detensioning, whichever occurs first, then maintain the temperature at or above 50°F until the prestressing steel is detensioned. For piles and other members with a minimum section dimension of 12 inches or more, maintain the concrete temperature at or above 50°F for the first 24 hours or until detensioning, then maintain the temperature at or above 40°F until the prestressing steel is detensioned. Make arrangements for heating, covering, insulating or housing the concrete work in advance of placement and maintain the required temperature without injury due to concentration of heat. Do not use direct fired heaters during the first 24 hours after concrete placement, unless actions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide. Continuously monitor the temperature of the concrete or the ambient air around the product until the product is detensioned. Monitor by the use of thermocouples located in the product cross-section or temperature recording devices located under the enclosure. Provide one thermocouple or temperature recording device for each 200 feet of bed length or part thereof. Locate the thermocouples within the products cross-section as shown in the QC Plan or as approved by the Engineer. Record the monitored temperatures determined by each thermocouple. Review the recorded temperatures to ensure that they are within the specified limits. Initially calibrate recording devices or thermocouples and recalibrate them at least annually in accordance with the manufacturer's recommendations.

450-10.1.2 Hot Weather Concreting: Meet the requirements of Section 346 for temperature requirements and special measures for mixing concrete in hot weather.

Apply fog mist spray of water to prestressing strands, reinforcing steel and steel forms just before placing the concrete when the hot weather concreting special measures are in effect and the temperature of steel forms or reinforcing steel is greater than 120ºF.

450-10.2 Protection of Concrete from Weather: Have protection materials available before the concrete placement begins to cover the products in the event of rain during the placement of concrete. Protection materials may be tarps, curing blankets, or other impervious material that will not puncture when placed over protruding reinforcing steel and/or form elements. Include the method and materials for protection in the QC Plan.

450-10.3 Concrete Placement:

450-10.3.1 General: Check forms, reinforcing steel, prestressing steel, vent pipes, anchorages and other embedded items for compliance with the Contract Documents before placing concrete. Place concrete in accordance with 400-7, except as modified herein.

For concrete operations conducted at night, provide enough lighting to allow visual inspection of the interior of the forms during the complete concrete placement operation.

Convey concrete by the use of buckets, conveyors, pumps, troughs, or other equipment specifically designed for concrete conveyance, provided the placement method consistently produces quality concrete with no segregation or separation of the mix. Locate the concrete conveyance equipment within 12 inches of the top of the forms or surface of the concrete to minimize the free fall of the concrete.

Multiple placements may be used within a bedline, provided compliance with 450-11.1 is maintained.

450-10.3.2 Requirements for Successive Layers: Except for self-consolidating (self-compacting) concrete, place concrete as described in 450-10.3.2.1 through 450-10.3.2.5 as shown in the QC Plan or as approved in writing by the Engineer.

In any progressive concrete placement operation, do not allow the time between successive placements onto previously placed concrete to exceed 20 minutes, unless the previously placed concrete has not yet stiffened, as evidenced by the continued effective use of vibration.

450-10.3.2.1 AASHTO Type II, Florida-I Beam 36and Double-T Beams, Piling and Precast Slab Units (Except Voided Piling and Slabs): Place concrete in one or more layers or lifts. If more than one layer is used for Double-T Beams, end the first layer such that the top of the concrete is slightly below the bottom of the flange.

450-10.3.2.2 AASHTO Type III, Type IV and Florida-I Beams 45 and 54 and Voided Units (Slabs and Piling): Place concrete in a minimum of two horizontal layers. The thickness of the first layer will be such that the top of the concrete is just above the top of the bottom flange. In voided units, end the first layer slightly above the middle height of the void. Fill the form by the last layer.

450-10.3.2.3 All Beams 63 Inches or Deeper: Place concrete in a minimum of three horizontal layers. The thickness of the first layer will be such that the top of the concrete is slightly above the top of the bottom flange. The thickness of the second layer will be such that the top of the concrete is slightly above the bottom of the top flange. Fill the beam forms by the last layer.

450-10.3.2.4 Pretensioned I Beams Containing Longitudinal Post-tensioning Ducts: Place concrete in one continuous lift beginning in the end block zone and progressing to the other end. Do not allow the progression of the concrete placement to proceed until previously placed concrete has been properly consolidated, and the rate of advancement equals the ability to fill the forms. In progression of the placement, deposit concrete within the forms on the surface of previously placed concrete.

450-10.3.2.5 Florida U Beams: Place the concrete in Florida U Beams in a minimum of two horizontal layers. The thickness of the first layer shall be such that the top of the concrete is above the top of the bottom flange.

450-10.4 Vibration of Concrete: Except for self-consolidating concrete, consolidate concrete by internal or external vibration, or combination of these methods. Design external form vibrators for the specific use. Design forms used in conjunction with external vibration and build them to effectively transmit vibration to the concrete mass. Mount and operate form vibrators in compliance with the vibrator manufacturer’s written recommendations, a copy of which must be on file at the prestressed concrete plant. Secure vibrators to the form mounts by positive locking

devices so that maximum vibration is transmitted into the form. Modify or replace external form vibrator systems that are demonstrated to be ineffective. Operate vibrators at each mount location for the time necessary for complete concrete consolidation. Do not allow progressive points of vibration to exceed twice the visually effective radius of vibration. Keep forms equipped with external vibrators clean, and free of any buildup of hardened concrete.

Ensure internal vibrators are available before concrete placement is started. Use an internal vibrator with a head of such size that proper vibration of the concrete will be secured without causing movement of the prestressing steel or reinforcing steel. The vibrating frequency range must be 8,000 to 15,000 impulses per minute. Have at least one standby vibrator available on-site. Insert the vibrator in the concrete at points spaced to ensure uniform vibration of the entire mass of the concrete. Do not allow points of insertions to be further apart than the radius over which the vibrator is visibly effective. Allow the vibrator to sink into the concrete by its own weight and allow it to penetrate into the underlying layers sufficiently so that the two layers are thoroughly consolidated together. After the concrete is thoroughly consolidated, slowly withdraw the vibrator to avoid formation of holes.

Revise the existing placement and consolidation procedure to improve the consolidation of the concrete, if the existing placement and consolidation procedure have produced unacceptable surface defects such as honeycombing, aggregate or mortar pockets, and excessive air bubbles.

450-10.5 Finishing:

450-10.5.1 General: When concrete incorporating silica fume is used, screed and finish with a continuous water fog mist maintained above the concrete. Do not apply the fog directly toward the concrete. The Contractor may apply a monomolecular finishing aid approved by the Engineer in accordance with the manufacturer's recommendation.

450-10.5.2 Beams: Rough float the top surface of the beam and then scrub it transversely with a coarse brush or metal tine to produce a roughened surface for bonding. Unless otherwise specified, apply a Class 3 surface finish to the external surfaces of prestressed beams in accordance with Section 400. Remove mortar leakage and stains to produce beams with a uniform appearance.

450-10.5.3 Piling: Unless a Class 5 Applied Finish Coating is otherwise specified, apply a general surface finish as specified in Section 400 to pile surfaces, except that pointing with mortar will not be required for cosmetic chips and bug holes with a depth less than 1/4 inch and a diameter of less than 3/4 inch. All other general surface finish requirements will apply, including the pointing of material form tie cavities with mortar. Surface finish deficiencies that meet the definition of noncomplying prestressed products must be corrected in accordance with 450-12. Miter or round the top corners similar to the corner radius of the pile forms. Surfaces exposed during casting must have a steel trowel finish.

450-10.5.4 Slabs and Double-T Beams: When the plans show the top surface of prestress slab or Double-T Beams units to be the riding surface, apply a Class 4 floor finish in accordance with Section 400. When the plans show the surface to be overlaid with asphalt or concrete, rough float the top surface and then scrub it transversely with a coarse brush to remove all laitance and to produce a roughened surface for bonding. Unless otherwise specified, apply a Class 3 surface finish to other exposed surfaces in accordance with Section 400.

450-10.6 Curing: Cure prestressed concrete as required for a minimum duration of 72 hours. If forms are loosened or removed before the 72 hour curing period is complete, expand the curing to cover the newly exposed surfaces by either coating with curing compound or

extending the continuous moist cure area. Maintain concrete surface moisture at all times until curing is begun. If a water sheen is not present, apply supplemental moisture by fog misting or prevent water sheen loss on flat work by use of an evaporation retarder.

After the finishing operations have been completed and as soon as the concrete has hardened sufficiently to permit the application of curing material without marring the exposed surface, cover the exposed surfaces of all prestressed concrete products by one of the following procedures or other alternate curing methods. Alternate curing methods and details proposed by the Contractor must be included in the QC Plan or otherwise approved by the Engineer. Base alternate curing methods upon a demonstrated ability to retain surface moisture of the concrete and to control curing temperatures within acceptable limits. Discontinue use of any alternate curing method other than those included herein upon any indication of noncompliance with this Specification.

450-10.6.1 Continuous Moisture: Place burlap on the surface and keep it continuously saturated for the curing period by means of soil soakers, leaking pipes, or automatic sprinklers. Do not apply moisture manually. If side forms are removed during the curing period, extend the burlap to completely shield the sides of the product. Water flow may be metered to cycle repetitively for five minutes on and five minutes off during the 72 hour curing period. When it is not practical to apply moisture or curing compound inside the voided piles, cover their ends with wet burlap to prevent moisture loss.

450-10.6.2 Membrane Curing Compound: Apply a white Type 2 curing compound to all surfaces in a single-coat, continuous operation, at a uniform coverage as recommended by the manufacturer but not less than 1 gal. per 150 square feet. Apply the curing compound on the concrete surfaces that are still damp but no free standing water. Allow surfaces covered by the membrane curing compound to remain undisturbed for the curing period. Recoat any cracks, checks or other defects in the membrane seal which are detected during the curing period within one hour. If side forms are loosened during the curing period, remove them at that time and immediately coat the formed surfaces with a clear membrane curing compound and maintain the surface seal for the remainder of the curing period. Bottom surfaces must be similarly coated after removal of the forms. Remove membrane curing compound to applied surfaces of concrete products to which other concrete is to be bonded by sandblasting or water-blasting until all traces of membrane curing compound are removed.

When the curing compound is applied by spraying, use a compressor driven sprayer of sufficient size to provide uniform spray at the nozzle. Keep all nozzles clean to ensure a uniform application of compound. For compressor driven sprayers, provide a calibrated reservoir which will allow the quantity of applied materials to be accurately determined. Maintain standby equipment in case of mechanical failure. If a mechanical failure occurs, a hand held pump-up sprayer may be used to apply curing compound to the remainder of the products cast in the day's production. Suspend additional concrete placements until the mechanical sprayer is functioning properly.

450-10.6.3 Curing Blankets: Curing blankets may be used for curing the top surfaces of products. Do not use curing blankets which have been torn or punctured. Securely fasten edges to provide as tight a seal as practical. Allow curing blankets to remain in place for the curing period. Should the system fail to maintain a moist condition on the concrete surface, discontinue the use of curing blankets and take immediate corrective action to prevent further loss of concrete moisture.

450-10.7 Accelerated Curing:

450-10.7.1 General: Use low-pressure steam curing, radiant heat curing or continuous moisture and heat curing. If accelerated curing is completed before the curing period has elapsed, continue curing for the remaining part of the curing period in accordance with one of the curing methods above.

If accelerated curing is used, furnish and use temperature recording devices that will provide accurate, continuous, and permanent records of the time and temperature relationship of the enclosure and concrete throughout the entire curing period. Place the temperature recording sensors at a minimum of two locations, spaced approximately at or near the third point of bed length, to measure the temperatures of the enclosure and concrete. Initially calibrate recording thermometers and recalibrate them at least annually in accordance with manufacturer's recommendations. Place the sensors at the center of gravity of the bottom flanges for beams. Place the sensors at the center of gravity of the cross sections normal to pile length for solid piles, and at the midpoint of the wall thickness of the pile for voided piles.

When the ambient air temperature is equal to or higher than 50ºF, start the accelerated curing by supplying or retaining moisture and the application of the heat, following the initial set period of concrete. Determine the initial set time in accordance with ASTM C 403. During the application of heat, do not allow the temperature rise in the concrete product to exceed 36ºF per hour. The maximum curing temperature of the enclosure or concrete must not exceed 150ºF. Maintain the maximum curing temperature uniform throughout the enclosure, with variation of not more than 20ºF from the maximum peak temperature until concrete reaches the required release strength. Allow the concrete element to cool gradually at the maximum cooling rate of 50ºF per hour and continue the cooling at this rate until the concrete temperature is 40ºF or less above the ambient temperature outside the curing enclosure.

When the ambient air temperature is below 50ºF cure the concrete in two stages. Start the accelerated curing of the first stage during the preset period by applying heat to increase the temperature of concrete at the maximum rate of 10ºF per hour. The total temperature gain of concrete during the initial set period cannot exceed 40ºF higher than the placement temperature, or 104ºF, whichever is less. Upon obtaining the initial set, continue curing as stated above for ambient temperature of 50ºF or higher. To prevent moisture loss on exposed surfaces during the preheating period, cover products as soon as possible after casting or keep the exposed surfaces wet by fog spray or wet blankets. Use enclosures for heat curing that allow free circulation of heat about the product and that are constructed to contain the heat with a minimum moisture loss. The use of tarpaulins or similar flexible covers may be used provided they are kept in good repair and secured in such a manner to prevent the loss of heat and moisture. Use enclosures that cover the entire bed from stressing abutment to stressing abutment, including all exposed stranding.

450-10.7.2 Low-Pressure Steam: The steam must be in a saturated condition. Do not allow steam jets to impinge directly on the concrete, test cylinders, or forms. Cover control cylinders to prevent moisture loss and place them in a location where the temperature is representative of the average temperature of the enclosure.

450-10.7.3 Curing with Radiant Heat: Apply radiant heat by means of pipe circulating steam, hot oil or hot water, or by electric heating elements. To prevent moisture loss during curing, keep the exposed surfaces wet by fog spray or wet blankets.

450-10.7.4 Continuous Moisture and Heat: This method consists of heating the casting beds in combination with the continuous moisture method described above. Do not allow the heating elements to come in direct contact with the concrete or the forms. The initial

covering of burlap and the continuous application of moisture will be as described in 450-10.6. An auxiliary cover in addition to the burlap for retention of the heat will be required over the entire casting bed. Support this cover a sufficient distance above the product being cured to allow circulation of the heat.

450-10.8 Curing Requirements for Silica Fume Concrete: Use either a 72 hour continuous moisture curing or a (12-24) hour low-pressure steam curing in accordance with 450-10.7. Upon completion of the low-pressure steam curing, continue curing for the remaining part of the 72 hour curing period by application of the curing compound, continuous moisture curing, or use of the curing blankets.

If 72 hour continuous moisture is used, begin curing silica fume concrete immediately after the finishing operation is complete and keep a film of water on the surface by fogging until the curing blankets are in place. No substitution of alternative methods nor reduction in the time period is allowed. After completion of the 72 hour curing period, apply a membrane curing compound to all concrete surfaces. Apply curing compound according to 450-10.6.

450-10.9 Form Removal: Do not remove forms sooner than six hours after casting and not until the concrete strength is sufficient to avoid structural damage. For AASHTO Type V, Type VI, Florida-I Beams, and Bulb-T Beams, do not remove the forms supporting the top flange concrete sooner than 12 hours after casting unless the release strength has been reached.

450-11 Detensioning.

450-11.1 General: The required concrete strength at which the prestressing force may be transferred to the concrete in a product will be a minimum of 4,000 psi, unless specified otherwise in the plans. Verify the release strength by compressive strength cylinder tests or other approved means, no later than 24 hours after casting and every 24 hours thereafter until release strength is developed. In lieu of every 24 hour testing, the contractor is permitted to estimate the strength development of concrete by the maturity method in accordance with ASTM C 1074, the pulse velocity method in accordance with ASTM C 597, or any other nondestructive test method acceptable to the Engineer, until the time of the detensioning. Before detensioning, verify the concrete release strength by testing the compressive strength test cylinders. Make a minimum of two compressive strength release test cylinders daily for each individual mix or for each LOT, or fraction thereof, of given concrete mix design where the daily consumption exceeds this volume or when non-continuous batching or dissimilar curing is used. The release strength test, representing the LOT, is the average compressive strength of two test cylinders, which are cured under conditions similar to the product or match-cured test specimens, which are match cured until the time of release. For products cured using accelerated curing, release the prestressing force immediately after terminating the accelerated curing process. After the detensioning operation is completed, continue to 72 hour curing period using one of the methods listed in 450-10.6. For products cured using methods other than accelerated curing, release the prestressing force within a detensioning time limit, not to exceed five calendar days after the verification of release strength by compressive strength cylinder test or other approved strength gain monitoring system. For all products in a casting line, use the same test method for determining their release strengths. Ensure the detensioning time limit is included in the Plant's QC Plan. Cure concrete cylinders used for detensioning strength tests in the same manner and location as the prestressed concrete products.

450-11.2 Method of Stress Transfer: In all detensioning operations, keep the prestressing forces nearly symmetrical about the vertical axis of the product and apply them in a

manner that will minimize sudden shock or loading. Remove or loosen forms, ties, inserts, or other devices that would restrict longitudinal movement of the products along the bed. Release hold-downs for products with draped strands in a sequence as shown in the plans or QC Plan. Cut dormant strands (partially tensioned strands) in top of beams before releasing any fully tensioned strands. Release fully bonded strands next, beginning with the lowest row and moving upwards, followed progressively by strands having the minimum length of tubular sheathing through to those strands having the maximum length of tubular sheathing. The Contractor may propose alternative detensioning patterns to suit the plant's particular operation. Specify the method of the stress transfer to be used either in the QC Plan or the construction submittal.

Transfer prestressing forces to the concrete by either single strand release or multiple strand release.

450-11.3 Single Strand Detensioning: Detension the strand by using a low-oxygen flame in accordance with a pattern and schedule provided in the approved shop drawings, or QC Plan, or described in 450-5. Heat with a low-oxygen flame played along the strand for a minimum of 5 inches. Heat strands in such a manner that the failure of the first wire in each strand will occur after the torch has been applied for a minimum of five seconds. Release strands in all prestressed products simultaneously and symmetrically about the vertical axis at both ends of the bed and at all intermediate points between products to minimize sliding of products. As an alternate, strands in piles, sheet piles, slabs and AASHTO Type II girders may be released simultaneously and symmetrically about the vertical axis at both ends of the bed until all the strands are released, then proceeding in order to intermediate points nearest the bed ends, or to the single remaining point at the center and release strands at these points in the same manner until all strands are released.

450-11.4 Multiple Strand Detensioning: In this method, detension all strands simultaneously by hydraulic dejacking. The total force is taken from the header by the jack, then released gradually. Do not allow the overstress required to loosen the anchoring devices at the header to exceed the force in the strand by 5%. After detensioning, strands at all points may be cut progressively from one end of the bed to the other using equipment and methods described above.

450-11.5 Trimming Strands and Bars: Upon completion of the detensioning operation, cut the exposed strands to required length, using an oxygen flame or mechanical cutting device. On piles and other products requiring flush cutting of strands and bars, use only mechanical cutting, unless specifications require strand to be burned or ground below the pile surface. Do not use electric arc welders. Unless otherwise specified, allow all strands to protrude 2.5 inches plus or minus 0.5 inch beyond the end of the product, except cut strands for piling back to be flush with or below the concrete surface. For beams with ends not to be encased in permanent concrete diaphragms, cut strands a minimum of 1/8 inch below the concrete surface.

450-11.6 Protecting Ends of Strands: For beams with ends not to be encased in permanent concrete diaphragms, epoxy coat the exposed beam ends, including clipped and chamfered surfaces with two layers of Type F-1 epoxy compound within seven calendar days of detensioning and prior to development of any corrosion at the ends of strands. Prepare the concrete surface and apply epoxy in accordance with the manufacturer's recommendations. The finish thickness of the epoxy coating must be a minimum of 1/16 inch, forming a vertical flat plane at the end of the beam without deviations for localized depressions resulting from recessing of the strands or other defects.

450-12 Noncomplying Prestressed Products.

450-12.1 General: When a precast prestressed concrete product does not comply with the requirements of this Section or is damaged, use the following provisions for evaluating and disposing of deficiencies. However, when precast prestressed concrete products have been installed, the disposition of concrete cracks shall be in accordance with 400-21. Apply these provisions in all cases that clearly fall under the circumstances described. Consider situations not covered by these specific circumstances on their individual merits. Consider and apply the following where practical.

The QC Manager, or QC inspectors under direction of the QC Manager, will examine all deficiencies within the time limit specified in 450-2.1 and 450-2.3, to determine the applicable provisions and requirements of this Article and which course of action is appropriate. If the QC Manager determines that a deficiency is a cosmetic or minor defect, appropriate repairs may be executed immediately in accordance with 450-13. Perform and complete cosmetic and minor defect repairs to the satisfaction of the QC Manager. If the QC Manager determines that a deficiency is a major deficiency, requiring an engineering evaluation, submit a repair proposal to the Engineer in accordance with 450-14. Make all repairs that require a repair proposal under the observation of and to the satisfaction of the QC Manager.

The disposition of deficiencies and repair methods provided herein must at no time, and under no circumstances, be used as an excuse for or applied in such a manner so as to relieve the Contractor of his responsibility for QC. The number and type of deficiencies evaluated under this specification will, however, be used in evaluating the Contractor's QC.

The Engineer will require a credit on any product with deficiencies that require engineering evaluation and are attributable to the Contractor, accepted for use in the structure. Bear the costs of repairs and any actions taken to rectify deficiencies at no expense to the Department.

450-12.2 Surface Deficiencies: Surface deficiencies are defined below. Regardless of the types of deficiencies, when the total surface area of all deficiencies within a single product exceeds 2.0 % of the product's length times its depth, the product will require engineering evaluation and disposition in accordance with 450-14. Surface deficiencies include spalls, chips, bug holes, surface porosities, and honeycombs.

450-12.2.1 Bug Hole: A bug hole is a void caused by air that is entrapped against the form and that has an area up to 3.0 square inches and a depth up to 1.5 inches. Treat any bug hole with a dimension exceeding either of these dimensions as a honeycomb. The Engineer will not require the Contractor to repair any bug hole with a depth less than 0.25 inch and less than 0.75 inch in diameter, unless otherwise indicated in the plans or specifications. Consider all other bug holes cosmetic and repair them in accordance with 450-13.2.

450-12.2.2 Spall: A spall is a depression resulting when a fragment is detached from a larger mass by impact, action of weather, by pressure or by expansion within the larger mass.

A cosmetic spall is a circular or oval depression not greater than 1.0 inch in depth nor greater than 3.0 square inches in area, and must be repaired in accordance with 450-13.2.

With the exception of the spalls at the top flange of the beam-ends, a minor spall is defined as a spall not larger than 2.0 square feet and no deeper than concrete cover. A spall located at the edge of the top flange, within 1/4 length from the beam-end, is considered minor spall if the total longitudinal length of the defect does not exceed 10 feet and any of the

lateral dimensions of the spall perpendicular to the longitudinal axis of the beam is not greater than 15% of the width of the top flange. Repair minor spalls in accordance with 450-13.4.

A major spall is a spall that any of its dimensions exceeds the dimensions that are described for minor spalls. A major spall requires engineering evaluation and disposition in accordance with 450-14.

450-12.2.3 Chip: A chip is the local breaking of the corners or edges of the concrete with the resulting void containing angular surfaces.

Cosmetic chips are chips where the sum of the two lateral dimensions perpendicular to the length does not exceed 2.0 inches. Regardless of length, it is not necessary to repair cosmetic chips except for visually exposed reinforcing steel, prestressing strand, insert, or weldments surfaces, which may require repair in accordance with 450-13.5.

Minor chips are chips where the sum of the two lateral dimensions perpendicular to the length exceeds 2.0 inches, but does not exceed 4.0 inches, and with a length of no more than 12.0 inches. Repair minor chips in accordance with 450-13.5.

Major chips are any chips larger than minor chips. Major chips require engineering evaluation and disposition in accordance with 450-14.

450-12.2.4 Surface Porosity: Surface porosity is considered a minor defect and is the localized porosity of a formed surface due to medium scaling. Medium scaling is defined as the loss of surface mortar up to 3/8 inch in depth and exposure of concrete aggregate. Repair surface porosity in accordance with 450-13.3.

450-12.2.5 Honeycombing: Honeycombing is voids in the concrete, loss of fines or other material from between the aggregate particles, the inclusion of air pockets between aggregate particles, or larger volumes of lost material. Remove honeycombing in its entirety to sound concrete before establishing the classification of the defect.

Minor honeycombing is a void no deeper than concrete cover and no larger than 2.0 square feet in area that results after the removal of unsound material. Repair minor honeycombing in accordance with 450-13.6.

Major honeycombing is a void deeper than concrete cover regardless of the surface area, or shallower but with a surface area greater than 2.0 square feet that results after the removal of unsound material. Major honeycombing requires engineering evaluation and disposition in accordance with 450-14.

450-12.3 Formed Surface Misshaping: Formed surface misshaping is the visual and measurable deficiency or excess of material from the specified tolerance on any surface of a product.

450-12.3.1 Pile Ends: Make square pile ends which are outside this Section's tolerances by grinding in accordance with 450-13.7, or any other means of removal as approved by the Engineer. Reshape the chamfer if more than 0.25 inch from the cast pile end is removed and such removal affects the chamfer dimension.

450-12.3.2 Pile Chamfers: Reshape chamfers outside of this Section's tolerances to within the tolerances in accordance with 450-13.7.

450-12.3.3 Other Surfaces: Any deficiency exceeding the plan dimensions for size, length, squareness, designated skew, plumbness, and the like by up to twice the specified plus (+) tolerance may be corrected by grinding to within the allowable tolerance in accordance with 450-13.7. Any deficiency exceeding the specified minus (-) tolerance or twice the specified plus (+) tolerance requires an engineering evaluation and disposition in accordance with 450-14.

450-12.4 Bearing Areas: Consider the bearing area to extend from the end of the product to 3 inches beyond the edge of the bearing contact area for the full product width.

Do not allow the bearing plate or bearing area plane of precast prestressed concrete beam and slab units to deviate from a true plane by more than 1/8 inch when tested in all directions with a steel straightedge. In the event that a 100% true plane is not achieved, the Engineer will accept a surface having not less than 80% of its area in a true plane provided the deviations are evenly distributed. Remove minor convex projections by grinding with an abrasive stone. The Engineer will accept minor depressions, provided that they amount to not more than 20% of the bearing area, are evenly distributed over the entire bearing area, and are not deeper than 1/8 inch.

450-12.5 Cracks: A crack is the separation of a product or portion thereof which may appear before or after detensioning and may or may not cause separation throughout the product thickness or depth. Identify cracks by the classifications and locations described below and subject them to the disposition required by the identified crack. Regardless of the classifications and locations of cracks within any single product, if the total surface length of all cracks on any and all surfaces exceeds one-third of the product's length, the product requires engineering evaluation and disposition in accordance with 450-14. Establish crack sizes subsequent to release of all pretensioning forces.

The Engineer will reject any pile that is cracked to the point that a transverse or longitudinal crack extends through the pile, shows failure of the concrete as indicated by spalling of concrete on the main body of the pile adjacent to the crack, or which in the opinion of the Engineer will not withstand driving stresses. Occasional hairline surface cracking caused by shrinkage or tensile stress in the concrete from handling will not be cause for rejection.

450-12.5.1 Classification and Treatment of Cracks: Regardless of cause and for the purposes of Section 450, cracks in precast prestressed components, excluding piling, will be identified according to their surface appearance in accordance with the following classifications:

Cosmetic cracks are any cracks which are less than 0.006 inch wide and are located in non-critical locations on the product. Based on the environmental classification of the site where the product will be located, treat cosmetic cracks as follows:

(1) Slightly or moderately aggressive environment: Do not treat cracks.

(2) Extremely aggressive environment: After detensioning, apply penetrant sealer in accordance with Section 413.

Minor cracks are any cracks which are between 0.006 and 0.012 inch wide, inclusive, and are located in non-critical locations on products. Based on the environmental classification of the site where the product will be located and the final elevation of the product on the site, treat minor cracks as follows:

(1) Slightly aggressive environment: Do not treat the cracks.

(2) Moderately aggressive environment:

(a) For products that will be located at an elevation of more than 12 feet above the existing ground level or above mean high water elevation: Do not treat cracks.

(b) For products that will be located at an elevation within 12 feet above the existing ground level or above mean high water elevation: Apply a penetrant sealer on the cracks after detensioning in accordance with Section 413.

(3) Extremely aggressive environment:

a. For products that will be located at an elevation of more than 12 feet above the existing ground level or above mean high water elevation: Apply a penetrant sealer on the cracks after detensioning in accordance with Section 413.

b. For products that will be located at an elevation within 12 feet above the existing ground level or above mean high water elevation: Inject epoxy into the cracks after detensioning in accordance with Section 411.

Major cracks are any cracks of any width which are located in critical locations on products or cracks in non-critical locations of the product that are greater than 0.012 inch wide. Major cracks require an engineering evaluation, including crack depth measurement and disposition, in accordance with 450-14.

Cracks in the Riding Surface: Repair cracks in the top surface of components which will become the riding surface (with no overlays), once in service, regardless of the environmental classification as follows:

(1) Epoxy inject cracks wider than 0.006 inch in accordance with Section 411, unless the Engineer approves the sealing of cracks with high molecular weight methacrylate in accordance with Section 413.

(2) Seal cracks that are 0.006 inch wide or less by applying a penetrant sealer in accordance with Section 413.

450-12.5.2 Locations of Cracks: Regardless of cause and for the purposes of this Specification, cracks will be identified as occurring in either critical or non-critical locations of the product in accordance with the following criteria and conditions:

Critical locations of cracks are any locations in which a crack would tend to open under stresses occurring at any time during the service life of the structure, or which may reduce the ultimate capacity or fatigue life of the product. Specifically, critical locations of cracks are any locations in a product not defined and not included in 450-12.5.3 as non-critical. Cracks in critical locations require engineering evaluation and disposition in accordance with 450-14.

Non-critical locations of cracks are defined by the position within a product's length, the position within a product's depth, and the orientation of the crack.

450-12.5.3 Non-critical Locations of Cracks by Product Type:

450-12.5.3.1 Piles: Surface cracks in any direction and of a length not exceeding twice the width of the pile.

450-12.5.3.2 Simple Span Prestressed Concrete Beams: End zones (within a distance of three times the depth of the product from the end):

(a) One horizontal crack at either or both ends in the top flange and web of the product, not in the plane of nor intersecting any row of prestressing strands, and extending from the end of the product for a length not to exceed half the product's depth.

(b) Vertical cracks extending through the top flange not to exceed one quarter of the product's depth after detensioning.

Mid-span region (between end zones): Vertical cracks extending through the top flange and web of the product.

Any Location: Horizontal crack at the interface of the web and top flange which is not longer than the product's depth.

Intermediate diaphragms of Florida U-Beams: cracks at any location.

450-12.5.3.3 Simple Span Double-T Beams: End zones (within a distance of twice the depth of the product from the end): One horizontal crack at either or both ends and in the top flange of the product, not in the plane of nor intersecting any row of prestressing strands, and extending from the end of the product for a length not to exceed half the product's depth.

Mid-span Region (between end zones): Vertical cracks extending through the top flange and not exceeding half the web depth of the product.

Any Location: Horizontal crack at the interface of the web and top flange which is not longer than the product's depth.

450-12.5.3.4 Pretensioned I Beams Containing Longitudinal Post-tensioning Ducts: End zones (within a distance of twice the depth of the beam from the end): Vertical cracks in the bottom half of the beam within an end zone with no post-tensioning anchorages and where the post-tensioning ducts are located in the top of the beam at the location of a permanent substructure support.

Mid-span Region (between quarter points): Vertical cracks in the web and top flange of the beam provided the beam is to be supported at each end in its final position in the structure.

Horizontal cracks not longer than the beam's depth and only at the interface of the web and top flange provided the beam is to be supported at each end in its final position in the structure.

450-12.5.3.5 Simple Span Prestressed Slab Units: End Zones (within a distance of twice the depth of the product from the end): One horizontal crack at either or both ends in the top half of the product, which is not in the plane of nor intersecting any row of prestressing strands, and extending from the end of the product for a length not to exceed half the product's depth.

Any Location (after detensioning), Vertical cracks in the top half of the product's depth.

450-13 Repair Methods and Materials.

450-13.1 General: Before beginning the repair of bug holes, spalls, chips, surface porosity, and honeycomb, remove all laitance, loose material, form oil, curing compound and any other deleterious matter from repair area. Repair cosmetic and minor deficiencies by methods specified herein. The Contractor is permitted to elect an alternate repair method, provided the proposed repair method is included in the QC Plan. 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 written 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 that is listed on the Qualified Products List (QPL).

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. 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. Firmly consolidate the grout 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 steel, prestressing strand, inserts or weldments are exposed, remove the concrete from around the items to provide a 1 inch clearance all around. 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. Firmly consolidate the grout 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 450-12.5.

450-14 Submittal of Proposal to Accept or Repair Deficiencies.

450-14.1 General: When a product has deficiencies unacceptable to the Engineer, the Contractor may propose repairs. Deficiencies discovered in the casting yard must be repaired

before shipment. Do not ship products, which require repairs, from the casting yard to the project site until such repairs are complete and the Engineer has determined the product to be acceptable. Deficiencies discovered at the project site may be repaired at the site, subject to the Engineer's approval. All proposed repairs must be submitted for engineering evaluation and credit in accordance with 450-14.2, unless the specific repair methods have been submitted and approved in the QC Plan. The plant may use the repair method that is previously approved in the QC Plan, without submittal of the proposal for engineering evaluation or credit. The use of the previously approved repair method is only applicable to the same type of single deficiency that is exhibited in a product.

450-14.2 Submittal of Proposal for Engineering Evaluation: Proposals must include an evaluation of the product's relative ability to perform its intended function in the structure and its durability relative to other acceptable, similar products. Submit the proposal in writing to the Engineer as outlined below.

If the proposal is accepted by the Engineer, all Department costs associated with review of the proposal, including the cost of any and all engineering evaluation and testing services required, will be deducted from payment to the Contractor, but not to exceed 15% of the product value based on unit bid prices.

Prepare the proposal to consist of the following:

1. A cover letter prepared on the Contractor's letterhead describing the product and addressed to the Engineer,
2. Information describing the details of the non-compliance and the proposed repairs in a format acceptable to the Engineer,
3. A structural and durability evaluation of the product,
4. A proposed credit to the Contract proportionate to the product's deficiency. The credit is in addition to the cost for review and evaluation of the proposal,
5. Any other supportive information, pictures and drawings. For cracked elements, show on a drawing 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. The description of the proposed repair and the structural and durability evaluation of the product must be prepared by or under the direct supervision of the Contractor's Engineer of Record and must bear his/her signature and seal.

Include in the proposed credit consideration of the Department's added costs which may include but are not necessarily limited to re-inspection, testing, reduced durability, or increased maintenance cost. The Engineer will review and evaluate the Contractor's proposal and will notify the Contractor of its disposition. The Engineer's review of the Contractor's proposal does not amend or delete code requirements, unless such changes are specifically brought to the Engineer's attention and accepted by the Engineer. The Engineer's acceptance of a proposal does not relieve the Contractor of his responsibility to provide products that are structurally adequate to resist the loads specified in the Contract drawings and that maintain the intended aesthetic, durability and maintenance aspects of the product. The Engineer will not accept repaired products unless repairs are made as proposed or described, the resulting repairs are sound in all aspects, and the repairs are aesthetically acceptable. Replace a rejected product with a product meeting the requirements of the Contract Documents at no additional expense to the Department.

450-15 Repairs Before Approval.

If repairs to precast products are initiated in advance of the Engineer's approval, the affected product will only be considered for acceptability and use when the following conditions have been satisfied:

1. Before beginning the repairs, prepare and deliver to the Engineer a repair proposal in accordance with the requirements of 450-14.

2. All repair materials must meet the requirements of Section 930 and be selected from the QPL or otherwise be subsequently evaluated, tested by the Contractor as required by the Department, and approved by the Department for the specific use made of the material.

3. Repairs have been performed under the observation of the QC Manager.

Accept responsibility for actions taken, and perform these actions at your own risk. It is intended that repairs be made only after the proposed methods have been accepted to ensure that the proposal will not be modified or rejected, and the work will be accepted if the repair proves to be adequate.

450-16 Handling, Storage, Shipping and Erection.

450-16.1 Handling: All products which are pretensioned may only be handled after transfer of the prestressing force. For products that are prestressed by a combination of pretensioning and post-tensioning do not handle before sufficient prestress has been applied to sustain all forces and bending moments due to handling. Exercise care in handling to prevent damage to products. Lift and move products so as to minimize stresses due to sudden changes in momentum. Calculate pick up and dunnage points. Pick up products only at points designated as pickup points as shown on the Contract plans or shop drawings. Maintain all beams in an upright position at all times.

Evaluate the temporary stresses and stability of beams during their handling. The temporary stresses induced into the products during handling must be within the acceptable stresses at release listed in the Department's Structures Design Guidelines. Take appropriate action to increase the stability of products during handling when the factor of safety against lateral buckling instability is below 2.0. Include the expected fabrication tolerance for sweep in the analysis. The analysis procedure provided by the Precast/Prestressed Concrete Institute or similar procedures may be used for the stability evaluation.

Verify lifting devices for capacity in lifting and handling products, taking into account various positions during handling. Keep multiple component lifting devices matched to avoid non-compatible use. When a product has multiple lifting devices, use lifting equipment capable of distributing the load at each device uniformly to maintain the stability of the product. When the lifting devices are grouped in multiples at one location, align them for equal lifting.

Take appropriate steps to prevent the occurrence of cracking. When cracking occurs during handling and transportation, revise handling and transporting equipment and procedures as necessary to prevent cracking for subsequent products.

450-16.2 Storage: Store precast prestressed beams, Double-T Beams and slab units on only two points of support located within 18 inches of the end of the product or as calculated. Support skewed beams, Double-T Beams or slab units within 18 inches of the end of the full product section or as calculated. Support other products on an adequate number of supports so as to keep stresses in the products within the allowable stresses at release listed in the Department's Structures Design Guidelines. Locate multiple supports (more than two) within 1/2 inch of a horizontal plane through the top surface of the supports. Adequately brace beams as necessary to maintain stability.

All supports must be level and on adequate foundation material that will prevent shifting or differential settlement which may cause twisting or rotation of products. Immediately pick up products in storage that have rotated or twisted and adjust the supports to provide level and uniform support for the product.

Support prestressed products that are stacked by dunnage placed across the full width of each bearing point and aligned vertically over lower supports. Do not use stored products as a storage area for either shorter or longer products or heavy equipment.

Where feasible, base the selection of storage sites, storage conditions and orientation upon consideration of minimizing the thermal and time-dependent creep and shrinkage effects on the camber and/or sweep of the precast pretensioned products.

Continuous application of water during the initial 72 hour moist curing period may be interrupted for a maximum of one hour to allow relocation of precast prestressed concrete elements within the manufacturing facility. Keep the moist burlap in place during relocation of the element.

Measure and record the sweep and camber of beams monthly. Keep the measurement records on file for review at any time by the Engineer, and upon request, transmit a copy of these measurements to the Engineer. If the camber exceeds by 1 inch the design camber shown in the plans, take appropriate actions in accordance with 400-7.13.1 to accommodate the product in the structure.

If the sweep exceeds the tolerance specified, take immediate measures to bring the sweep of the product back to within tolerance.

Notify the Engineer immediately when the sweep or camber exceeds the specified tolerances. Special storage conditions for the purpose of removing excessive sweep will not be restricted by requirements of this Subarticle nor contained in 450-2.1. If the sweep of the product exceeds the tolerance specified and cannot be removed, the disposition of the product will be in accordance with 450-12.1 and 450-14.

450-16.3 Shipping: Do not ship precast prestressed concrete products to the project site prior to the completion of the 120 hour curing period and attainment of the required 28-day strength. The contractor is permitted to verify the shipping strength test, before 28 days, by testing compressive strength cylinders that are cured under the conditions similar to the product or by testing temperature match cured cylinders. The use of maturity method, ASTM C 1074, pulse velocity method in accordance with ASTM C 597, or any other nondestructive test method acceptable to Engineer, is permitted to estimate the strength before its verification by test cylinders. The shipping strength test is the average compressive strength of two test cylinders. Do not ship products until accepted and stamped by the QC Manager or the inspectors under the direct observation of the QC Manager. At the beginning of each project, provide a notarized statement to the Engineer from a responsible company representative certifying that the plant will manufacture the products in accordance with the requirements set forth in the Contract Documents and plant's QC Plan. The QC Manager's stamp on each product indicates certification that the product was fabricated in conformance with the Contractor's QC Plan, the Contract, and this Section. Ensure that each shipment of prestressed concrete products to the project site is accompanied with a signed or stamped delivery ticket providing the description and the list of the products.

Evaluate the temporary stresses and stability of all products during shipping and locate supports, generally within 18 inches from the beam end, in such a manner as to maintain stresses within acceptable levels. Include impact loadings in the evaluation.

450-16.4 Erection: Erect precast prestressed products without damage. Meet the handling and storage requirements of 450-16.1 and 450-16.2 for field operations. Before casting diaphragms and the deck slab, do not allow the horizontal alignment of prestressed concrete beams to deviate from a straight line connecting similar points of beam ends by more than the sweep tolerances specified in 450-2.1. Adequately brace beams as necessary to maintain stability.

450-17 Measurement and Payment.

450-17.1 General: The work specified in this Section will be measured and paid for as shown below for the particular item involved. Precast prestressed concrete members are acceptable to the Department for full payment when all requirements of the Contract Documents have been met. No partial payments will be made for precast prestressed concrete members until the 28-day strength requirement, along with other applicable specification requirements, have been met.

450-17.2 Prestressed Concrete Piling: Payment will be made at the Contract unit price per foot for the particular type of piling, measured and paid for as specified in Section 455, including the provisions for cutoffs and splices.

450-17.3 Prestressed Concrete Beams: Payment will be made at the Contract unit price per foot for Prestressed Beams, complete in place and accepted. Final pay lengths will be plan quantity based on casting lengths, as detailed on the plans, subject to the provisions of 9-3.2.

450-17.4 Prestressed Concrete Slab Units: Payment will be made at the Contract unit price per foot for the units, complete in place and accepted. Final pay lengths will be plan quantity based on casting lengths, as detailed in the plans, subject to the provisions of 9-3.2.

450-18 Basis of Payment.

Price and payment will be full compensation for all work and materials specified in this Section, including steel reinforcement, pretensioning steel, embedded ducts, hardware, inserts and other materials as required, to fabricate, transport and place the product into its permanent position in the structure.

Payment for the items will be made under the following:

Item No. 450- 1-	Prestressed Beams - per foot.
Item No. 450- 2	Prestressed Beams: Florida-I Beams – per foot.
Item No. 450- 3-	Prestressed Slab Units - per foot.
Item No. 450- 4-	Prestressed Beam U-beams - per foot.
Item No. 450- 88-	Prestressed Slab Units Transversely Post-Tensioned - square foot.

455 STRUCTURES FOUNDATIONS.
(REV 5-11-11) (FA 5-18-11) (1-12)

SECTION 455 (Pages 516 – 591) is deleted and the following substituted:

SECTION 455
STRUCTURES FOUNDATIONS

Index

A. GENERAL

455-1 General Requirement.

The Contractor may examine available soil samples and/or rock cores obtained during the soil boring operations at the appropriate District Materials Office.

455-1.1 Protection of Existing Structures: When the plans require foundation construction operations in close proximity to existing structures, take all reasonable precautions to prevent damage to such structures. The requirements described herein apply to all types of structures (on or off the right-of-way) that may be adversely affected by foundation construction operations (including phase construction) due to vibrations, ground loss, ground heave, or dewatering. Protect utilities as described in-the applicable provisions of Section 7.

Monitor structures for settlement in a manner approved by the Engineer, recording elevations to 0.001 foot. Monitor the following structures:

(1) shown in the plans.

(2) within a distance, in feet, of pile driving operations equal to 0.5 times the square root of the impact hammer energy, in foot-pounds . Take required measurements before the initiation of driving and then daily on days when driving occurs or as indicated in the plans and weekly for two weeks after driving has stopped.

(3) within a distance of ten shaft diameters or the estimated depth of excavation, whichever is greater.

(4) within a distance of three times the depth of excavation for the footing.

Obtain the Engineer's approval of the number and location of monitoring points. Take elevation;

(1) before beginning construction,
(2) daily during the driving of any casings, piling, or sheeting,
(3) weekly for two weeks after stopping driving,
(4) during excavation,
(5) during blasting,
(6) or as directed by the Engineer.

Notify the Engineer of any movements detected and immediately take any remedial measures required to prevent damage to the existing structures.

Employ a qualified Specialty Engineer to survey all structures, or portions thereof, within:

(1) a distance, in feet, of pile driving operations equal to 0.25 times the square root of the impact hammer energy, in foot-pounds

(2) a distance of ten shaft diameters or the estimated depth of excavation, whichever is greater

(3) three times the excavation depth for footings and caps

(4) or as shown in the plans

The Department will make the necessary arrangements to provide right-of-way entry for the Contractor's engineer to survey. Adequately document the condition of the structures and all existing cracks with descriptions and pictures. Prepare two reports documenting the condition of the structures: one report before beginning foundation construction operations and a second report after completing foundation construction operations. The Department will take ownership of both reports. Do not perform pre-driving and post-driving surveys of the condition of bridges owned by the Department except when shown in the Contract Documents.

When shown in the Contract Documents, employ a qualified Specialty Engineer to monitor and record vibration levels during the driving of casings, piling, sheeting, or blasting operations. Provide vibration monitoring equipment capable of detecting velocities of 0.1 in/s or less.

Upon detecting settlement or heave of 0.005 foot, vibration levels reaching 0.5 in/s, levels otherwise shown in the Contract Documents, or damage to the structure, immediately stop the source of vibrations, backfill any open drilled shaft excavations, and contact the Engineer for instructions.

When the plans require excavations for construction of footings or caps, the Contractor is responsible for evaluating the need for, design of, and providing any necessary features to protect adjacent structures. When sheeting and shoring are not detailed in the plans, employ a Specialty Engineer to design the sheeting and shoring, and to sign and seal the plans and specification requirements. Send these designs to the Engineer for his record before beginning construction.

When shown in the Contract Documents or when authorized by the Engineer, install the piling to the depth required to minimize the effects of vibrations or ground heave on adjacent structures by approved methods other than driving (preformed holes, predrilling, jetting, etc.). In the event the Department authorizes the use of preformed pile holes to meet this requirement, the Department will pay for this work as described in 455-5.9.3.

If not otherwise provided in the plans, the Contractor is responsible for evaluating the need for, design of, and providing all reasonable precautionary features to prevent damage, including, but not limited to, selecting construction methods and procedures that will prevent damaging caving of the shaft excavation and monitoring and controlling the vibrations from construction activities, including driving of casings, driving of sheeting, and blasting.

When shown in the plans or directed by the Engineer, install a piezometer near the right-of-way line and near any structure that may be affected by lowering the ground water when dewatering is required. Monitor the piezometer and record the ground water elevation level daily. Notify the Engineer of any ground water lowering near the structure of 12 inches or more.

455-1.2 Excavation: Complete all excavation of the foundations prior to installing piles or shafts unless otherwise authorized by the Engineer. After completing pile/shaft installation, remove all loose and displaced materials from around the piles/shafts, leaving a clean, solid surface. Compact the soil surface on which concrete is to be placed or which will support the forming system for the concrete to support the load of the plastic concrete without settling or causing the concrete to crack, or as shown in the Contract Documents. The Engineer will not require the Contractor to compact for excavations made below water for seals or when the footing or cap or forming system (including supports) does not rest on the ground surface.

455-1.2.1 Abutment (End Bent) Fill: Place and compact the fill before installing end-bent piling/shafts, except when:

(1) driving specified test piling in end bents or,

(2) the plans show uncased piles through proprietary retaining wall fills.

When installing piles/shafts or casing prior to placing fill, take necessary precautions to prevent displacement of piles/shafts during placing and compacting fill materials within 15 feet of the piles/shafts or casing. Reference and check the position of the piles/shafts or casing at three approximately equal intervals during construction of the embankment.

Place embankment material in 6 inch loose lifts in the 15 foot area around the piles/shafts or casing. Compact embankment material within the 15 foot area adjacent to the piles/shafts or casing to the required density with compaction equipment weighing less than 1,000 pounds. When installing piles/shafts prior to the completion of the surrounding fills, do not cap them until placing the fills as near to final grade as possible, leaving only the necessary working room for construction of the caps.

Provide permanent casings installed prior to placement of the fill, for all drilled shafts through mechanically stabilized fills (for example, behind proprietary retaining walls) for shafts installed after fill placement. Install temporary casings through the completed conventional fill when permanent casings are not required.

Provide permanent casings, if required, before the fill is placed extending a sufficient distance into the existing ground to provide stability to the casings during construction of the abutment fill.

455-1.3 Cofferdams: Construct cofferdams as detailed in the plans. When cofferdams are not detailed in the plans, employ a Specialty Engineer to design cofferdams, and to sign and seal the plans and specification requirements. Send the designs to the Engineer for his records before beginning construction.

Provide a qualified diver and a safety diver to inspect the conditions of the foundation enclosure or cofferdam when the Contract Documents require a seal for construction. Equip these divers with suitable voice communications, and have them inspect the foundation enclosure and cofferdam periphery including each sheeting indentation and around each piling or drilled shaft to ensure that no layers of mud or other undesirable materials were left above the bottom of seal elevation during the excavation process. Also have the divers check to make sure the surfaces of the piles or drilled shafts are sufficiently clean to allow bond of the concrete down to the minimum bottom of seal elevation. When required, ensure that there are no mounds of stone, shell, or other authorized backfill material left after placement and grading. Assist the Engineer as required to ensure that the seal is placed as specified and evaluate the adequacy of the foundation soils or rock. Correct any deficiencies found by the divers. Upon completion of inspection by the divers, the Department may also elect to inspect the work before authorizing the Contractor to proceed with subsequent construction operations. Furnish the Engineer a

written report by the divers indicating the results of their underwater inspection before requesting authorization to place the seal concrete.

455-1.4 Vibrations on Freshly Placed Concrete (Drilled Shafts and Piers): Ensure that freshly placed concrete is not subjected to vibrations greater than 1.5 in/sec from pile driving and/or drilled shaft casing installation sources located within the greater dimension of three shaft diameters (measured from the perimeter of the shaft closest to the vibration source) or 30 feet (from the nearest outside edge of freshly placed concrete to the vibration source) until that concrete has attained its final set as defined by ASTM C-403 except as required to remove temporary casings before the drilled shaft elapsed time has expired.

455-2 Static Compression Load Tests.

455-2.1 General: Employ a professional testing laboratory, or Specialty Engineer with prior load test experience on at least three projects, to conduct the load test in compliance with these Specifications, to record all data, and to furnish reports of the test results to the Engineer except when the Contract Documents show that the Department will supply a Geotechnical Engineer to provide these services.

Perform the load test by applying a load up to the load required in the Contract Documents or to the failure load, whichever occurs first.

Do not apply test loads to piles sooner than 48 hours (or the time interval shown in the plans) after driving of the test pile or reaction piles, whichever occurs last.

Allow up to four weeks after the last load test for the analysis of the load test data and to provide all the estimated production tip elevations. If the Contractor is willing to construct production foundation elements in areas designated by the Engineer, tip elevations will be determined in these areas beginning seven days after the receipt of the load test data which represents the designated area.

Do not begin static load testing of drilled shafts until the concrete has attained a compressive strength of 3,400 psi. The Contractor may use high early strength concrete to obtain this strength at an earlier time to prevent testing delays.

Load test piles/shafts in the order directed by the Engineer. The Department will furnish certain load test equipment and/or personnel when shown in the plans. Inspect all equipment to be furnished by the Department at least 30 days prior to use, and notify the Engineer of any equipment that is not in satisfactory operating condition. The Department will consider any necessary repairs ordered by the Engineer to place the equipment in satisfactory operating condition as Unforeseeable Work. Provide the remainder of the equipment and personnel needed to conduct the load tests. Unless shown otherwise in the Contract Documents, provide all equipment, materials, labor, and technical personnel required to conduct the load tests, including determination of anchor reaction member depths. In this case, provide a loading apparatus designed to accommodate the maximum load plus an adequate safety factor.

While performing the load test, provide safety equipment, and employ safety procedures consistent with the latest approved practices for this work. Include with these safety procedures adequate support for the load test plates and jack to prevent them from falling in the event of a release of load due to hydraulic failure, test pile/shaft failure, or any other cause.

Include in the bid the cost of transporting load test equipment and instrumentation supplied by the Department from their storage location to the job site and back. Handle these items with care. The Contractor is responsible for the safe return of these items. After completion of the static load tests, return all Department furnished equipment in satisfactory operating condition. Repair all damage to the test equipment furnished by the Department to the

satisfaction of the Engineer. Clean all areas of rust on structural steel items, and recoat those areas in accordance with Section 560. Return all load test equipment supplied by the Department within 30 days after completing the load tests.

The Contractor is responsible for the equipment from the time it leaves its storage area until the time it is returned. During this time, insure the equipment against loss or damage for the replacement cost thereof (the greater of $150,000 or the amount shown in the plans) or for the full insurable value if replacement cost insurance is not available.

Notify the Engineer at the preconstruction conference or no later than 30 days before beginning test pile installation of the proposed testing schedule so that items supplied by the Department may be reserved. Notify the Department at least ten working days before pick-up or return of the equipment. During pick-up, the Department will complete a checklist of all equipment placed in the Contractor's possession. The Department will later use this checklist to verify that the Contractor has returned all equipment. Provide personnel and equipment to load or unload the equipment at the Department's storage location. Provide lifting tongs or nylon slings to handle Department owned test girders. Do not perform cutting, welding, or drilling on Department owned girders, jacks, load cells, or other equipment.

455-2.2 Loading Apparatus: Provide an apparatus for applying the vertical loads as described in one of the following:

(1) As shown and described in the Contract Documents.

(2) As supplied by the Contractor, one of the following devices designed to accommodate a load at least 20% higher than that shown in the Contract Documents or described herein for test loads:

(a) Load Applied by Hydraulic Jack Acting Against Weighted Box or Platform: Construct a test box or test platform, resting on a suitable support, over the pile, and load it with earth, sand, concrete, pig iron, or other suitable material with a total weight greater than the anticipated maximum test load. Locate supports for the weighted box or platform at least 6 feet or three pile/shaft diameters, whichever is greater, measured from the edge of the pile or shaft to the edge of the supports. Insert a hydraulic jack with pressure gauge between the test pile or shaft and the underside of the reaction beam, and apply the load to the pile or shaft by operating the jack between the reaction beam and the top of the pile or shaft.

(b) Load Applied to the Test Pile or Shaft by Hydraulic Jack Acting Against Anchored Reaction Member: Construct reaction member anchorages as far from the test piles/shafts as practical, but in no case closer than the greater of 3 pile/shaft diameters or 6 feet from the edge of the test pile/shaft. Attach a girder(s) of sufficient strength to act as a reaction beam to the upper ends of the anchor piles or shafts. Insert a hydraulic jack with pressure gauges between the head of the test pile/shaft and the underside of the reaction beam, and apply the test load to the pile/shaft by operating the jack between the reaction beam and the pile/shaft head.

If using drilled shafts with bells as reaction member anchorages, locate the top of the bell of any reaction shaft anchorage at least three shaft diameters below the bottom of the test shaft.

(c) Combination Devices: The Contractor may use a combination of devices (a) and (b), as described above, to apply the test load to the pile or shaft.

(d) Other Systems Proposed by the Contractor and Approved by the Engineer: When necessary, provide horizontal supports for loading the pile/shaft, and space them so that the ratio of the unsupported length to the minimum radius of gyration of the pile does not exceed 120 for steel piles, and the unsupported length to the least cross-section dimension does

not exceed 20 for concrete piles or drilled shafts. Ensure that horizontal supports provide full support without restraining the vertical movement of the pile in any way.

When required by the Contract Documents, apply a horizontal load to the shaft either separately or in conjunction with the vertical load. Apply the load to the test shaft by hydraulic jacks, jacking against Contractor provided reaction devices. After receiving the Engineer's approval of the proposed method of load application, apply the horizontal load in increments, and relieve it in decrements as required by the Contract Documents.

455-2.2.1 Modified Quick Test:

(a) Loading Procedure: Apply vertical loads concentric with the longitudinal axis of the tested pile/shaft to accurately determine and control the load acting on the pile/shaft at any time. Place the load on the pile/shaft continuously, in increments equal to approximately 5% of the maximum test load specified until approaching the failure load, as indicated by the measuring apparatus and/or instruments. Then, apply increments of approximately 2.5% until the pile/shaft "plunges" or attains the limiting load. The Engineer may elect to stop the loading increments when he determines the Contractor has met the failure criteria or when a settlement equal to 10% of the pile/shaft width or diameter is reached. Apply each load increment immediately after taking and verifying the complete set of readings from all gauges and instruments. Apply each increment of load within the minimum length of time practical, and immediately take the readings. Complete the addition of a load increment and the completion of the readings within five to 15 minutes. The Engineer may elect to hold the maximum applied load up to one hour.

Remove the load in decrements of about 10% of the maximum test load. Remove each decrement of load within the minimum length of time practical, and immediately take the readings. Complete the removal of a load decrement and the taking of the readings within five to 15 minutes. The Engineer may also require up to two reloading cycles with five loading increments and three unloading decrements. Record the final recovery of the pile/shaft until movement is essentially complete for a period up to one hour after the last unload interval.

(b) Failure Criteria and Nominal Resistance: Use the criteria described herein to establish the failure load. The failure load is defined as the load that causes a pile/shaft top deflection equal to the calculated elastic compression plus 0.15 inch plus 1/120 of the pile/shaft minimum width or the diameter in inches for piles/shafts 24 inches or less in width, and equal to the calculated elastic compression plus 1/30 of the pile/shaft minimum width or diameter for piles/shafts greater than 24 inches in width. Consider the nominal resistance of any pile/shaft so tested as either the maximum applied load or the failure load, whichever is smaller.

455-2.3 Measuring Apparatus: Provide an apparatus for measuring movement of the test piles/shafts that consists of all of the following devices:

(1) Wire Line and Scale: Stretch a wire as directed by the Engineer between two supports located at a distance at least:

(a) 10 feet from the center of the test pile but not less than 3.5 times the pile diameter or width.

(b) 12 feet from the centerline of the shaft to be tested but not less than three shaft diameters.

Locate the wire supports as far as practical from reaction beam anchorages. At over-water test sites, the Contractor may attach the wire line as directed by the Engineer to the sides of the service platform. Mount the wire with a pulley on one support and a weight at the end of the wire to provide constant tension on the wire. Ensure that the wire passes across the face of a scale mounted on a mirror attached to the test pile/shaft so that readings can be made

directly from the scale. Use the scale readings as a check on an average of the dial readings. When measuring both horizontal and vertical movement, mount separate wires to indicate each movement, horizontal or vertical. Measure horizontal movements from two reference wires set normal to each other in a horizontal.

(2) Wooden Reference Beams and Dial Gauges: Attach wooden reference beams as detailed in the plans or approved by the Engineer to independent supports. For piles, install the greater of 3.5 times the pile diameter or width or 10 feet from the centerline of the test pile. For drilled shafts install at the greater of three shaft diameters or 12 feet from the centerline of the shaft to be tested. Locate the reference beam supports as far as practical from reaction beam anchorages. For over-water test sites, the Contractor may attach the reference beams as directed by the Engineer between two diagonal platform supports. Attach dial gauges, with their stems resting either on the top of the pile/shaft or on lugs or similar reference points on the pile/shaft, to the fixed beams to record the movement of the pile/shaft head. Ensure that the area on the pile/shaft or lug on which the stem bears is a smooth surface which will not cause irregularities in the dial readings.

For piles, the minimum acceptable method for measuring vertical movement is two dial gauges, each with 0.001 inch divisions and with 2 inch minimum travel, placed at 180 degrees or at the diagonal corners of the pile.

For shafts, ensure that three dial gauges, each with 0.001 inch divisions and with 2 inch minimum travel, placed at 120 degree intervals around the shaft, are the minimum acceptable method for measuring vertical movement. Ensure that four dial gauges, each with 0.001 inch divisions and with 2 inch minimum travel, placed at 90 degree intervals are the minimum required for measuring horizontal movement.

(3) Survey Level: As a check on the dial gauges, determine the elevation of a point near the top of the test pile/shaft (on plan datum) by survey level at each load and unload interval during the load test. Unless approved otherwise by the Engineer, level survey precision is 0.001 foot. Alternately, the surveyor may read an engineer's 50 scale attached near the pile/shaft head. Determine the first elevation before applying the first load increment; make intermediate readings immediately before a load increment or an unload decrement, and after the final unload decrement that completely removes the load. Make a final reading at the time of the last recovery reading or as directed by the Engineer.

For over-water test sites, when shown in the plans or directed by the Engineer, the Contractor shall drive an H pile through a 36 inch casing to provide a stable support for the level and to protect it against wave action interfering with level measurements. Provide a suitable movable jig for the surveyor to stand. Use a jig that has a minimum of three legs, has a work platform providing at least 4 feet width of work area around the casing, and is approved by the Engineer before use. The described work platform may be supported by the protective casing when approved by the Engineer.

455-2.4 Load Test Instrumentation:

(1) General: The intent of the load test instrumentation is to measure the test load on top of the pile/shaft and, when provided in the Contract Documents, its distribution between side friction and end bearing to provide evaluation of the preliminary design calculations and settlement estimates and to provide information for final pile/shaft length design. Ensure that the instrumentation is as described in the Contract Documents.

When requested by the Engineer, provide assistance during installation of any instrumentation supplied by the Department. Supply 110 V, 60 Hz, 30 A of AC electric

power in accordance with the National Electric Code to each test pile/shaft site during the installation of the instrumentation, during the load testing, and during any instrumented redrives ordered by the Engineer.

Place all of the internal instrumentation on the rebar cage before installation in the test shaft. Construct the rebar cage at least two days before it is required for construction of the test shaft. Provide assistance during installation of instrumentation supplied by the Department, including help to string, place, and tie the instrumentation and any assistance needed in moving or repositioning the cage to facilitate installation. Place the rebar cage in one segment complete with its instrumentation. The Engineer may require multiple lift points and/or a suitable "stiffleg" (length of H pile or other suitable section) to get the cage in a vertical position without causing damage to the instrumentation. Successfully demonstrate the lifting and handling procedures before the installing instrumentation.

(2) Hydraulic Jack and Load Cell: Provide hydraulic jack(s) of adequate size to deliver the required test load to the pile/shaft unless shown otherwise in the plans. Before load testing begins, furnish a certificate from a reputable testing laboratory showing a calibration of gauge readings for all stages of jack loading and unloading for jacks provided. Ensure that the jack has been calibrated within the preceding six months unless approved otherwise. Recalibrate the jack after completing load testing if so directed by the Engineer. Ensure that the accuracy of the gauge is within 5% of the true load.

Provide an adequate load cell approved by the Engineer that has been calibrated within the preceding six months. Provide an approved electrical readout device for the load cell. Before beginning load testing, furnish a certificate from a reputable testing laboratory showing a calibration of readings for all stages of loading and unloading for load cells furnished by the Contractor. Ensure that the accuracy of the load cell is within 1% of the true load.

If the Department supplies the Contractor with the jack and/or load cell, have the equipment calibrated and include the cost in the cost for static load test.

(3) Telltales: When shown in the Contract Documents, provide telltales that consist of an unstressed steel rod placed, with appropriate clearance and greased for reducing friction and corrosion, inside a constant-diameter pipe that rests on a flat plate attached to the end of the pipe at a point of interest shown in the plans. Construct telltales in accordance with details shown in the Contract Documents. Install dial gauges reading to 0.001 inch with 1 inch minimum travel as directed by the Engineer to measure the movement of the telltale with respect to the top of the pile/shaft.

(4) Embedded Strain Gauges: When shown in the Contract Documents, provide strain gauges which shall be placed in the test shaft to measure the distribution of the load. Ensure that the type, number, and location of the strain gauges are as shown in the plans or as directed by the Engineer. Use strain gauges that are waterproof and have suitable shielded cable that is unspliced within the shaft.

455-2.5 Support Facilities: Furnish adequate facilities for making load and settlement readings 24 hours per day. Provide such facilities for the instrumented area, and include lighting and shelter from rain, wind, and direct sunlight.

455-2.6 Load Test Personnel Furnished by the Contractor: Provide a certified welder, together with necessary cutting and welding equipment, to assist with the load test setup and to make any necessary adjustments during the load test. Provide personnel to operate the jack, generators, and lighting equipment, and also provide one person with transportation to assist as required during load test setup and conducting of the load tests. Provide qualified personnel, as

determined by Specialty Engineer or testing lab, required to read the dial gauges, take level measurements, and conduct the load test, except when the Contract Documents show that the Department will provide these personnel.

455-2.7 Cooperation by the Contractor: Cooperate with the Department, and ensure that the Department has access to all facilities necessary for observation of the conduct and the results of the test.

455-2.8 Required Reports: Submit a preliminary static load test report to the Engineer within five days after completing the load test. When the Contract Documents do not require internal instrumentation, submit the final report within ten days after completing the load test. Furnish the final report of test results for internally instrumented shafts within 30 days after completing the load test. Include in the report of the load test the following information:

(1) A tabulation of the time of, and the amount of, the load and settlement readings, and the load and recovery readings taken during the loading and unloading of the pile/shaft.

(2) A graphic representation of the test results, during loading and unloading of pile/shaft top movement as measured by the average of the dial gauge readings, from wireline readings and from level readings.

(3) A graphic representation of the test results, when using telltales, showing pile/shaft compression and pile/shaft tip movement.

(4) The estimated failure and safe loads according to the criteria described herein.

(5) Remarks concerning any unusual occurrences during the loading of the pile/shaft.

(6) The names of those making the required observations of the results of the load test, the weather conditions prevailing during the load test, and the effect of weather conditions on the load test.

(7) All supporting data including jack and load cell calibrations and certificates and other equipment requiring calibration.

(8) When the Contract Document requires internal instrumentation of the pile/shaft, furnish all of the data taken during the load test together with instrument calibration certifications. In addition, provide a report showing an analysis of the results of axial load and lateral load tests in which soil resistance along and against the pile/shaft is reported as a function of deflection.

Provide the necessary report(s) prepared by the Specialty Engineer responsible for collection and interpretation of the data, except when the Contract Documents show that the Department will provide a Geotechnical Engineer.

455-2.9 Disposition of Loading Material: After completing all load tests, clean, remove all rust and debris from Department equipment, repaint all areas having damage to the paint in accordance with Section 560, and return all load test equipment supplied by the Department to its designated storage area. Repair any structural damage to Department owned equipment to the satisfaction of the Engineer. Notify the Department at least ten working days in advance so that arrangements can be made to unload the equipment. Remove all equipment and materials, which remains the Contractor’s property, from the site. Clean up and restore the site to the satisfaction of the Engineer.

455-2.10 Disposition of Tested Piles/Shafts: After completing testing, cut off the tested piles/shafts, which are not to be incorporated into the final structure, and any reaction piles/shafts

at an elevation 24 inches below the finished ground surface. Take ownership of the cut-offs and provide areas for their disposal.

B. PILING

455-3 Description.

Furnish and install concrete, steel, or wood piling including driving, jetting, preformed pile holes, cutting off, splicing, dynamic load testing, and static load testing of piling.

455-4 Classification.

The Department classifies piling as follows:

(1) Treated timber piling.
(2) Prestressed concrete piling.
(3) Steel piling.
(4) Test piling.
(5) Sheet piling.
    (a) Concrete sheet piling.
    (b) Steel sheet piling.
(6) Polymeric Piles (see Section 471 for requirements).

455-5 General Requirements.

455-5.1 Site Preparation:

455-5.1.1 Predrilling of Pile Holes: Predrilled pile holes are either starter holes to the depth described in this section or holes drilled through embankment/fill material down to the natural ground surface. 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 455-5.9.1 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 pile length whichever is greater, except that,

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. Perform such work the Engineer allows but does not require at no expense to the Department. When the Engineer requires such work, the Department will pay for such work as Preformed Pile Holes as described in 455-5.9.

455-5.1.2 Underwater Driving: Underwater driving is defined as any driving through water which is above the pile head at the time of driving.

When conducting underwater driving, provide a diver equipped with voice communications to aid in placing the hammer back on the pile for required cushion changes or for subsequent redriving, to attach or recover instrumentation the Engineer is using, to inspect the condition of the pile, or for other assistance as required.

Select one of the following methods for underwater driving:

(a) Accomplish underwater driving using conventional driving equipment and piling longer than authorized so that the piling will extend above the water surface during final driving. When choosing this option, furnish a pile hammer that satisfies the requirements of this Section for use with the longer pile.

(b) Accomplish underwater driving using an underwater hammer that meets the requirements of this Section and is approved by the Engineer. When choosing this option, provide at least one pile longer than authorized at each pile group, extending above the water surface at final driving. At each group location, drive the longer pile first. The Engineer will evaluate the adequacy of the underwater driving system. The Engineer may use the pile tip elevation of the longer pile that the Contractor has driven and the Engineer has accepted, to evaluate the acceptability of the piles driven with the underwater hammer.

(c) Accomplish underwater driving using conventional driving equipment with a suitable approved pile follower. When choosing this option, provide at least one pile longer than required at each pile group, extending above the water surface at final driving. At each group location, drive the full length pile first without using the follower. The Engineer will evaluate the adequacy of the follower used for underwater driving. The Engineer may choose to perform a dynamic load test on the first pile the Contractor drives with the follower in each group. The Engineer may use the pile tip elevation of the longer pile, that the Contractor has driven and the Engineer has accepted, to evaluate the acceptability of the piles driven with the follower.

Prior to use, submit details of the follower for the Engineer's evaluation and approval along with the information required in 455-10. Include the weight, cross-section details, stiffness, type of materials, and dimensions of the follower.

455-5.2 Pile Hammers: All equipment is subject to satisfactory field performance. Use a variable energy hammer to drive concrete piles. Hammers will be rated based on the theoretical energy of the ram at impact. Supply driving equipment which provides the required resistance at a blow count ranging from 3 blows per inch (36 blows per foot) to 10 blows per inch (120 blows per foot) at the end of initial drive, unless approved otherwise by the Engineer after satisfactory field trial. When the Engineer determines the stroke height or bounce chamber pressure readings do not adequately determine the energy of the hammer, provide and maintain a device to measure the velocity of the ram at impact. Determine the actual hammer energy in the field so that it is consistent with the hammer energy used for each bearing capacity determination. When

requested, furnish to the Engineer all technical specifications and operating instructions related to hammer equipment.

455-5.2.1 Air/steam: Variable energy air/steam hammers shall be capable of providing at least two ram stroke lengths. The short ram stroke length shall be approximately half of the full stroke for hammers with strokes up to 4 feet and no more than 2 feet for hammers with maximum strokes lengths over 4 feet. Operate and maintain air/steam hammers within the manufacturer's specified ranges. Use a plant and equipment for steam and air hammers with sufficient capacity to maintain, under working conditions, the hammer, volume and pressure specified by the manufacturer. Equip the plant and equipment with accurate pressure gauges which are easily accessible to the Engineer. The Engineer will not accept final bearing on piles the Contractor drives with air/steam hammers unless the Contractor operates the hammers within 10% of the manufacturer's rated speed in blows per minute, unless otherwise authorized by the Engineer.

455-5.2.2 Diesel: Variable energy diesel hammers shall have at least three fuel settings that will produce reduced strokes. Operate and maintain diesel hammers within the manufacturer's specified ranges. Determine the rated energy of diesel hammers using measured ram stroke length multiplied by the weight of the ram for open end hammers and by methods recommended by the manufacturer for closed end hammers.

Provide the Engineer with a chart from the hammer manufacturer equating stroke and blows per minute for the open-end diesel hammer to be used. Also provide and maintain in working order for the Engineer's use an approved device to automatically determine and display ram stroke for open-end diesel hammers.

Equip closed-end (double acting) diesel hammers with a bounce chamber pressure gauge, in good working order, mounted near ground level so the Engineer can easily read. Also, provide the Engineer with a chart, calibrated to actual hammer performance within 30 days prior to initial use, equating bounce chamber pressure to either equivalent energy or stroke for the closed-end diesel hammer to be used.

455-5.2.3 Hydraulic: Variable energy hydraulic hammers shall have at least three hydraulic control settings that provide for predictable stroke control. The shortest stroke shall be a maximum of 2 feet for the driving of concrete piles. The remaining strokes shall be full stroke and approximately halfway between minimum and maximum stroke.

Determine the hammer energy according to the manufacturer's recommendations. When pressure measuring equipment is required to determine hammer energy, calibrate the pressure gauges before use.

455-5.2.4 Vibratory: Vibratory hammers of sufficient capacity (force and amplitude) may be used to drive steel sheet piles and, with approval of the Engineer, to drive steel bearing piles a sufficient distance to get the impact hammer on the pile (to stick the pile). The Engineer will determine the allowable depth of driving using the vibratory hammer based on site conditions. However, in all cases, use a power impact hammer for the last 15 feet or more of the final driving of steel bearing piles for bearing determinations after all piles in the bent/pier have been driven with a vibratory hammer. Do not use vibrating hammers to install concrete piles, or to install support or reaction piles for a load test.

455-5.3 Cushions and Pile Helmet:

455-5.3.1 Capblock: Provide a capblock (also called the hammer cushion) as recommended by the hammer manufacturer. Use commercially manufactured capblocks constructed of durable manmade materials with uniform known properties. Do not use wood

chips, wood blocks, rope, or other material which permit excessive loss of hammer energy. Do not use capblocks constructed of asbestos materials. Obtain the Engineer's approval for all proposed capblock materials and proposed thickness for use. Maintain capblocks in good condition, and change them when charred, melted, or otherwise significantly deteriorated. The Engineer will inspect the capblock before driving begins and weekly or at appropriate intervals determined by the Engineer based on field trial. Replace or repair any hammer cushion which loses more than 25% of its original thickness, in accordance with the manufacturer's instructions, before permitting further driving.

455-5.3.2 Pile Cushion: Provide a pile cushion that is adequate to protect the pile from being overstressed in compression and tension during driving. Use a pile cushion sized so that it will fully fill the lateral dimensions of the pile helmet minus one inch. Determine the thickness based upon the hammer-pile-soil system. For driving concrete piles, use a pile cushion made from pine plywood or oak lumber. Alternative materials may be used with the approval of the Engineer. Obtain the Engineer's approval for all pile cushions. Do not use materials previously soaked, saturated or treated with oil. Maintain pile cushions in good condition and change when charred, splintered, excessively compressed, or otherwise deteriorated to the point it will not protect the pile against overstressing in tension and/or compression. Protect cushions from the weather, and keep them dry. Do not soak the cushions in any liquid. Replace the pile cushion if, during the driving of any pile, the cushion is either compressed more than one-half the original thickness or begins to burn. Provide a new cushion for each pile unless approved otherwise by the Engineer after satisfactory field trial.

Reuse pile cushions in good condition to perform all set-checks and redrives. Use the same cushion to perform the set-check or redrive as was used during the initial driving, unless this cushion is unacceptable due to deterioration, in which case use a similar cushion.

455-5.3.3 Pile Helmet: Provide a pile helmet suitable for the type and size of piling being driven. Use a pile helmet deep enough to adequately contain the required thickness of pile cushion and to assist in maintaining pile-hammer alignment. Use a pile helmet that fits loosely over the pile head and is at least 1 inch larger than the pile dimensions. Use a pile helmet designed so that it will not restrain the pile from rotating.

455-5.4 Leads: Provide pile leads constructed in a manner which offers freedom of movement to the hammer and that have the strength and rigidity to hold the hammer and pile in the correct position and alignment during driving. When using followers, use leads that are long enough and suitable to maintain position and alignment of the hammer, follower, and pile throughout driving.

455-5.5 Followers: Use followers only for underwater driving. Obtain the Engineer's approval for the type of follower, when used, and the method of connection to the leads and pile. Use followers constructed of steel with an adequate cross-section to withstand driving stresses. When driving concrete piles, ensure that the cross-sectional area of the follower is at least 18% of the cross-sectional area of the pile. When driving steel piles, ensure that the cross-sectional area of the follower is greater than or equal to the cross-sectional area of the pile. Provide a pile helmet at the lower end of the follower sized according to the requirements of 455-5.3.3. Use followers constructed that maintain the alignment of the pile, follower, and hammer and still allow the pile to be driven within the allowable tolerances. Use followers designed with guides adapted to the leads that maintain the hammer, follower, and the piles in alignment.

Use information from driving full length piles described in 455-5.1.2 compared to driving piles with the follower and/or dynamic load tests described in 455-5.13 to evaluate the adequacy of the follower and to establish the blow count criteria when using the follower.

455-5.6 Templates and Ground Elevations: Provide a fixed template, adequate to maintain the pile in proper position and alignment during driving with swinging leads or with semi-fixed leads. Where practical, place the template so that the pile can be driven to cut-off elevation before removing the template. Ensure that templates do not restrict the vertical movement of the pile.

Supply a stable reference close to the pile, which is satisfactory in the opinion of the Engineer, for determination of the pile penetration. At the time of driving piles, furnish the Engineer with elevations of the original ground and template at each pile or pile group location. Note the highest and lowest elevation at each required location and the ground elevation at all piles.

455-5.7 Water Jets: Use jet pumps, supply lines, and jet pipes that provide adequate pressure and volume of water to freely erode the soil. Do not perform jetting without prior approval by the Engineer or unless allowed by the plans.

Do not perform jetting in the embankment or for end bents. Where conditions warrant, with approval by the Engineer, perform jetting on the holes first, place the pile therein, then drive the pile to secure the last few feet of penetration. Only use one jet for prejetting or jetting through piles constructed with a center jet-hole. Use two jets when using external jets. When jetting and driving, position the jets slightly behind the advancing pile tip (approximately 3 feet or as approved by the Engineer). When using water jets in the driving, determine the pile bearing only from the results of driving after withdrawing the jets, except where using jets to continuously eliminate soil resistance through the scour zone, ensure that they remain in place as directed by the Engineer and operating during pile bearing determination. Where practical, perform jetting on all piles in a pile group before driving begins. When large pile groups or pile spacing and batter make this impractical, or when the plans specify a jet-drive sequence, set check a sufficient number of previously driven piles in a pile group to confirm their capacity after completing all jetting.

455-5.8 Penetration Requirements: Measure the penetration of piles from the elevation of natural ground, scour elevation shown in the plans, or the bottom of excavation, whichever is lower. When the Contract Documents show a minimum pile tip elevation or a minimum depth of penetration, drive the tip of the pile to this minimum elevation or this minimum penetration depth. In all such cases, the Engineer will accept the bearing of a pile only if the Contractor achieves the required bearing when the tip of the pile is at or below the specified minimum tip elevation or depth of penetration and below the bottom of the preformed or predrilled pile hole.

When the plans do not show a minimum depth of penetration, scour elevation, or minimum tip elevation, ensure that the required penetration is at least 10 feet into firm bearing material or at least 20 feet into soft material unless otherwise permitted by the Engineer. If a scour elevation is shown in the plans, achieve these penetrations below the scour elevation. The Engineer may accept a penetration between 15 and 20 feet when there is an accumulation of five consecutive feet or more of firm bearing material. Firm bearing material is any material offering a driving resistance greater than or equal to 30 tons/ft^2 of gross pile area as determined by the Wave Equation (455-5.11.2). Soft material is any material offering less than these resistances. The gross pile area is the actual pile tip cross-sectional area for solid concrete piles, the product

of the width and depth for H piles, and the area within the outside perimeter for pipe piles and voided concrete piles.

Do not drive piles beyond practical refusal (20 blows per inch). To meet the requirements in this Subarticle, provide penetration aids, such as jetting or preformed pile holes, when piles cannot be driven to the required penetration without reaching practical refusal.

If the Contractor encounters unforeseeable, isolated obstructions that the Contractor cannot practically penetrate by driving, jetting, or preformed pile holes, and the Contractor must remove the pile to obtain the required pile penetration, the Department will pay the costs for such removal as Unforeseeable Work.

455-5.9 Preformed Pile Holes:

455-5.9.1 Description: Preformed Pile Holes serve as a penetration aid when all other pile installation methods fail to produce the desired penetration and when authorized by the Engineer to minimize the effects of vibrations on adjacent structures. Preformed Pile Holes are necessary when the presence of rock or strong strata of soils will not permit the installation of piles to the desired penetration by driving or a combination of jetting and driving, when determined necessary by the Engineer, or when authorized by the Engineer to minimize the effects of vibrations on adjacent existing structures. The Engineer may require preformed holes for any type of pile. Drive all piles installed in Preformed Pile Holes to determine that the bearing requirements have been met.

For preformed holes which are required through material that caves during driving to the extent that the preformed hole does not serve its intended purpose, case the hole from the surface through caving material. After installing the pile to the bottom of the preformed hole, remove the casings unless shown otherwise in the plans. Determine bearing of the pile after removing the casing unless shown otherwise in the plans. Fill all voids between the pile and soil remaining after driving through preformed holes with clean A-3 sand or sand meeting the requirements of 902-3.3, after the pile has achieved the required minimum tip elevation, unless grouting of preformed pile holes is shown in the plans. If pile driving is interrupted during sand placement, drive the pile at least 20 additional blows after filling all of the voids between the pile and soil with sand at no additional compensation.

455-5.9.2 Provisions for Use of Preformed Pile Holes: The Department generally anticipates the necessity for Preformed Pile Holes and includes directions in the Contract Documents. The Department will pay for Preformed Piles Holes when the Contractor establishes that the required results cannot be obtained when driving the load bearing piles with specified driving equipment, or if jetting is allowed, while jetting the piles and then driving or while jetting the piles during driving.

455-5.9.3 Conditions Under Which Payment Will Be Made: The Department will make payment for Preformed Pile Holes shown in the plans, required by the Engineer or where the Contractor demonstrates that such work is necessary to achieve the required penetration of the pile. The Department considers, but does not limit to, the following conditions as reasons for Preformed Pile Holes:

(a) Inability to drive piles to the required penetration with driving and jetting equipment.

(b) To penetrate a hard layer or layers of rock or strong stratum that the Engineer considers not sufficiently thick to support the structure.

(c) To obtain greater penetration into dense (strong) material and into dense material containing holes, cavities or unstable soft layers.

(d) To obtain penetration into a stratum in which it is desired to found the structure.

(e) To minimize the effects of vibrations or heave on adjacent existing structures.

(f) To minimize the effects of ground heave on adjacent piles.

455-5.9.4 Construction Methods: Construct Preformed Pile Holes by drilling, or driving and withdrawing a suitable punch or chisel at the locations of the piles. Construct a hole that is equal to or slightly greater than the largest pile dimension for the entire length of the hole and of sufficient depth to obtain the required penetration. Carefully form the preformed hole by using a drill or punch guided by a template or other suitable device, and do not exceed the minimum dimensions necessary to achieve the required penetration of the pile. When the plans call for grouting the Preformed Pile Holes, provide the minimum dimension of the pile hole that is 2 inches larger than the largest pile dimension. Construct the holes at the plan position of the pile and the tolerances in location, and ensure the hole is straight and that the batter is the same as specified for the pile. Loose material may remain in the preformed pile hole if the conditions in 455-5.9.3 are satisfied.

455-5.9.5 Grouting of Pile Holes: Grout Preformed Pile Holes for bearing piles, when the plans require grouting after driving. Clean the Preformed Pile Holes, and fill them with cement grout as shown in the plans. Use grout that has a minimum compressive strength of 3,000 psi at 28 days or as specified. Pump the grout through three or more grout pipes initially placed at the bottom of the preformed hole. The Contractor may raise the grout pipes when necessary to prevent clogging and to complete the grouting operations. Maintain the grout pipes below the surface of the previously placed grout. Continue grouting until the grout reaches the ground surface all around the pile. Provide divers to monitor grouting operations when the water depth is such that it is impractical to monitor from the ground surface. When grouting is shown in the plans, include the cost in the price for piles. In the event that the Engineer determines the Contractor must grout and the required grouting is not shown in the plans, the Department will pay for the grouting work as Unforeseeable Work.

455-5.10 Bearing Requirements:

455-5.10.1 General: Drive piles to provide the bearing capacities required for carrying the loads shown in the plans. For all types of bearing piles, consider the driving resistance as determined by the methods described herein sufficient for carrying the specified loads as the minimum bearing which is accepted for any type of piles. Determine pile bearing using the method described herein or as shown in the plans.

The Engineer may accept a driven pile when the pile has achieved minimum penetration, the blow count is generally increasing and the minimum required bearing capacity obtained for 24 inches of consecutive driving. At his discretion, the Engineer may also accept a driven pile when the minimum penetration is achieved and driving has reached practical refusal in firm material.

455-5.10.2 Blow Count Criteria: The Engineer will determine the number of blows required to provide the required bearing according to the methods described herein. Determine the pile bearing by computing the penetration per blow with less than 1/4 inch rebound averaged through 12 inches each of penetration. When it is considered necessary by the Engineer, determine the average penetration per blow by averaging the penetration per blow through the last 10 to 20 blows of the hammer.

455-5.10.3 Practical Refusal: Practical refusal is defined as 20 blows per inch with the hammer operating at the highest setting or setting determined by the Engineer and less than 1/4 inch rebound per blow. Stop driving as soon as the Engineer determines that the pile has reached practical refusal. The Engineer will generally make this determination within 2 inches of driving. However, the Engineer will in no case approve the continuation of driving at practical refusal for more than 12 inches. When the required pile penetration cannot be achieved by driving without exceeding practical refusal, use other penetration aids such as jetting or Preformed Pile Holes.

455-5.10.4 Set-checks and Pile Redrive:

(a) Set-checks: In the event that the Contractor has driven the pile to approximately 12 inches above cut-off without reaching the required resistance, the Engineer may require the Contractor to interrupt driving up to two hours prior to performing a set-check. Provide an engineer's level or other suitable equipment for elevation determinations to determine accurate pile penetration during the set-checks. In the event the results of the initial set-checks are not satisfactory, the Engineer may direct additional set-checks. The Engineer may accept the pile as driven when a set-check shows that the Contractor has achieved the minimum required pile bearing and has met all other requirements of this Section.

(b) Pile Redrive: Pile Redrive consists of redriving the pile after the following working day from initial driving to determine time effects, to reestablish pile capacity due to pile heave, or for other reasons determined by the Engineer. Redrive piles as directed by the Engineer.

(c) Uninstrumented Set-Checks and Uninstrumented Pile Redrive: The Engineer may consider the pile to have sufficient bearing resistance when the specified set-check criteria is met through the last 10 to 20 blows of the hammer at the specified minimum stroke and the total penetration is less than six inches with less than 1/4 inch rebound per blow. When the total penetration during a set-check or redrive is greater than six inches or pile rebound exceeds 1/4 inch per blow, the Engineer may consider the pile to have sufficient bearing resistance when the specified blow count criteria is achieved in accordance with 455-5.10.1.

(d)Instrumented Set-Checks and Instrumented Pile Redrive: When considered necessary by the Engineer, dynamic load tests will be used to determine whether the pile bearing is sufficient. The Engineer may consider the pile to have sufficient bearing resistance when dynamic measurements demonstrate the static pile resistance during at least one hammer blow exceeds the required pile resistance, the average static pile resistance during the next five hammer blows exceeds 95% of the required pile resistance and the static pile resistance during all subsequent blows exceeds 90% of the required pile resistance.

455-5.10.5 Pile Heave: Pile heave is the upward movement of a pile from its originally driven elevation. Drive the piles in an approved sequence to minimize the effects of heave and lateral displacement of the ground. Monitor piles previously driven in a pile group for possible heave during the driving of the remaining piles. When required by the Engineer, take elevation measurements to determine the magnitude of the movement of piles and the ground surface resulting from the driving process. Redrive all piles that have heaved 1/4 inch or more unless the Engineer determines that the heave is not detrimental to pile capacity. The Department will pay for all work in conjunction with redriving piles due to pile heave under the Pile Redrive item.

455-5.10.6 Piles with Insufficient Bearing: In the case that the Engineer determines that the safe bearing capacity of any pile is less than the required bearing capacity,

the Contractor may splice the pile and continue driving or may extract the pile and drive a pile of greater length, or, if so ordered by the Engineer, drive additional piles until reducing the required bearing per pile to the determined bearing capacity of the piles already driven.

455-5.11 Methods to Determine Pile Capacity:

455-5.11.1 General: Dynamic load test will be used to determine pile capacity for all structures or projects unless shown otherwise in the Contract Documents. When necessary, the Engineer may require static load tests to confirm pile capacities. When the Contract Documents do not include items for static load tests, the Engineer will consider all required static load testing Unforeseeable Work. When considered necessary by the Engineer, adjust the blow count criteria to match the resistance determined from static load tests.

455-5.11.2 Wave Equation:

(a) General: 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.

The Engineer may modify the scour resistance shown in the plans if the dynamic load test is used to determine the actual soil resistance through the scour zone. Also, the Engineer may make modifications in scour resistance when the Contractor proposes drilling and/or jetting to reduce the soil resistance in the scour zone.

Use Wave Equation Analyses to show the hammer is capable of driving to a resistance equal to at least 2.0 times the factored design load plus the scour and down drag resistance (if applicable) shown in the Contract Documents, without overstressing the piling in compression or tension and without reaching practical refusal (20 blows per inch). Ensure that the hammer provided also meets the requirements described in 455-5.2.

(b) Required Equipment For Driving: Hammer approval is solely based on satisfactory field trial including dynamic load test results and Wave Equation Analysis. Supply a hammer system that meets the requirements described in the specifications based on the above analysis. Obtain approval from the Engineer for the pile driving system based on satisfactory field performance.

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.

(c) Maximum Allowed Pile Stresses:

(1) General: The maximum allowed driving stresses for concrete, steel, and timber piles are given below. In the event Wave Equation analyses 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 or make other appropriate agreed upon changes. For penetration of weak soils by concrete piles, use thick cushions and/or reduced stroke to control tension stresses during driving.

(2) Concrete Piles: Use the wave equation to evaluate the proposed pile cushioning. Use the following equations to determine the maximum allowed pile stresses as predicted by the wave equation, and measured during driving when driving prestressed concrete piling:

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

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

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

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

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_{pe}= effective prestress (after all losses) at the time of driving, psi, taken as 0.8 times the initial prestress force (f_{pe}= 0 for dowel spliced piles).

(3) Steel Piles: Ensure the maximum allowed pile compression and tensile stresses as predicted by the Wave Equation, and/or measured during driving are no greater than 0.9 times the yield strength (0.9 f_y) of the steel.

(4) Timber Piles: Ensure the maximum allowed pile compression and tensile stresses as predicted by the wave equation, and/or 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.

455-5.11.3 Temporary Piles: Submit for the Engineers approval, a Wave Equation analysis signed and sealed by a Specialty Engineer which establishes the driving criteria for temporary piles. The required driving resistance is equal to the design (service) load multiplied by the appropriate factor of safety plus the scour and down drag resistance shown in the plans (no safety factor is required) or the ultimate bearing capacity shown in the plans, whichever is higher:

The factor of safety applied to the design (service) load is:

2.0..... when static load tests are required.
2.5.....when the Pile Driving Analyzer
.....and Wave Equation Analysis are required.
3.0..... when only the Wave Equation Analysis is required.

455-5.11.4 Dynamic Load Tests: Dynamic load testing consists of estimating pile capacity by the analysis of electronic data collected from blows of the hammer during driving of an instrumented pile.

455-5.11.5 Static Load Tests: Static load testing consists of applying a static load to the pile to determine its capacity. Use The Modified Quick Test Procedure in accordance with 455-2.2.1.

455-5.11.6 Fender Pile Installation: For piles used in fender systems, regardless of type or size of pile, either drive them full length or jet the piles to within 2 feet of cutoff and drive to cutoff elevation to seat the pile. The Engineer will not require a specific driving resistance unless noted in the plans. Use methods and equipment for installation that do not

damage the piles. If the method or equipment used causes damage to the pile, modify the methods or equipment at no expense to the Department.

455-5.12 Test Piles:

455-5.12.1 Description: Drive piles of the same cross-section and type as the permanent piles shown in the plans, in order to determine any or all of the following:

(a) the installation criteria for the piles.

(b) the nature of the soil.

(c) the lengths of permanent piles required for the work.

(d) the driving resistance characteristics of the various soil strata.

(e) the amount of work necessary to obtain minimum required pile penetration.

(f) the ability of the driving system to do the work.

(g) the need for point protection.

Because test piles are exploratory in nature, drive them harder (within the limits of practical refusal), deeper, and to a greater bearing resistance than required for the permanent piling. Except for test piles which are to be statically or Statnamically load tested, drive test piles their full length or to practical refusal. Splice test piles which have been driven their full length and have developed only minimal required bearing, and proceed with further driving.

As a minimum, unless otherwise directed by the Engineer, do not cease driving of test piles until obtaining the required bearing capacity continuously, where the blow count is increasing, for 10 feet unless reaching practical refusal first. For test piles which are to be statically or Statnamically load tested, ignore this minimum and drive these piles as anticipated for the production piles.

When test piles attain practical refusal prior to attaining minimum penetration, perform all work necessary to attain minimum penetration and the required bearing. Where practical, use water jets to break the pile loose for further driving. Where jetting is impractical, extract the pile and install a Preformed Pile Hole through which driving will continue. The Department will consider the work of extracting the pile to be Unforeseeable Work.

When driving test piles other than low displacement steel test piles, have preforming equipment available at the site and water jets as specified in 455-5.7 when jetting is allowed, ready for use, before the test pile driving begins.

The Engineer may elect to interrupt pile driving up to four times on each test pile, two times for up to two hours and two additional times during the next working day of initial driving to determine time effects during the driving of test piles.

Install instruments on test piles when dynamic load tests are included in the plans or when directed by the Engineer.

455-5.12.2 Location of Test Piles: Drive all test piles in the position of permanent piles at the designated locations. Ensure that all test piles designated to be statically load tested are plumb. In the event that all the piles are battered at a static load test site, the Engineer will designate an out-of-position location for driving a plumb pile for the static load test.

455-5.12.3 Equipment for Driving: Use the same hammer and equipment for driving test piles as for driving the permanent piles. Also use the same equipment to redrive piles.

455-5.13 Dynamic Load Tests: The Engineer will take dynamic measurements during the driving of piles designated in the plans or authorized by the Engineer . Install instruments prior to driving. All test piles will have dynamic load tests. The Engineer will perform Dynamic Load Tests to evaluate any or all of the following:

1. Evaluate suitability of Contractor's driving equipment, including hammer, capblock, pile cushion, and any proposed follower.
2. Determine pile capacity.
3. Determine pile stresses.
4. Determine energy transfer to pile.
5. Determine distribution of soil resistance.
6. Evaluate soil variables including quake and damping.
7. Evaluate hammer-pile-soil system for Wave Equation analyses.
8. Evaluate pile installation problems.
9. Other.

Either install Embedded Data Collectors (EDCs) in the piles in accordance with Design Standards, Index No. 20602 or attach instruments (strain transducers to measure force and accelerometers to measure acceleration) with bolts to the pile for dynamic load testing.

Make each pile to be dynamically tested with externally attached instruments available to drill holes for attaching instrumentation and for wave speed measurements. Support the pile with timber blocks placed at appropriate intervals. Ensure that the pile is in a horizontal position and does not contact adjacent piles. Provide a sufficient clear distance at the sides of the pile for drilling the holes. The Engineer will furnish the equipment, materials, and labor necessary for drilling holes and taking the wave speed measurements. If the Engineer directs dynamic load testing, instrumented set-checks or instrumented redrives, provide the Engineer safe access to the top of the piles for drilling the attachment holes. After placing the leads provide the Engineer reasonable means of access to the piles to attach the instruments and for removal of the instruments after completing the pile driving.

The Engineer will monitor the stresses in the piles with the dynamic test equipment during driving to ensure the Contractor does not exceed the maximum allowed stresses. If necessary, add additional cushioning, replace the cushions, or reduce the hammer stroke to maintain stresses below the maximum allowable. If dynamic test equipment measurements indicate non-axial driving, immediately realign the driving system. If the cushion is compressed to the point that a change in alignment of the hammer will not correct the problem, add cushioning or change the cushion as directed by the Engineer.

Drive the pile to the required penetration and resistance or as directed by the Engineer. Dynamic load testing of a pile may average up to two hours longer than for driving an uninstrumented pile.

When directed by the Engineer, perform instrumented set-checks or redrives. Do not use a cold diesel hammer for a set-check or redrive unless in the opinion of the Engineer it is impractical to do otherwise. Generally, warm up the hammer by driving another pile or applying at least 20 blows to a previously driven pile or to timber mats placed on the ground.

455-5.14 Pile Lengths:

455-5.14.1 Test Pile Length: Provide the length of test piles shown in the plans or as directed by the Engineer.

455-5.14.2 Production Pile Length: When shown in the plans, the lengths are based on information available during design and are approximate only. The Engineer will

determine final pile lengths in the field which may vary significantly from the lengths or quantities shown in the plans.

455-5.14.3 Authorized Pile Lengths: The authorized pile lengths are the lengths determined by the Engineer based on all information available before the driving of the permanent piles, including, but not limited to, information gained from the driving of test piles, dynamic load testing, static load testing, supplemental soil testing, etc. When authorized by the Department, soil freeze information obtained during set checks and pile redrives may be used to determine authorized pile lengths for sites with extreme soil conditions. The Contractor may elect to provide piling with lengths longer than authorized to suit his method of installation or schedule. When the Contractor elects to provide longer than authorized pile lengths, the Department will pay for the furnished length as either the originally authorized length or the length between cut-off elevation and the final accepted pile tip elevation, whichever is the longer length.

Within five working days after driving all the test piles, completing all load tests, completing all redrives, and receiving all test reports, the Engineer will furnish the Contractor an itemized list of authorized pile lengths. Use these lengths for furnishing the permanent piling for the structure. If the Contractor is willing to start his pile driving operations in zones consisting of at least four test piles designated by the Engineer, and if the Contractor so requests in writing at the beginning of the test pile program, the Department will furnish pile lengths for these designated phases within five working days after driving all the test piles, completing all load tests, completing all redrives, and receiving all test reports for those designated zones. The Engineer will furnish the driving criteria for piles within three working days of furnishing pile lengths.

On multiple phase projects, the Engineer will not furnish pile lengths on subsequent phases until completing the piling on initial phases.

455-5.15 Allowable Driving Tolerances:

455-5.15.1 General: Meet the tolerances described in this Subarticle to the piles that are free standing without lateral restraint (after the template is removed). After the piles are driven, do not move the piles laterally to force them to be within the specified tolerances. The Contractor may move battered piles laterally to overcome the dead load deflections caused by the pile's weight. When this is necessary, submit calculations signed and sealed by a Specialty Engineer to the Engineer that verify the amount of dead load deflection prior to moving any piles.

455-5.15.2 Position: Ensure that the final position of the pile head at cut-off elevation is no more than 3 inches laterally in the X or Y coordinate from the plan position indicated in the plans.

455-5.15.3 Axial Alignment: Ensure that the axial alignment of the driven piles does not deviate by more than 1/4 in/ft from the vertical or batter line indicated in the plans.

455-5.15.4 Elevation: Ensure that the final elevation of the pile head is no more than 1 1/2 inches above, or more than 4 inches below, the elevation shown in the plans. Do not embed the pile less than 6 inches below the elevation shown in the plans unless a minimum penetration requirement is shown.

For fender piles, cut off piles at the elevation shown on the plans to a tolerance of +0.0"/-2.0" using sawing or other means as approved by the Engineer to provide a smooth level cut.

455-5.15.5 Deviation From Above Tolerances: When the Contractor has failed to meet the above tolerances, the Contractor may request design changes in the pile caps or footings to incorporate piles driven out of tolerance. Bear the expense of redesign and Unforeseeable Work resulting from approved design changes to incorporate piles driven out of tolerance. Ensure the Contractor's Engineer of Record performs any redesign and signs and seals the redesign drawings and computations. Do not begin any proposed redesign until it has been reviewed for acceptability and approved by the Engineer.

455-5.16 Disposition of Pile Cut-offs, Test Piles, and Load Test Materials:

455-5.16.1 Pile Cut-offs:

(a) Steel Piling: Unless shown otherwise in the plans, the Department will retain ownership of cut-off sections, or portions of cut-off sections, and unused piling 20 feet long or longer that are not damaged. Deliver them to the Department's nearest maintenance yard. Ensure that sections of piles delivered to the maintenance yard are straight and undamaged. Cut off the damaged portions prior to delivery. Take ownership of cut-off sections less than 20 feet long. Remove them from the job, and dispose of them.

(b) Other Pile Types: Upon completion of all work under the Contract in connection with piling, unless shown otherwise in the plan, take ownership of any unused cut-off lengths remaining, and remove them from the right-of-way. Provide areas for their disposal.

455-5.16.2 Test Piles: Where so directed by the plans or the Engineer, cut off, or build-up as necessary, test piles, and leave them in place as permanent piles. Extract and replace test piles driven in permanent position and found not suitable for use due to actions of the Contractor at no expense to the Department. Pull, or cut off at an elevation 2 feet below the ground surface or bottom of proposed excavation, test piles driven out of permanent position, and dispose of the removed portion of the test pile.

When test piles are required to be driven in permanent pile positions, the Contractor may elect to drive the test pile out of position, with the approval of the Engineer, provided that a replacement pile is furnished and driven by the Contractor at no expense to the Department in the position that was to be occupied by the test pile. Under this option, the Department will pay for the test pile in the same manner as if it were in permanent position.

Unless otherwise directed in the plans or by the Engineer, retain ownership of test piles that are pulled or cut off and provide areas for their disposal.

455-6 Timber Piling.

455-6.1 Description: Drive timber piles constructed of round timber of the kind and dimensions specified in the plans at the locations and to the elevations shown in the plans, or as directed by the Engineer.

455-6.2 Materials: Meet the timber piling requirements of Section 953. Treat the piles according to the applicable provisions of Section 955. Treat all cuts and drilled holes in accordance with 470-3.

455-6.3 Preparation for Driving:

455-6.3.1 Caps: Protect the heads of timber piles during driving, using a cap of approved type, that will distribute the hammer blow over the entire cross-section of the pile. When necessary, cut the head of the pile square before beginning pile driving.

455-6.3.2 Collars: Provide collars or bands to protect piles against splitting and brooming at no expense to the Department.

455-6.3.3 Shoes: Provide piles shod with metal shoes, of a design satisfactory to the Engineer, at no expense to the Department. Shape pile tips to receive the shoe and install according to the manufacturer's directions.

455-6.4 Storage and Handling: Store and handle piles in the manner necessary to avoid damage to the piling. Take special care to avoid breaking the surface of treated piles. Do not use cant dogs, hooks, or pike holes when handling and storing the piling.

455-6.5 Cutting Off: Saw off the tops of all timber piles at the elevation indicated in the plans. Saw off piles which support timber caps to the exact plane of the superimposed structure so that they exactly fit it. Withdraw and replace broken, split, or misplaced piles.

455-6.6 Build-ups: The Engineer will not permit splices or build-ups for timber piles. Extract piles driven below plan elevation and drive a longer pile.

455-6.7 Pile Heads:

455-6.7.1 Piles with Timber Caps: On piles wider than the timber caps, dress off to a slope of 45 degrees the part of the pile head projecting beyond the sides of the cap. Coat the cut surface with the required preservative over which place a sheet of copper, of a weight of 10 oz/ft^2 or greater, meeting the requirements of ASTM B 370. Provide a cover that measures at least 4 inches more in each dimension greater than the diameter of the pile. Bend the cover down over the pile and fasten the edges with large head copper nails or three wraps of No. 12 copper wire.

455-6.7.2 Fender and Bulkhead Piles: First paint the heads of fender piles and of bulkhead piles with preservative and then cover with copper as provided above for piles supporting timber caps.

455-7 Prestressed Concrete Piling.

455-7.1 Description: Provide prestressed concrete piles that are manufactured, cured, and driven in accordance with the requirements of the Contract Documents. Provide piles full length without splices when transported by barge or the pile length is less than or equal to 120 feet. When piles are transported by truck and the pile length exceeds 120 feet but is less than the maximum length for a three point pick-up according to Index 20600, and splicing is desired, provide minimal splices. Include the cost of the splices in the cost of the pile.

455-7.2 Manufacture: Fabricate piles in accordance with Section 450.

455-7.3 Storage and Handling:

455-7.3.1 Time of Driving Piles: Drive prestressed concrete piles at any time after the concrete has been cured in accordance with Section 450, and the concrete compressive strength is equal to or greater than the specified 28 day compressive strength.

455-7.3.2 Storage: Support piles on adequate dunnage both in the prestress yard and at the job site in accordance with the locations shown in the Standard Indexes to minimize undue bending stresses or creating a sweep or camber in the pile.

455-7.3.3 Handling: Handle and store piles in the manner necessary to eliminate the danger of fracture by impact or of undue bending stresses in handling or transporting the piles from the forms and into the leads. In general, lift concrete piles by means of a suitable bridge or slings attached to the pile at the locations shown in the Standard Indexes. Construct slings used to handle piles of a fabric material or braided wire rope constructed of six or more wire ropes which will not mar the corners or the surface finish of the piles. Do not use chains to handle piles. During transport, support concrete piles at the lifting locations shown in the Standard Indexes or fully support them throughout 80% or more of their length. In handling piles for use in salty or brackish water, exercise special care to avoid damaging the surface and

corners of the pile. If an alternate transportation support arrangement is desired, submit calculations, signed and sealed by the Specialty Engineer, for approval by the Engineer prior to transporting the pile. Calculations must show that the pile can be transported without exceeding the bending moments calculated using the support locations shown in the plans.

455-7.4 Cracked Piles: The Engineer will reject any pile that becomes cracked in handling to the point that a transverse or longitudinal crack extends through the pile, shows failure of the concrete as indicated by spalling of concrete on the main body of the pile adjacent to the crack, or which in the opinion of the Engineer will not withstand driving stresses. The Engineer will not reject any pile for the occasional minor surface hairline cracking caused by shrinkage or tensile stress in the concrete from handling.

Do not drive piling with irreparable damage, which is defined as any cracks that extend through the pile cross-sectional area that are, or will be, below ground or water level at the end of driving. Such cracks are normally evidenced by emitting concrete dust during their opening and closing with each hammer blow. Remove and replace broken piles or piles cracked to the extent described above at no expense to the Department. The Engineer will accept cracks less than 0.005 inch which do not extend through the pile. Using approved methods, cut off and splice or build-up to cut-off elevation piles with cracks greater than 0.005 inch at the pile head or above ground or water level, and piles with cracks above ground or water level which extend through the cross-sectional area of the pile. The Engineer, at his discretion, may require correction of pile damage or pile cracks by cutting down the concrete to the plane of sound concrete below the crack and rebuilding it to cut-off elevation, or the Engineer may reject the pile. Extract and replace rejected piles that cannot be repaired, at no expense to the Department.

Take appropriate steps to prevent the occurrence of cracking, whether due to handling or driving. When cracking occurs during driving take immediate steps to prevent additional cracking by using thicker cushions or reducing the ram stroke length. Revise handling and transporting equipment and procedures as necessary to prevent cracking during handling and transportation.

455-7.5 Preparation for Transportation: Cut any strands protruding beyond the ends of the pile flush with the surface of the concrete using an abrasive cutting blade before transporting the piles from the casting yard.

Cut and patch the metal lifting devices in accordance with 450-9.2.1.

455-7.6 Method of Driving: Unless otherwise directed, drive piles by a hammer or by means of a combination of water jets and hammer when jetting is allowed. When using jets in combination with a hammer, withdraw the jets and drive the pile by the hammer alone, to secure final penetration and to rigidly fix the tip end of the pile. Keep jets in place if they are being used to continuously eliminate the soil resistance in the scour zone.

455-7.7 Extensions and Build-ups Used to Increase Production Lengths:

455-7.7.1 General: Where splices and build-ups for concrete piles are necessary, construct such splices and build-ups in accordance with Standard Index 20601. The Contractor may construct build-ups less than 2 feet in length in accordance with 455-11.8. When splicing a prestressed precast section onto the original pile and, after driving, the length of spliced section below cut-off elevation is 4 feet or less, remove the pile concrete to the cut-off elevation and leave the dowels in place to be incorporated into the cap as directed by the Engineer. The Contractor may cut the length of dowels which becomes exposed to a length of 48 inches from the plane of pile-splice.

These requirements are not applicable to specially designed piling. Make splices for special pile designs as shown in the plans.

455-7.7.2 Extensions to be Driven or Those 21 feet or Longer: Construct extensions to be driven or extensions 21 feet or longer in length in accordance with the details shown in the plans and in a manner including the requirements, sequences, and procedures outlined below:

(a) Cast a splice section in accordance with Section 450 with the dowel steel in the correct position and alignment.

(b) Drill dowel holes using an approved steel template that will position and align the drill bit during drilling. Drill holes a minimum of 2 inches deeper than the length of the dowel to be inserted.

(c) Clean the drilled dowel holes by inserting a high pressure air hose to the bottom of the hole and blowing the hole clean from the bottom upward. Eliminate any oil, dust, water, and other deleterious materials from the holes and the concrete surfaces to be joined.

(d) Place forms around joints between the pile sections.

(e) Mix the adhesive components in accordance with the manufacturer's directions. Do not mix sand or any other filler material with the epoxy components unless it is prepackaged by the manufacturer for this specific purpose. Use adhesives meeting the requirements of Section 926 for Type B Epoxy Compounds.

(f) After ensuring that all concrete surfaces are dry, fill the dowel holes with the adhesive material.

(g) Insert the dowels of the spliced section into the adhesive filled holes of the bottom section and position the spliced section so that the axes of the two sections are in concentric alignment and the ends of the abutting sections are spaced 1/2 inch apart. The Contractor may use small steel spacers of the required thickness provided they have 3 inches or more of cover after completing the splice. Fill the space between the abutting sections completely with the adhesive.

(h) Secure the spliced sections in alignment until the adhesive is cured in accordance with the manufacturer's directions for the time appropriate with the prevailing ambient temperatures. Do not utilize the crane to secure the pile extension during the adhesive cure time. Utilize alignment braces to maintain the proper pile alignment during the epoxy cure time.

(i) After curing is completed, remove alignment braces and forms and clean and dress the spliced area to match the pile dimensions.

455-7.7.3 Precast Reinforced Build-ups: Construct Precast Reinforced Build-ups in accordance with the requirements of this Subarticle, Section 346, and Section 400. Provide the same material for the form surfaces for precast build-ups as was used to form the prestressed piles. Use concrete of the same mix as used in the prestressed pile and dimension the cross-section the same as piling being built up. Install build-ups as specified in 455-7.7.2(b) through 455-7.7.2(i). Apply to the build-ups the same surface treatment or sealant applied to the prestressed piles.

455-7.8 Pre-Planned Splices: Splices shall be made by the doweled splice method contained in the Standard Indexes or may be made using proprietary splices which are listed on the Department's QPL. Splice test piles in the same manner as the production piles. Include in the pile installation plan, the chosen method of splicing and the approximate locations of the splice. Generally, place the splice at approximately the midpoint between the estimated pile tip

and the ground surface, considering scour if applicable. Stagger the splice location between adjacent piles by a minimum of 10 feet. Obtain the Engineer's approval prior to constructing any pile sections. Construct piles which are to be spliced using the doweled splice with preformed dowel holes in the bottom section and embedded dowels in the upper section.

When the electing to use dowel splices, assist the Engineer in performing a dynamic load test on each dowel spliced pile to verify the splicing integrity at the end of driving. Replace any damaged pile splices in accordance with 455-11.2.7. Provide the Engineer 48 hours advance notification prior to driving piles with epoxy-bonded dowel splices.

Mechanical pile splices shall be capable of developing the following capacities in the pile section unless shown otherwise in the plans and capable of being installed without damage to the pile or splice:

a) Compressive strength = (Pile Cross sectional area) x (28 day concrete strength)

b) Tensile Strength = (Pile Cross sectional area) x 900 psi

Pile Size (inches)	Bending Strength (kip-feet)
18	245
20	325
24	600
30	950

455-7.9 Pile Cut-offs: After the completion of driving, cut piles off which extend above the cut-off elevation with an abrasive saw. Make the cut the depth necessary to cleanly cut through the prestressed strands. Take ownership and dispose of cut-off sections not used elsewhere as allowed by this Section.

455-8 Steel Piling.

455-8.1 Description: Furnish, splice, drive, and cut off structural steel shapes to form bearing piles. Include in this work the installation of bracing members of structural steel by bolting or welding, construction of splices and the filling of pipe piles with the specified materials.

455-8.2 Material: For the material in steel piles, pile bracing, scabs, wedges, and splices, meet the requirements of Section 962.

455-8.3 Pile Splices: Order and use the full authorized pile length where practicable. Do not splice to obtain authorized lengths less than 40 feet except when shown in the plans. When approved by the Engineer, perform splicing to obtain authorized lengths between 40 and 60 feet. The Engineer will permit splicing to obtain authorized lengths in excess of 60 feet.

Where the pile length authorized is not sufficient to obtain the required bearing value or penetration, order an additional length of pile and splice it to the original length.

Make all splices in accordance with details shown in the plans and in compliance with the general requirements of AWS D1.1 or American Petroleum Institute Specification 5L (API 5L).

455-8.4 Welding: Make all welded connections to steel piles by electric arc welding, in accordance with details shown in the plans and in compliance with the general requirements of AWS D1.5. Electroslag welding is not permitted. Welds will be inspected by visual methods.

455-8.5 Pile Heads and Tips: Cut off all piles at the elevation shown in the plans. If using a cutting torch, make the surface as smooth as practical.

Where foundation material is so dense that the Contractor cannot drive the pile to the required penetration and firmly seat it without danger of crumpling the tip, reinforce the tips with approved cast steel point protectors as shown in the plans or required by the Engineer. Construct point protectors in one piece of cast steel meeting the requirements of ASTM A 27, Grade 65-35 heat treated to provide full bearing for the piles. Attach points by welding according to the recommendations of the manufacturer.

455-8.6 Pile Bent Bracing Members: Place structural steel sway and cross bracing, and all other steel tie bracing, on steel pile bents and bolt or weld in place as indicated in the plans. Where piles are not driven into position in exact alignment as shown in the plans, the Engineer may require the use of fills and shims between the bracing and the flanges of the pile. Furnish and place all fills and shims required to square and line up faces of flanges for cross bracing at no additional expense to the Department.

455-8.7 Coating: Coat exposed parts of steel piling, wedging, bracing, and splices in accordance with the provisions for coating structural steel as specified in Section 560.

455-8.8 Storage and Handling: While handling or transporting the piles from the point of origin and into the leads, store and handle in the manner necessary to avoid damage due to bending stresses. In general, lift steel piles by means of a suitable bridge or a sling attached to the pile at appropriate points to prevent damage. Lift the pile from the horizontal position in a manner that will prevent damage due to bending of the flanges and/or web.

455-8.9 Filling Pipe Piles: When required by the plans, fill pipe piles with the specified materials. Use clean concrete sands and concrete meeting the requirements of Section 346. Place concrete in pipes containing water using methods in accordance with 455-15.9 with modified tremie and pump line sizes. Concrete may be placed directly into pipes which are dry. Construct and place reinforcement cages in accordance with 455-16. Reinforcement cages may be installed before concrete placement or after concrete placement is completed if proper alignment and position is obtainable.

455-9 Sheet Piling.

455-9.1 Description: Leave permanent piling in place as part of the finished work and generally remove temporary piling after each construction phase.

455-9.2 Materials: Meet the following requirements:

Concrete	Section 346
Bar Reinforcement	Section 931
Prestressing Reinforcement	Section 933
Steel Sheet Piles*	Section 962

*For temporary steel sheet piles meet the requirements specified in the plans.

455-9.3 Steel Sheet Piling: Drive steel sheet piling and cut off true to line and grade. Install steel sheet piling with a suitable hammer. Remove and replace any section damaged during handling and installation at no additional expense to the Department.

455-9.3.1 Method of Installation: Where rock or strong material is encountered such that the sheet piles cannot be set to grade by driving, remove the strong material by other acceptable means, such as excavation and backfilling or by punching. When the plans do not indicate the existence of rock or strong material, work of removing, drilling or punching the strong material or rock will be paid for as Unforeseeable Work.

455-9.4 Concrete Sheet Piling:

455-9.4.1 Description: Ensure that Concrete Sheet Piling is of prestressed concrete construction and manufactured, cured, and installed in accordance with the requirements of the Contract Documents. Use these piles in bulkheads and abutments and at other locations as shown in the plans.

455-9.4.2 Manufacture of Piles: Ensure that the piles are fabricated in accordance with Section 450.

455-9.4.3 Method of Installation: Jet concrete sheet piling to grade where practical. The Engineer will require a minimum of two jets. Provide water at the nozzles of sufficient volume and pressure to freely erode material adjacent to the piles. Where encountering rock or strong material, such that the sheet piles cannot be set to grade by jetting, remove the strong materials by other acceptable means, such as excavation and backfilling, drilling or by punching with a suitable punch. When the plans do not indicate the existence of rock or strong material and the piles cannot be set by jetting, the Department will pay for the work of removing, drilling or punching the strong material or rock as Unforeseeable Work.

455-9.4.4 Grouting and Caulking: Concrete sheet piles are generally detailed to have tongues and grooves on their lower ends, and double grooves on their upper ends. Where so detailed, after installation, clean the grooves of all sand, mud, or debris, and fully grout the grooves. Use approved plastic bags (sheaths) which will meet the shape and length of the groove to be grouted to contain the plastic grout within the double grooves. Provide grout composed of one part cement and two parts sand. The Contractor may use clean local sand or sand meeting the requirements of Section 902 in this grout. In lieu of sand-cement grout, the Contractor may use concrete meeting the requirements of Section 347, using small gravel or crushed stone coarse aggregate. Deposit the grout through a grout pipe placed within a watertight plastic sheath (bag) extending the full depth of the double grooves and which, when filled, completely fills the slot formed by the double grooves.

455-9.5 Storage and Handling: Handle and store all sheet piles in a manner to prevent damage. Handle long sheet piles with fabric slings or braided wire rope constructed of six or more wire ropes placed at appropriate lift points to prevent damage due to excessive bending.

455-10 Pile Installation Plan.

455-10.1 General: Complete the Pile Driving Installation Plan form provided by the Engineer. Return the Pile Driving Installation Plan information to the Engineer at the preconstruction conference or no later than 30 days before driving the first pile. Ensure the Pile Driving Installation Plan information includes the following:

1. List and size of proposed equipment including cranes, barges, driving equipment, jetting equipment, compressors, and preformed pile hole equipment. Include manufacturer’s data sheets on hammers.
2. Methods to determine hammer energy in the field for determination of pile capacity. Include in the submittal necessary charts and recent calibrations for any pressure measuring equipment.
3. Detailed drawings of any proposed followers.
4. Detailed drawings of templates.
5. Details of proposed load test equipment and procedures, including recent calibrations of jacks and required load cells.
6. Sequence of driving of piles for each different configuration of pile layout.
7. Proposed schedule for test pile program and production pile driving.

8. Details of proposed features and procedures for protection of existing structures.

9. Required shop drawings for piles, cofferdams, etc.

10. Methods and equipment proposed to prevent displacement of piles during placement and compaction of fill within 15 feet of the piles.

11. Methods to prevent deflection of battered piles due to their own weight and to maintain their as-driven position until casting of the pile cap is complete.

12. Proposed pile splice locations and details of any proprietary splices anticipated to be used.

455-10.2 Acceptance of Equipment and Procedures: All equipment and procedures are subject to satisfactory field performance. Make any required changes that may result from unsatisfactory field performance. The Engineer will give final acceptance after the Contractor makes necessary modifications. Do not make any changes in the driving system after acceptance without authorization of the Engineer. A hammer repaired on site or removed from the site and returned is considered to have its performance altered (efficiency increased or decreased), which is considered a change in the driving system and is subject to a Dynamic Load Test in accordance with 455-5.13 at no additional compensation.

455-11 Method of Measurement (All Piling).

455-11.1 Treated Timber Piling: 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.

455-11.2 Prestressed Concrete Piling:

455-11.2.1 General: The quantity to be paid for will be the length, in feet, of Prestressed Concrete Piling furnished, driven and accepted according to the authorized lengths list, including any additions and excluding any deletions thereto, as approved by the Engineer.

455-11.2.2 Furnished Length: The furnished 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 455-5.14.3 subject to provisions of 455-11.2.3 through 455-11.2.10, 455-11.8, 455-11.9 and 455-11.13.

455-11.2.3 Build-ups: The lengths of pile build-ups authorized by the Engineer, measured from the plane of cutback or the joint between the sections, to head of build-up, will be included in the quantities of Piling.

455-11.2.4 Piles Requiring Cut-offs: 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.

455-11.2.5 Piles Driven Below Cut-off Elevation: Where a pile is driven below cut-off elevation and satisfactory bearing is obtained so that no further driving is required, the length of pile will be measured from cut-off elevation to tip of the pile.

455-11.2.6 Driving of 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.

455-11.2.7 Replacing Piles: In the event a pile is broken or otherwise damaged by the Contractor to the extent that the damage is irreparable, in the opinion of the Engineer, the Contractor shall extract and replace the pile at no additional expense to the Department. In the event that a pile is mislocated by the Contractor, the Contractor shall extract and replace the pile

at no expense to the Department except when a design change proposed by the Contractor is approved by the Department as provided in 455-5.15.5.

In the event that a pile is driven below cut-off without obtaining the required bearing, and the Engineer elects to have the pile pulled and a longer pile substituted, it 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, the Engineer may elect to have the pile extracted, and it will be paid for as Unforeseeable Work. If the extracted pile is undamaged and driven elsewhere the pile will be paid for at 30% of the Contract unit price for Piling. When the Department determines that it is responsible for damaged or mislocated pile, and a replacement pile is required, compensation will be made under the item for Piling, for both the original pile and replacement pile.

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.

455-11.2.8 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:

(a) Using a pile longer than the authorized length: Payment 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. When making and driving a pile splice below cut-off elevation to achieve bearing, the length to be paid for piling will be the length between cut-off elevation and final pile tip elevation.

(b) Using an underwater hammer: Payment for piling and pile splices will be in accordance with 455-11.2.1 through 455-11.2.7 and 455-11.9.2. The Contractor shall furnish additional lengths required to provide the full length confirmation pile at no expense to the Department. Payment for piling for the full length confirmation pile will be the authorized length of the pile, unless the length driven below cut-off elevation is greater than the authorized length, in which case the length to be paid for will be the length between cut-off elevation and the final tip elevation. Splices in confirmation piles will be paid for only when the splice is driven below cut-off elevation.

(c) Using a pile follower: When a pile follower is used with a conventional pile driving system, the method of payment will be the same as shown above in 455-11.9.2.

455-11.3 Steel Piling:

455-11.3.1 General: The quantity to be paid for will be the length, in feet, of Steel Piling furnished, spliced, driven and accepted, up to the authorized length, including any additions and excluding any deletions thereto as approved by the Engineer.

455-11.3.2 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 additions or deletions thereof as approved by the Engineer.

Where a test pile is left in place as a permanent pile, it will be paid for only as Test Piles. Any extensions necessary to continue driving the pile for test purposes, as authorized by the Engineer, will be paid for as Test Piles. Other build-ups made only to incorporate the pile into the structure as a permanent pile 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 as shown in the plans or authorized by the Engineer, completed and accepted in accordance with the Contract Documents. No separate payment will be made for dynamic load tests used to evaluate the Contractor's driving equipment. This will generally be done on the first test pile or production pile driven on a project with each combination of proposed hammer and pile size and/or a separate pile to evaluate any proposed followers, or piles driven to evaluate proposed changes in the driving system. 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 in the Pay Item 455-34. No payment will be made for dynamic load tests on test piles.

Payment for attaching equipment to each production pile for dynamic load testing prior to initial driving and as authorized by the Engineer will be 20 feet of additional pile.

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. 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 splices 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 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.

For concrete piles, where the head of the pile to be spliced is not more than 2 feet below the elevation of cut-off, the pile build-up may be cast with the cap. The reinforcing steel and pile dimensions shall generally conform in every respect to a standard splice. The quantity to be paid for will be 9 feet of piling as compensation for drilling and grouting the dowels and reinforcing steel and concrete used for-build up 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 as 20 feet of additional steel piling.

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 455-11.2.7 will be paid for as described in 455-11.2.7. 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 Protection of Existing Structures: The quantity to be paid for will be at the Contract lump sum price. When the Contract Documents do not include an item for protection of existing structures, the cost of settlement monitoring as required by these Specifications will be included in the cost of the piling items; however, work in addition to settlement monitoring will be paid for as Unforeseeable Work when such additional work is ordered by the Engineer.

455-11.12 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.

455-11.13 Preformed Pile Holes: The quantity to be paid for will be 30% of one foot of piling for each foot 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 installed therein. Only those holes authorized to be paid for, as provided in 455-5.9.3, 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.

455-12 Basis of Payment (All Piling).

455-12.1 Treated Timber Piling: Price and payment will be full compensation for furnishing all materials, including collars, metal shoes, copper cover sheets, preservatives and tar, and for wrapping pile clusters with wire cable, where so shown in the plans.

455-12.2 Prestressed Concrete Piling: Price and payment will be full compensation for the cost of furnishing and placing all reinforcing steel, predrilled holes, furnishing the material for and wrapping pile clusters with wire cable where so shown in the plans and grouting of preformed pile holes when shown in the plans. Payment will be made in two increments: 70% of the unit price for Prestressed Concrete Piling for each foot fabricated and accepted as stockpiled materials, and 30% of the unit price for Prestressed Concrete Piling for the entire authorized length upon completion of driving.

455-12.3 Steel Piling: Price and payment will be full compensation for all labor, equipment, and materials required for furnishing and installing Steel Piling, including welding and painting as specified and the cost of predrilling pile holes described in 455-5.1.1. The cost of any sand or concrete fill and reinforcing steel in pipe piles will be included in the price for Steel Piling. Payment will be made in two increments: 70% of the unit price for Steel Piling for each

foot (meter) fabricated and accepted as stockpiled materials, and 30% of the unit price for Steel Piling for the entire authorized length upon completion of driving.

Bracing and other metal parts attached to or forming a part of piling or bracing and not otherwise classified, will be measured and paid for as provided in Section 460.

455-12.4 Test Piles: Price and payment will be full compensation for all incidentals necessary to complete all the work of this item except splices, build-ups, pile extractions and preformed pile holes authorized by the Engineer and paid for under other pay items or payment methods. The cost of all additional work not listed above necessary to ensure required penetration and attain required bearing of the test piles will be included in the price bid per foot of Test Pile, including driving and all other related costs. Payment will be made in two increments: 70% of the unit price for Test Piles for each foot fabricated and accepted as stockpiled materials, and 30% of the unit price for Test Piles for the entire authorized length upon completion of driving.

455-12.5 Dynamic Load Tests:

455-12.5.1 Dynamic Load Tests/ Test Piles: Price and payment will be full compensation for all labor, equipment, materials, instrumentation and installation required to assist the engineer in performing this work. All test piles will require dynamic load tests, and include all costs associated with dynamic load tests in the pay items for test piles.

455-12.5.2 Dynamic Load Tests/ Production Piles: Price and payment will be full compensation for all labor, equipment, materials, instrumentation and installation required to assist the Engineer in performing this work.

455-12.6 Steel Sheet Piling:

455-12.6.1 Permanent Sheet Piling: Price and payment will be full compensation for all labor, equipment, and materials required for furnishing and installing steel sheet piling including preformed holes and coating, but will not include furnishing and placing anchors when an anchored wall system is designed and detailed in the plans. In such cases, furnishing and installing anchors will be paid for separately.

455-12.6.2 Temporary Sheet Piling: For critical temporary steel sheet pile walls, walls which are necessary to maintain the safety of the traveling public or structural integrity of nearby structures, roadways and utilities during construction, that are detailed in the plans, price and payment will be full compensation for all labor, equipment, and materials required for furnishing and installing steel sheet piling including preformed holes when shown in the plans, and including wales, anchor bars, dead men, soil anchors, proof tests, creep tests, and other incidental items when an anchored wall system is required. Removal of the sheet piling, anchors, and incidentals will be included in the cost per square foot for Steel Sheet Piling (Critical Temporary). When the temporary steel sheet pile walls are not detailed in the plans, the cost of furnishing and installation shall be incidental to cost of other related items and no separate payment shall be made. If the wall is not shown in the plans, but deemed to be critical as determined by the Engineer, then a design shall be furnished by the Department and paid for separately under Steel Sheet Piling (Critical Temporary).

455-12.7 Concrete Sheet Piling: Price and payment will be full compensation for furnishing all materials, including reinforcing steel, grouting, plastic filter fabric, preformed holes and installation.

455-12.8 Preformed Pile Holes: Price and payment will be full compensation for all labor, equipment, casings and materials required to perform this work.

455-12.9 Protection of Existing Structures: Price and payment will be full compensation for all labor, equipment, and materials required to perform this work.

455-12.10 Point Protectors: Price and payment will be full compensation for all labor, equipment, and materials required to perform this work.

455-12.11 Static Load Tests: Price and payment will be full compensation for all labor, equipment, and materials required to perform this work.

455-12.12 Pile Cut-Off: Anticipate all piles will require cutting-off, and include all costs associated with pile cut-off in the pay items for piling.

455-12.13 Payment Items: Payment will be made under:

Item No. 455- 2-	Treated Timber Piling - per foot.
Item No. 455- 14-	Concrete Sheet Piling - per foot.
Item No. 455- 18-	Protection of Existing Structures - lump sum.
Item No. 455- 34-	Prestressed Concrete Piling - per foot.
Item No. 455- 35-	Steel Piling - per foot.
Item No. 455- 36-	Concrete Cylinder Piling - per foot.
Item No. 455-119-	Test Loads - each.
Item No. 455-120-	Point Protection - each.
Item No. 455-133-	Steel Sheet Piling - per square foot.
Item No. 455-143-	Test Piles (Prestressed Concrete) - per foot.
Item No. 455-144-	Test Piles (Steel) - per foot.
Item No. 455-145-	Test Piles (Concrete Cylinder) - per foot.

C. DRILLED SHAFTS

455-13 Description.

Construct drilled shaft foundations consisting of reinforced, or unreinforced when indicated in the plans, concrete drilled shafts with or without bell footings.

455-14 Materials.

455-14.1 Concrete: For all concrete materials, meet the requirements of Section 346. Use concrete that is specified in the plans.

455-14.2 Reinforcing Steel: Meet the reinforcing steel requirements of Section 415. Ensure that reinforcing steel is in accordance with the sizes, spacing, dimensions, and the details shown in the plans.

455-15 Construction Methods and Equipment.

455-15.1 General Requirements:

455-15.1.1 Templates: Provide a fixed template, adequate to maintain shaft position and alignment during all excavation and concreting operations, when drilling from a barge. Do not use floating templates (attached to a barge). The Engineer will not require a template for shafts drilled on land provided the Contractor demonstrates satisfactorily to the Engineer that shaft position and alignment can be properly maintained. The Engineer will require a fixed template, adequate to maintain shaft position and alignment during all excavation and concreting operations, for shafts drilled on land when the Contractor fails to demonstrate satisfactorily that he can properly maintain shaft position and alignment without use of a template.

455-15.1.2 Drilled Shaft Installation Plan: At the preconstruction conference submit a drilled shaft installation plan for review by the Engineer. Final approval will be subject to satisfactory performance. Include in this plan the following details:

1. Name and experience record of drilled shaft superintendent or foreman in responsible charge of drilled shaft operations. Ensure the drilled shaft superintendent or foreman in responsible charge of the drilled shaft operations has a minimum of one year of experience of installing drilled shafts of the size and depth shown in the plans and a minimum of three years experience in the construction of drilled shafts using the following methods:

a. Mineral slurry,

b. Casings up to the length shown in the plans,

c. Shaft drilling operations on water under conditions as shown in the plans.

2. List and size of proposed equipment, including cranes, drills, augers, bailing buckets, final cleaning equipment, desanding equipment, slurry pumps, core sampling equipment, tremies or concrete pumps, casings, etc.

3. Details of sequence of construction operations and sequence of shaft construction in bents or shaft groups.

4. Details of shaft excavation methods.

5. Details of slurry, including proposed methods to mix, circulate, desand, test methods, and proposed testing laboratory to document test results.

6. Details of proposed methods to clean shaft after initial excavation.

7. Details of shaft reinforcement, including methods to ensure centering/required cover, cage integrity during placement, placement procedures, cage support, and tie downs.

8. Details of concrete placement, including elapsed concrete placement times and proposed operational procedures for concrete tremie or pump, including initial placement, raising during placement, and overfilling of the shaft concrete. Provide provisions to ensure proper final shaft cutoff elevation.

9. Details of casing removal when removal is required, including minimum concrete head in casing during removal.

10. Required submittals, including shop drawing and concrete design mixes.

11. Details of any required load tests, including equipment and procedures, and recent calibrations for any jacks or load cells.

12. Proposed CSL Specialty Engineer to perform, log, analyze, and report the test results.

13. Methods and equipment proposed to prevent displacement of casing and/or shafts during placement and compaction of fill.

14. Provide the make and model of the shaft inspection device, if applicable.

15. Details of environmental control procedures used to prevent loss of slurry or concrete into waterways or other protected areas.

16. Proposed schedule for test shaft installation, load tests and production shaft installation.

17. Other information shown in the plans or requested by the Engineer.

18. For drilled shafts for miscellaneous structures constructed using polymer slurry, identify the polymer slurry meeting the requirements of 455-15.8.2, the pH and viscosity ranges recommended by the manufacturer for the materials to be excavated and a description of the mixing method to be used. Submit the Material Safety Data Sheets (MSDS) for the product, and certifications that the polymer slurry and components meet the requirements of 455-15.8.2. Submit the contact information for the manufacturer's representative available for immediate contact during shaft construction and the representative's schedule of availability.

The Engineer will evaluate the drilled shaft installation plan for conformance with the Contract Documents. Within 20 days after receipt of the plan, the Engineer will notify the Contractor of any additional information required and/or changes that may be necessary in the opinion of the Engineer to satisfy the Contract Documents. The Engineer will reject any part of the plan that is unacceptable. Submit changes agreed upon for reevaluation. The Engineer will notify the Contractor within seven days after receipt of proposed changes of their acceptance or rejection. All equipment and procedures are subject to trial and satisfactory performance in the field.

Acceptance by the Engineer does not relieve the Contractor of the responsibility to perform the work in accordance with the Contract Documents. The Installation Plan is for the Contractor to explain the approach to the work and allow the Engineer an opportunity to comment on the equipment and procedures chosen before field operations begin. The Engineers acceptance is not a guarantee that the chosen methods and equipment are capable of obtaining the required results, this responsibility lies with the Contractor.

455-15.1.3 General Methods & Equipment: Perform the excavations required for the shafts and bell footings, through whatever materials encountered, to the dimensions and elevations shown in the Contract Documents, using methods and equipment suitable for the intended purpose and the materials encountered. Provide equipment capable of constructing shafts supporting bridges to a depth equal to the deepest shaft shown in the plans plus 15 foot or plus three times the shaft diameter, whichever is greater, except when the plans require equipment capable of constructing shafts to a deeper depth. Provide equipment capable of constructing shafts supporting non-bridge structures, including mast arms, signals, signs and light supports to a depth equal to the deepest shaft shown in the plans plus 5 feet.

Construct drilled shafts according to the Contract Documents using generally either the dry method, wet method, casing method, or permanent casing method as necessary to produce sound, durable concrete foundation shafts free of defects. Use the permanent casing method only when required by the plans or authorized by the Engineer. When the plans describe a particular method of construction, use this method except when permitted otherwise by the Engineer after field trial. When the plans do not describe a particular method, propose a method on the basis of its suitability to the site conditions and submit it for approval by the Engineer.

Set a suitable temporary removable surface casing from at least 1 foot above the ground surface to at least 1-1/2 shaft diameters below the ground surface to prevent caving of the surface soils and to aid in maintaining shaft position and alignment. The Engineer may require predrilling with slurry and/or overreaming to the outside diameter of the casing to install the surface casing at some sites.

For drilled shafts installed to support mast arms, cantilever signs, overhead truss signs, high mast light poles or other miscellaneous structures, provide temporary surface casings from at least 1 foot above the ground surface to at least 5 feet below the ground surface.

Do not use a temporary casing greater than the diameter of the reinforcing steel cage, plus 24 inches. Fill the oversized temporary casing with drilled shaft concrete at no additional expense to the Department. For miscellaneous structure foundations located within permanent sidewalks or within 5 feet of curb sections, provide temporary surface casings from no lower than the top of sidewalk to at least 5 feet below the ground surface.

455-15.2 Dry Construction Method: Use the dry construction method only at sites where the ground water table and soil conditions, generally stiff to hard clays or rock above the water table, make it feasible to construct the shaft in a relatively dry excavation and where the sides and bottom of the shaft are stable and may be visually inspected by the Engineer prior to placing the concrete.

In applying the dry construction method, drill the shaft excavation, remove accumulated seepage water and loose material from the excavation and place the shaft concrete in a relatively dry excavation.

Use the dry construction method only when shaft excavations, as demonstrated in a test hole, have 12 inches or less of seepage water accumulated over a four hour period, the sides and bottom remain stable without detrimental caving, sloughing, or swelling for a four hour period, and the loose material and water can be satisfactorily removed prior to inspection and prior to placing concrete. Use the wet construction method or the casing construction method for shafts that do not meet the requirements for the dry construction method.

455-15.3 Wet Construction Method: Use the wet construction method at all sites where it is impractical to provide a dry excavation for placement of the shaft concrete.

The wet construction method consists of drilling the shaft excavation below the water table, keeping the shaft filled with fluid (mineral slurry, natural slurry or water), desanding and cleaning the mineral slurry and final cleaning of the excavation by means of a bailing bucket, air lift, submersible pump or other approved devices and placing the shaft concrete (with a tremie or concrete pump extending to the shaft bottom) which displaces the water or slurry during concreting of the shaft excavation.

Where drilled shafts are located in open water areas, construct the shafts by the wet method using exterior casings extending from above the water elevation into the ground to protect the shaft concrete from water action during placement and curing of the concrete. Install the exterior casing in a manner that will produce a positive seal at the bottom of the casing so that there is no intrusion or extrusion of water or other materials into or from the shaft excavation.

Expandable or split casings that are removable are not permitted for use below the water surface.

For drilled shafts installed to support mast arms, cantilever signs, overhead truss signs, high mast light poles or other miscellaneous structures, fill the excavation with premixed mineral slurry meeting the requirements of 455-15.8.1 or polymer slurry meeting the requirements of 455-15.8.2 before the drill advances to the bottom of the temporary casing. Do not attempt to excavate the shaft excavation using plain water or natural slurry.

455-15.4 Temporary Casing Construction Method: Use the temporary casing method at all sites where it is inappropriate to use the dry or wet construction methods without the use of temporary casings other than surface casings. In this method, the casing is advanced prior to excavation. When a formation is reached that is nearly impervious, seal in the nearly impervious formation. Proceed with drilling as with the wet method to the projected depth. Proceed with the placement of the concrete as with the dry method except withdraw the casing after placing the

concrete. In the event seepage conditions prevent use of the dry method, complete the excavation and concrete placement using wet methods.

Where drilling through materials having a tendency to cave, advance the excavation by drilling in a mineral slurry. In the event that a caving layer or layers are encountered that cannot be controlled by slurry, install temporary removable casing through such caving layer or layers. The Engineer may require overreaming to the outside diameter of the casing. Take whatever steps are required to prevent caving during shaft excavation including installation of deeper casings. If electing to remove a casing and replace it with a longer casing through caving soils, backfill the excavation. The Contractor may use soil previously excavated or soil from the site to backfill the excavation. The Contractor may use other approved methods which will control the size of the excavation and protect the integrity of the foundation soils to excavate through caving layers.

Before withdrawing the casing, ensure that the level of fresh concrete is at such a level that the fluid trapped behind the casing is displaced upward. As the casing is withdrawn, maintain the level of concrete within the casing so that fluid trapped behind the casing is displaced upward out of the shaft excavation without mixing with or displacing the shaft concrete.

The Contractor may use the casing method, when approved by the Engineer, to construct shafts through weak caving soils that do not contribute significant shaft shear resistance. In this case, place a temporary casing through the weak caving soils before beginning excavation. Conduct excavation using the dry construction method where appropriate for site conditions and the wet construction method where the dry construction method is not appropriate. Withdraw the temporary casing during the concreting operations unless the Engineer approves otherwise.

455-15.5 Permanent Casing Construction Method: Use the permanent casing method when required by the plans. In this method, place a casing to the prescribed depth before beginning excavation. If the Contractor cannot attain full penetration, the Engineer may direct the Contractor to excavate through the casing and advance the casing until reaching the desired penetration. In some cases the Engineer may require the Contractor to overream the outside diameter of the casing before placing the casing.

Cut the casing off at the prescribed elevation upon reaching the proper construction sequence and leave the remainder of the casing in place.

455-15.6 Excavations: When pilot holes and/or load tests are performed, the Engineer will use the pilot hole and/or load test results to determine the authorized tip elevations and/or the authorized installation criteria of the drilled shafts. Drilled shaft construction shall not begin until pilot hole and/or load test reports are approved by the Engineer. Shaft tip elevations based on pilot hole results and/or load tests may vary from the Tip Elevations presented in the plans. Extend drilled shaft excavations deeper by extra depth excavation when the Engineer determines the material encountered while drilling the shaft excavation is unsuitable and/or is not the same as anticipated in the design of the drilled shaft. In the absence of suitable strength tests or load tests to evaluate materials excavated, construct the shafts no higher than the Tip Elevations shown in the plans.

455-15.6.1 Pilot Hole: When pilot holes are shown in the plans core a pilot hole, prior to shaft excavation, in accordance with ASTM D 2113 Standard Practice for Diamond Core Drilling for Site Excavation and the Department's Soils & Foundations Handbook using a double or triple wall core barrel through part or all of the shaft, to a depth of 3 times the diameter of the

drilled shaft below the tip elevation shown in the plans, as directed by the Engineer. The Engineer may require the Contractor to cut any core to a total depth below the bottom of the drilled shaft excavation of up to 5 times the diameter of the drilled shaft.

455-15.6.2 Cores: Take cores when shown in the plans or directed by the Engineer to determine the character of the material directly below the shaft excavation. Provide equipment to retrieve the core from a depth of 5 times the diameter of the drilled shaft below the bottom of the drilled shaft excavation in accordance with ASTM D 2113 Standard Practice for Diamond Core Drilling for Site Excavation. Cut the cores with an approved core barrel to a minimum depth of 3 times the diameter of the drilled shaft below the bottom of the drilled shaft excavation after completing the shaft excavation, as directed by the Engineer. The Engineer may require the Contractor to cut any core to a total depth below the bottom of the drilled shaft excavation of up to 5 times the diameter of the drilled shaft.

For cores or pilot holes, use only a double or triple wall core barrel designed:

(a) to cut a core sample from 4 to 6 inches in diameter, at least 5 feet in length, and,

(b) so that the sample of material cored can be removed from the shaft excavation and the core barrel in an undisturbed state, and

The Engineer will inspect the cores and determine the depth of required excavation. When considered necessary by the Engineer, take additional cores. Place the core samples in suitable containers, identified by shaft location, elevation from and to, and job number, and deliver to the Department within 48 hours after cutting. When called for in the plans, substitute Standard Penetration Tests (SPT) for coring. In such cases, supply these tests at no additional cost per foot to the Department above that bid for core (shaft excavation).

Provide areas for the disposal of unsuitable materials and excess materials as defined in 120-5 that are removed from shaft excavations, and dispose of them in a manner meeting all requirements pertaining to pollution.

When shown in the plans, excavate bells to form a bearing area of the size and shape shown. Bell outlines varying from those shown in the plans are permissible provided the bottom bearing area equals or exceeds that specified. If the diameter of the bell exceeds three times the shaft diameter, drill the excavation deeper as directed and form a new bell footing. Excavate bells by mechanical methods.

Furnish the additional drilled shaft concrete over the theoretical amount required to complete filling any excavations for bells and shafts which are larger than required by the plans or authorized by the Engineer, at no expense to the Department.

455-15.7 Casings: Ensure that casings are metal, or concrete when indicated in the plans, of ample strength to withstand handling and driving stresses and the pressure of concrete and of the surrounding earth materials, and that they are smooth and water tight. Ensure that the inside diameter of casing is not less than the specified size of shaft except as provided below. The Department will not allow extra compensation for concrete required to fill an oversize casing or oversize excavation.

The Engineer will allow the Contractor to supply casing with an outside diameter equal to the specified shaft diameter (O.D. casing) provided he supplies additional shaft length at the shaft tip. Determine the additional length of shaft required by the following relationship:

$$Additional\ Length = \frac{(D_1 - D_2)L}{D_2}$$

where:

D_1= casing inside diameter specified = shaft diameter specified
D_2= casing inside diameter provided ($D_2 = D_1$ minus twice the wall thickness).
L= authorized shaft length below ground for temporary casing methods or below casing for permanent casing methods.

Bear all costs relating to this additional length including but not limited to the cost of extra excavation, extra concrete, and extra reinforcing steel.

Remove all casings from shaft excavations except those used for the Permanent Casing Method. Ensure that the portion of casings installed under the Permanent Casing Method of construction below the shaft cut-off elevation remains in position as a permanent part of the Drilled Shaft. The Contractor may leave casings if in the opinion of the Engineer the casings will not adversely affect the shaft capacity in place. When casings that are to be removed become bound in the shaft excavation and cannot be practically removed, drill the shaft excavation deeper as directed by the Engineer to compensate for loss of capacity due to the presence of the casing. The Department will not compensate for the casing remaining. The Department will pay for the additional length of shaft under Item No. 455-88 and the additional excavation under Item No. 455-125.

If temporary casing is advanced deeper than the Minimum Top of Rock Socket Elevation shown in the plans or actual top of rock elevation if deeper, withdraw the casing from the rock socket and overream the shaft. If the temporary casing cannot be withdrawn from the rock socket before final cleaning, extend the length of rock socket below the authorized tip elevation one-half of the distance between the Minimum Top of Rock Socket Elevation or actual elevation if deeper, and the temporary casing tip elevation.

When the shaft extends above ground or through a body of water, the Contractor may form the portion exposed above ground or through a body of water, with removable casing except when the Permanent Casing Method is specified (see 455-23.10). When approved, the Contractor may form drilled shafts extending through a body of water with permanent or removable casings. However, for permanent casings, remove the portion of metal casings between an elevation 2 feet below the lowest water elevation or 2 feet below ground whichever is higher and the top of shaft elevation after the concrete is cured. Dismantle casings removed to expose the concrete as required above in a manner which will not damage the drilled shaft concrete. Dismantle removable casings in accordance with the provisions of 455-17.5.

Generally when removal of the temporary casing is required, do not start the removal until completing all concrete placement in the shaft. The Engineer will permit movement of the casing by rotating, exerting downward pressure, and tapping it to facilitate extraction, or extraction with a vibratory hammer. Extract casing at a slow, uniform rate with the pull in line with the axis of the shaft. Withdraw temporary casings while the concrete remains fluid.

When conditions warrant, the Contractor may pull the casing in partial stages. Maintain a sufficient head of concrete above the bottom of the casing to overcome the hydrostatic pressure of water outside the casing. At all times maintain the elevation of the

concrete in the casing high enough to displace the drilling slurry between the outside of the casing and the edge of the hole while removing the casing.

The Contractor may use special casing systems in open water areas, when approved, which are designed to permit removal after the concrete has hardened. Design special casings so that no damage occurs to the drilled shaft concrete during their removal.

455-15.8 Slurry and Fluid in Excavation at Time of Concrete Placement:

455-15.8.1 Mineral Slurry: When mineral slurry is used in an excavation, use only processed attapulgite or bentonite clays. Use mineral slurry having a mineral grain size such that it will remain in suspension and having sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. Use a percentage and specific gravity of the material to make the suspension sufficient to maintain the stability of the excavation and to allow proper placement of concrete. Ensure that the material used to make the slurry is not detrimental to concrete or surrounding ground strata. During construction, maintain the level of the slurry at a height sufficient to prevent caving of the hole. In the event of a sudden significant loss of slurry such that the slurry level cannot practically be maintained by adding slurry to the hole, backfill the excavation and delay the construction of that foundation until an alternate construction procedure has been approved.

Thoroughly premix the mineral slurry with clean fresh water prior to introduction into the shaft excavation. Ensure that the percentage of mineral admixture used to make the suspension is such as to maintain the stability of the shaft excavation. The Engineer will require adequate water and/or slurry tanks when necessary to perform the work in accordance with these Specifications. The Engineer will not allow excavated pits on projects requiring slurry tanks without the written permission of the Engineer. Take the steps necessary to prevent the slurry from “setting up” in the shaft, including but not limited to agitation, circulation, and/or adjusting the composition and properties of the slurry. Provide suitable offsite disposal areas and dispose of all waste slurry in a manner meeting all requirements pertaining to pollution.

Provide a CTQP qualified drilled shaft inspector to perform control tests using suitable apparatus on the mineral slurry mixture to determine the following parameters:

(a) Freshly mixed mineral slurry: Measure the density of the freshly mixed mineral slurry regularly as a check on the quality of the suspension being formed using a measuring device calibrated to read within plus or minus0.5 lb per cubic foot.

(b) Mineral slurry supplied to the drilled shaft excavation: Perform the following tests on the mineral slurry supplied to the shaft excavation and ensure that the results are within the ranges stated in the table below:

Item to be measured	Range of Results at 68ºF	Test Method
Density	64 to 73 lb/ft^3 (in fresh water environment) 66 to 75 lb/ft^3 (in salt water environment)	Mud density balance: FM 8-RP13B-1
Viscosity	30 to 40 seconds	Marsh Cone Method: FM 8-RP13B-2
pH	8 to 11	Electric pH meter or pH indicator paper strips: FM 8-RP13B-4
Sand Content	4% or less	FM 8-RP13B-3

The Contractor may adjust the limits in the above table when field conditions warrant as successfully demonstrated in a Test Hole or with other methods approved by the Engineer. The Engineer must approve all changes in writing before the Contractor can continue to use them.

Perform tests to determine density, viscosity, and pH value to establish a consistent working pattern, taking into account the mixing process and blending of freshly mixed mineral slurry and previously used mineral slurry. Perform a minimum of four sets of tests to determine density, viscosity, and pH value during the first 8 hours mineral slurry is in use.

When the results show consistent behavior, discontinue the tests for pH value, and only carry out tests to determine density and viscosity during each four hours mineral slurry is in use. If the consistent working pattern changes, reintroduce the additional tests for pH value for the time required to establish consistency of the test values within the required parameters.

(c) The Department may perform comparison tests as determined necessary during the mineral slurry operations.

During construction, maintain the level of mineral slurry in the shaft excavation within the excavation and at a level not less than 4 feet above the highest expected piezometric water pressure along the depth of a shaft.

At any time the wet construction method of stabilizing excavations fails, in the opinion of the Engineer, to produce the desired final result, discontinue this method of construction, and propose modifications in procedure or alternate means of construction for approval.

455-15.8.2 Polymer Slurry For Shafts For Miscellaneous Structures:

Materials manufactured expressly for use as polymer slurry for drilled shafts may be used as slurry for drilled shaft excavations installed to support mast arms, cantilever signs, overhead truss signs, high mast light poles or other miscellaneous structures. A representative of the manufacturer must be on-site or available for immediate contact to assist and guide the construction of the first three drilled shafts at no additional cost to the Department. This representative must also be available for on-site assistance or immediate contact if problems are encountered during the construction of the remaining drilled shafts as determined by the Engineer. The Engineer will not allow polymer slurries during construction of drilled shafts for bridge foundations. Use polymer slurry only if the soils below the casing are not classified as organic, and the pH of the fluid in the hole can be maintained in accordance with the manufacturer's published recommendations. Submit the MSDS for the product, the

manufacturer's published mixing procedures, and the manufacturer's published range of values for pH and viscosity of the mixed slurry. Certify that the polymer slurry and components meet the following requirements:

a. The polymer slurries to be used on the project and their waste products are classified as non-hazardous as defined by Resource Conservation and Recovery Act (RCRA) Subpart C rules, Table 1 of 40 CFR 261.24 Toxicity Characteristic.

b. Pull out tests demonstrate the bond between the bar reinforcement and the concrete is not materially affected by exposure to the slurry under typical construction conditions, over the typical range of slurry viscosities to be used.

c. The slurry does not have a detrimental effect on the strength or quality of the concrete as a result of continuous contact with the concrete, and when 10% of the concrete mix water is replaced by slurry, over the typical range of slurry viscosities to be used.

d. Load tests demonstrate the bond between the concrete and the soil is not materially affected by exposure to the slurry under typical construction conditions, over the typical range of slurry viscosities to be used for the project.

e. The method of disposal meets the approval of all federal, state and local regulatory authorities.

Perform the following tests on the polymer slurry in the shaft excavation and ensure that the results are maintained within the ranges stated in the table below:

Mixed Polymer Slurry Properties		
Item to be measured	Range of Results at 68ºF	Test Method
Density	62 to 64 lb/ft^3 (fresh water) 64 to 66 lb/ft^3 (salt water)	Mud density balance: FM 8-RP13B-1
Viscosity	Range Published By The Manufacturer for Materials Excavated	Marsh Cone Method: FM 8-RP13B-2
pH	Range Published By The Manufacturer for Materials Excavated	Electric pH meter or pH indicator paper strips: FM 8-RP13B-4
Sand Content	0.5% or less	FM 8-RP13B-3

Polymer slurry may be mixed in the cased portion of the shaft in accordance with the manufacturer's published procedures.

During construction, maintain the level of the slurry at a height sufficient to prevent caving of the hole. At any time the wet construction method of stabilizing excavations fails, in the opinion of the Engineer, to produce the desired final result, discontinue this method of construction, and propose modifications in procedure or alternate means of construction for approval.

455-15.8.3 Fluid In Excavation At Time Of Concrete Placement: When any fluid is present in any drilled shaft excavation, including shafts to support miscellaneous structures, the applicable test methods and reporting requirements described in 455-15.8.1 apply to tests of fluid in the shaft prior to placing the concrete.

Take samples of the fluid in the shaft from the base of the shaft and at intervals not exceeding 10 feet up the shaft, using an approved sampling tool. Take whatever action is necessary prior to placing the concrete to bring the fluid within the specification and reporting requirements, outlined in the tables in 455-15.8.1, except as follows:

The Engineer will not require tests for pH or viscosity when slurry has not been introduced into the shaft excavation.

When using polymer slurry to support the excavation for drilled shafts installed to support mast arms, cantilever signs, overhead truss signs, high mast light poles or other miscellaneous structures, take whatever action is necessary prior to placing the concrete to bring the properties of the fluid within the ranges in 455-15.8.2.

Provide a CTQP qualified drilled shaft inspector to perform testing. The Department may also perform comparison tests. Provide equipment for such comparison tests when requested by the Engineer.

455-15.9 Tremies and Pumps:

455-15.9.1 General: The requirements of the applicable provisions of Section 400 will apply when using a tremie or a pump to place drilled shaft concrete.

455-15.9.2 Dry Excavations: Ensure that the tremie for depositing concrete in a dry drilled shaft excavation consists of a tube of solid construction, a tube constructed of sections which can be added and removed, or a tube of other approved design. The Contractor may pass concrete through a hopper at the top of the tube or through side openings as the tremie is retrieved during concrete placement. Support the tremie so that the free fall of the concrete is less than 5 feet at all times. If the free falling concrete causes the shaft excavation to cave or slough, control the movement of concrete by reducing the height of free fall of the concrete and/or reducing the rate of flow of concrete into the excavation.

455-15.9.3 Wet Excavations: Construct the tremie or pump line used to deposit concrete beneath the surface of water so that it is water-tight and will readily discharge concrete. Construct the discharge end of the tremie or pump line to prevent water intrusion and permit the free flow of concrete during placement operations. Ensure that the tremie or pump line has sufficient length and weight to rest on the shaft bottom before starting concrete placement. Ensure that the discharge end of the tremie or pump line is embedded at least 10 feet into the concrete at all times during placement operations after 10 feet of concrete has been placed. Ensure that the free fall of concrete into the hopper is less than 5 feet at all times. Support the tremie so that it can be raised to increase the discharge of concrete and lowered to reduce the discharge of concrete. The Engineer will not allow rapid raising or lowering of the tremie to increase the discharge of the concrete. Maintain a continuous flow of concrete and a positive pressure differential of the concrete in the tremie or pump line at all times to prevent water or slurry intrusion into the shaft concrete.

455-15.10 Excavation and Drilling Equipment:

455-15.10.1 General: All shaft excavation is Unclassified Shaft Excavation. The Engineer will require Drilled Shaft Sidewall Overreaming when inspections show it to be necessary. These terms are defined in 455-15.10.2, 455-15.10.3, and 455-15.10.4, respectively.

Use excavation and drilling equipment having adequate capacity, including power, torque, and crowd (downthrust), and excavation and overreaming tools of adequate design, size, and strength to perform the work shown in the plans or described herein. When the material encountered cannot be drilled using conventional earth augers and/or underreaming tools, provide special drilling equipment, including but not limited to rock augers,

core barrels, rock tools, air tools, blasting materials, and other equipment as necessary to continue the shaft excavation to the size and depth required. In the event blasting is necessary, obtain all necessary permits. The Contractor is responsible for the effects of blasting on already completed work and adjacent structures. The Engineer must approve all blasting.

455-15.10.2 Unclassified Shaft Excavation: Unclassified Shaft Excavation is defined as all processes required to excavate a drilled shaft of the dimensions shown in the Contract Documents to the depth indicated in the plans plus 15 feet or plus 3 shaft diameters, whichever is deeper, completed and accepted. Include in the work all shaft excavation, whether the material encountered is soil, rock, weathered rock, stone, natural or man-made obstructions, or materials of other descriptions.

455-15.10.3 Unclassified Extra Depth Excavation: Unclassified Extra Depth Excavation is defined as all processes required to excavate a drilled shaft of plan dimensions which is deeper than the limits defined as Unclassified Shaft Excavation.

455-15.10.4 Drilled Shaft Sidewall Overreaming: Drilled Shaft Sidewall Overreaming is defined as the unclassified excavation required to roughen its surface or to enlarge the drilled shaft diameter due to softening of the sidewalls or to remove excessive buildup of slurry cake when slurry is used. Increase the shaft radius a minimum of 1/2 inch and a maximum of 3 inches by overreaming. The Contractor may accomplish overreaming with a grooving tool, overreaming bucket, or other approved equipment.

Meet the limit for depth of sidewall overreaming into the shaft sidewall material and the elevation limits between which sidewall overreaming is required.

455-15.11 Inspection of Excavations:

455-15.11.1 Dimensions and Alignment: Provide equipment for checking the dimensions and alignment of each permanent shaft excavation. Determine the dimensions and alignment of the shaft excavation under the observation and direction of the Department. Generally check the alignment and dimensions by any of the following methods as necessary:

(a) Check the dimensions and alignment of dry shaft excavations using reference stakes and a plumb bob.

(b) Check the dimensions and alignment of casing when inserted in the excavation.

(c) Insert a casing in shaft excavations temporarily for alignment and dimension checks.

(d) Insert a rigid rod or pipe assembly with several 90-degree offsets equal to the shaft diameter into the shaft excavation for alignment and dimension checks.

Insert any casing, rod or pipe assembly, or other device used to check dimensions and alignment into the excavation to full depth.

455-15.11.2 Depth: Generally reference the depth of the shaft during drilling to appropriate marks on the Kelly bar or other suitable methods. Measure final shaft depths with a suitable weighted tape or other approved methods after final cleaning.

455-15.11.3 Shaft Inspection Device (SID): When shown in the plans, furnish all power and equipment necessary for the Engineer to inspect the bottom conditions of a drilled shaft excavation and to measure the thickness of bottom sediment or any other debris using a SID. Provide a means to position and lower the SID into the shaft excavation to enable the bell housing to rest vertically on the bottom of the excavation. Include all cost related to the inspection device in the cost of drilled shaft items.

Furnish a SID meeting the following requirements:

(a) A remotely operated, high resolution, color video camera sealed inside a watertight bell housing.

(b) Provides a clear view of the bottom inspection on a video monitor at the surface in real time.

(c) Provides a permanent record of the entire inspection with voice annotation on a quality DVD with a resolution of not less than 720 x 480.

(d) Provides a minimum field of vision of 110 square inches, with a graduated measuring device to record the depth of sediment on the bottom of the shaft excavation to a minimum accuracy of 1/2 inch and a length greater than 1-1/2 inches.

(e) Provides sufficient lighting to illuminate the entire field of vision at the bottom of the shaft in order for the operator and inspector to clearly see the depth measurement scale on the video monitor and to produce a clear recording of the inspection.

(f) Provides a compressed air or gas system to displace drilling fluids from the bell housing and a pressurized water system to assist in determination of bottom sedimentation depth

Obtain the Engineer's approval of the device in advance of the first inspection contingent on satisfactory field performance. Notify the Engineer for approval before a different device is used for any subsequent inspection.

455-15.11.4 Shaft Cleanliness Requirements: Adjust cleaning operations so a minimum of 50% of the bottom of each shaft will have less than 1/2 inch of sediment at the time of placement of the concrete. Ensure the maximum depth of sedimentary deposits or any other debris at any place on the bottom of the shaft excavation does not exceed 1 1/2 inches. The Engineer will determine shaft cleanliness by visual inspection for dry shafts, using divers or an inspection device or other methods the Engineer deems appropriate for wet shafts.

When using slurry, meet the requirements of 455-15.8 at the time of concrete placement.

455-15.11.4.1 Exceptions for Shafts for Miscellaneous Structures: Ensure the depth of sedimentary deposits or other debris does not exceed 1 inch over the bottom of the shaft when installing drilled shafts to support mast arms, cantilever signs, overhead truss signs, high mast light poles or other miscellaneous structures.

455-15.11.5 Time of Excavation: Any unclassified excavation work lasting more than 36 hours (measured from the beginning of excavation for all methods except the Permanent Casing Method, which begins at the time excavation begins below the casing) before placement of the concrete requires overreaming the sidewalls to the depth of softening or removing excessive slurry cake buildup. Ensure that the minimum depth of overreaming the shaft sidewall is 1/2 inch and the maximum depth is 3 inches. Provide any overreaming required at no expense to the Department when exceeding the 36 hour limit unless the time limit is exceeded solely to accomplish excavating deeper than the elevation shown in the plans as ordered by the Engineer. The Department will pay the Contractor for authorized overreaming resulting from softening or excessive filtercake buildup which is indicated by test methods employed by the Engineer during the initial 36 hour time period. The Department will pay the Contractor for authorized overreaming when excavating deeper than the elevation shown in the plans as ordered by the Engineer exceeds the 36 hour time limit.

When using mineral slurry, adjust excavation operations so that the maximum time that slurry is in contact with the bottom 5 feet of the shaft (from time of drilling to concreting) does not exceed 12 hours. If exceeding the 12 hour time limit, overream the

bottom 5 feet of shaft at no additional expense to the Department prior to performing other operations in the shaft.

455-16 Reinforcing Steel Construction and Placement.

455-16.1 Cage Construction and Placement: Completely assemble and place as a unit the cage of reinforcing steel, consisting of longitudinal bars, ties, and cage stiffener bars, immediately after the Engineer inspects and accepts the shaft excavation and immediately prior to placing concrete. Tie all intersections of drilled shaft reinforcing steel with cross ties or "figure 8" ties. Use double strand ties, ties with larger tie wire, U-bolts, or similar when necessary. The Engineer will give final approval of the cage construction and placement subject to satisfactory performance in the field.

455-16.2 Splicing Cage: If the bottom of the constructed shaft elevation is lower than the bottom of the shaft elevation in the plans, extend a minimum of one half of the longitudinal bars required in the upper portion of the shaft the additional length. Continue the tie bars for the extra depth, spaced on 2 foot centers, and extend the stiffener bars to the final depth. The Contractor may lap splice these bars or use unspliced bars of the proper length. Do not weld bars to the planned reinforcing steel unless shown in the Contract Documents.

For drilled shafts supporting mast arms, cantilever signs, overhead truss signs, high mast light poles or other miscellaneous structures, if the shaft cleaning operations result in excavating below the required tip elevation, the reinforcing steel cage may be spliced or suspended.

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.

Use wheels or other approved noncorrosive spacing devices within 3 feet of the bottom or within 6 feet of the top, and intervals not exceeding 15 feet along the shaft 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 of cage with a minimum of three 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 do not construct additional shafts until receiving approval from the Engineer.

455-16.4 Cross-Hole Sonic Logging (CSL) Tubes: Install CSL access tubes full length in all drilled shafts from the tip of shaft to a point high enough above top of shaft to allow cross-hole-sonic-logging testing, but not less than 30 inches above the top of the drilled shaft, ground surface or water surface, whichever is higher. Equally space tubes around circumference of drilled shaft. Securely tie access tubes to the inside of the reinforcing cage and align tubes to be parallel to the vertical axis of the center of the cage. Access tubes must be NPS 1 1/2 Schedule 40 black iron or steel (not galvanized) pipe. Ensure that the CSL access tubes are free from loose rust, scale, dirt, paint, oil and other foreign material. Couple tubes as required with threaded couplers, such that inside of tube remains flush. Seal the bottom and top of the tubes with threaded caps. The tubes, joints and bottom caps shall be watertight. Seal the top of the tubes with lubricated, threaded caps sufficient to prevent the intrusion of foreign materials. Stiffen the cage sufficiently to prevent damage or misalignment of access tubes during the lifting and installation of the cage. Repair or replace any unserviceable tube prior to concreting. Exercise care in removing the caps from the top of the tubes after installation so as not to apply

excess torque, hammering or other stress which could break the bond between the tubes and the concrete.

Provide the following number (rounded up to the next whole number of tubes) and configuration of cross-hole sonic logging access tubes in each drilled shaft based on the diameter of the shaft.

Shaft Diameter	Number of Tubes Required	Configuration around the inside of Circular Reinforcing Cage
36 to 48 inches	4	90 degrees apart
Greater than 48 inches	1 tube per foot of Shaft Diameter	360 degrees divided by the Number of Tubes

Insert simulated or mock probes in each cross-hole-sonic access tube prior to concreting to ensure the serviceability of the tube. Fill access tubes with clean potable water and recap prior to concreting. Repair or replace any leaking, misaligned or damaged tubes as in a manner acceptable to the Engineer prior to concreting.

For drilled shaft foundations requiring anchor bolts, verify CSL access tubes will not interfere with anchor bolt installation before excavating the shaft. When CSL access tube locations conflict with anchor bolt locations, move the CSL access tube location plus or minus 2 in. along the inner circumference of the reinforcing cage. Notify the Engineer before excavating the shaft if the CSL access tube locations cannot be moved out of conflict with anchor bolt locations.

When drilled shaft cages will be suspended in place from the top rather than resting on the bottom of the excavation, clearly mark the top of shaft location on each tube.

455-17 Concrete Placement.

455-17.1 General: Place concrete in accordance with the applicable portions of Sections 346 and 400, 455-15.2, 455-15.3, 455-15.4, 455-15.5, 455-15.8, 455-15.9, and the requirements herein.

Place concrete as soon as possible after completing all excavation, cleaning the shaft excavation, inspecting and finding it satisfactory, and immediately after placing reinforcing steel. Continuously place concrete in the shaft to the top elevation of the shaft. Continue placing concrete after the shaft is full until good quality concrete is evident at the top of the shaft. Place concrete through a tremie or concrete pump using approved methods. After the shaft is overpoured sufficiently to eliminate all contaminated concrete, additional concrete may be added to the shaft without the use of a tremie or pump in accordance with Section 400.

If the pressure head is lost during concrete placement for any reason, the Engineer may direct the Contractor to perform integrity testing at no expense to the Department.

Immediately after concreting, check the water levels in the CSL access tubes and refill as necessary. If tubes become unserviceable, core new holes in the drilled shaft as directed by the Engineer.

455-17.2 Placement Time Requirements: The elapsed time for placing drilled shaft concrete includes the concrete mixing and transit time, the concrete placement time, the time required to remove any temporary casing that causes or could cause the concrete to flow into the space previously occupied by the casing, and the time to insert any required column steel, bolts, weldments, etc. Maintain a minimum slump of 5 inches throughout the elapsed time. Use

materials to produce and maintain the required slump through the elapsed time that meets the class of concrete specified. Provide slump loss tests that demonstrate to the Engineer that the concrete will maintain a 5 inch or greater slump for the anticipated elapsed time before beginning drilled shaft construction.

455-17.3 Forms: When the top of shaft elevation is above ground, form the portion of the shaft above ground with a removable form or another approved method to the dimensions shown in the plans.

When the shaft extends above the ground through a body of water, the Contractor may form the portion through the water with removable forms except when the Permanent Casing Method is specified.

When approved, the Contractor may form the portion through the water with permanent forms, provided the forms are removed from 2 feet below the lowest water elevation to the top of shaft elevation.

455-17.4 Riser Blocks: The Contractor may cast a riser block of equal diameter as the column and of a maximum height of 6 inches at the top of the completed shaft. When this option is chosen, extend any dowel steel above the top of shaft an additional 6 inches.

455-17.5 Curing: Cure the top surface in accordance with the applicable provisions of Section 400, and construct any construction joint area as shown in the plans. Protect portions of drilled shafts exposed to a body of water from the action of water by leaving the forms in place for a minimum of seven days after casting the concrete. The Contractor may remove forms prior to seven days provided the concrete strength has reached 2,500 psi or greater as evidenced by cylinder breaks.

455-17.6 Non-Destructive Testing of Drilled Shaft Integrity:

455-17.6.1 Cross-Hole Sonic Logging (CSL) Tests: Perform all CSL testing in accordance with ASTM D 6760. Test all drilled shafts in bridge bents or piers considered nonredundant in the plans, using CSL. For all other drilled shafts, perform CSL testing only on drilled shafts selected by the Engineer. The minimum number of shafts tested is the number of shafts indicated in the plans. The Engineer may increase the number shafts tested as deemed necessary.

Engage a qualified Specialty Engineer to perform the CSL testing. The qualified CSL Specialty Engineer must have a minimum three years experience of CSL testing and have a Florida Licensed Professional Engineer supervising the collection and interpretation of data. The Contractor shall provide all necessary 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.

After acceptance of production shafts by the Engineer, remove all water from the access tubes or core holes and fill the tubes or core holes with a structural non-shrink grout approved by the Engineer.

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.

455-17.6.1.1 Equipment: Furnish Cross-Hole-Sonic logging test equipment as follows:

1. Include ultrasonic transmitter and receiver probes for 1.5 inch I.D. pipe which produce measurements with consistent signal strength and arrival time in uniform, good quality concrete with all tube spacings on the project.

2. Include a microprocessor based data acquisition system for display, storage, and transfer of data. Graphically display first pulse Arrival Time (FAT) during data acquisition.

3. Electronically measure and record the relative position (depth) of the probes in the tubes with each CSL signal.

4. Print the CSL logs for report presentation.

5. Provide report quality plots of CSL measurements that identify each individual test.

6. Electronically store each CSL log in digital format, with shaft identification, date, time and test details, including the transmitter and receiver gain.

455-17.6.1.2 Procedure: Perform Cross-hole sonic logging between 72 hours and 25 calendar days of shaft concrete placement and after the concrete compressive strength exceeds 3,000 psi. Furnish information regarding the shaft, tube lengths and depths, construction dates, and other pertinent shaft installation observations and details to the Department at the time of testing. Verify access tube lengths and their condition in the presence of the Department, at least 24 hours prior to CSL testing. If the access tubes do not provide access over the full length of the shaft, repair the existing tube(s) or core additional hole(s), as directed by the Engineer, at no additional cost to the Department.

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 2.5 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.

Report any anomalies indicated by longer pulse arrival times and significantly lower amplitude/energy signals to the Engineer and conduct further tests as required to evaluate the extent of possible defects. Conduct offset CSL measurements between all tube pair combinations in any drilled shafts with 30% or greater in velocity reduction. Record offset measurements with source and receiver vertically offset in the tubes. These measurements add four measurements per tube combination to the horizontal measurements described in this section. Offset measurements are described by the angle (in degrees) and direction the signal travels between the probes with respect to the horizontal plane: +45, +22.5 (source below receiver), and -45, -22.5 (source above receiver). Record offset measurements from the point where the higher probe is at least 5 feet below the velocity reduction to the point where the lower probe is at least 5 feet above the velocity reduction. Provide offset CSL logs and 3-D tomographic analysis of all CSL data at no additional cost to the Department in the event 30% or greater in velocity reductions are detected.

455-17.6.1.3 Required Reports: Present the CSL testing and analysis results to the Engineer in a report. Include CSL logs with analyses of first pulse arrival time (FAT) versus depth and pulse energy/amplitude versus depth. Present a CSL log for each tube pair tested with any defect zones identified on the logs and discussed in the test report as appropriate. When offset measurements are required, perform 3-D tomographic analysis using all offset data, and include color coded 3-D tomographic images in the report.

455-17.6.1.4 Evaluation of CSL Test Results: The Engineer will evaluate the observations during drilled shaft construction and CSL test results to determine whether or not the drilled shaft construction is acceptable. Drilled shafts with velocity reduction exceeding 30% are not acceptable without an engineering analysis.

455-17.6.1.5 Coring and/or Repair of Drilled Shafts: If the Engineer determines a drilled shaft is unacceptable based on the CSL tests and tomographic analyses, or observes problems during drilled shaft construction, core the shaft to allow further evaluation and repair, or replace the shaft. If coring to allow further evaluation of the shaft and repair is chosen, one or more core samples shall be taken from each unacceptable shaft for full depth of the shaft or to the depth directed by the Engineer. The Engineer will determine the number, location, and diameter of the cores based on the results of 3-D tomographic analysis of offset and horizontal CSL data. Keep an accurate log of cores. Properly mark and place the cores in a crate showing the shaft depth at each interval of core recovery. Transport the cores, along with five copies of the coring log to the Engineer. Perform strength testing by an AASHTO certified lab on portions of the cores that exhibit questionable concrete as determined by the Engineer. If the drilled shaft offset CSL testing, 3-D tomographic analyses and coring indicate the shaft is defective, propose remedial measures for approval by the Engineer. Such improvement may consist of, but is not limited to correcting defective portions of the shaft, providing straddle shafts to compensate for capacity loss, or providing a replacement shaft. Repair all detected defects and conduct post repair integrity testing using horizontal and offset CSL testing and 3-D tomographic imaging as described in this Section. Engage a Specialty Engineer to perform gamma-gamma density logging to verify the integrity of the shaft outside the reinforcing cage in the same locations offset CSL data was/is required. Submit all results to the Engineer within five days of test completion for approval. Perform all work described in this Section at no additional cost to the Department, and with no increase in contract time.

455-18 Test Holes.

The Engineer will use the construction of test holes to determine if the methods and equipment used by the Contractor are sufficient to produce a shaft excavation meeting the requirements of the Contract Documents. During test hole excavations, the Engineer will evaluate the ability to control dimensions and alignment of excavations within tolerances; to seal the casing into impervious materials; to control the size of the excavation under caving conditions by the use of mineral slurry or by other means; to properly clean the completed shaft excavation; to construct excavations in open water areas; to establish elevations for belling; to determine the elevation of ground water; to place reinforcing steel and concrete meeting the requirements of these Specifications within the prescribed time frame; and to execute any other necessary construction operation. Revise the methods and equipment as necessary at any time during the construction of the test hole when unable to satisfactorily carry out any of the necessary operations described above or when unable to control the dimensions and alignment of the shaft excavation within tolerances.

Drill test holes out of permanent position at the location shown in the plans or as directed by the Engineer. Ensure the diameter and depth of the test hole or holes are the same diameter and maximum depth as the production drilled shafts. Reinforce the test hole unless otherwise directed in the Contract Documents. Fill the test hole with concrete in the same manner production drilled shafts will be constructed. Backfill test holes which are not filled with concrete with suitable soil in a manner satisfactory to the Engineer. Leave concreted test holes in place, except remove the top of the shaft to a depth of 2 feet below the ground line. Use the same

procedure for shafts constructed in water. Restore the disturbed areas at the sites of test holes drilled out of position as nearly as practical to their original condition. When the Contractor fails to demonstrate to the Engineer the adequacy of his methods or equipment, and alterations are required, make appropriate modifications and provide additional test holes at no expense to the Department. Include the cost of all test holes in the cost of the Drilled Shafts. Make no changes in methods or equipment after initial approval without the consent of the Engineer.

A separate test hole is not required for drilled shafts installed under mast arms, cantilever signs, overhead truss signs, high mast light poles or other miscellaneous structures. The first production shaft will serve as a test hole for determining acceptability of the installation method.

455-19 Test Bells.

Ream the bells at specified test holes to establish the feasibility of belling in a specific soil strata. Use the diameter and shape of the test bell shown in the plans or as approved in writing.

455-20 Construction Tolerances.

Meet the following construction tolerances for drilled shafts:

(a) 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.

(b) Ensure that the vertical alignment of the shaft excavation does not vary from the alignment shown in the plans by more than 1/4 in/ft of depth.

(c) 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.

(d) 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 6 inches unless shown otherwise in the plans.

(e) 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 less than the specified shaft diameter 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. When casing is not used, 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.

(f) Excavate the bearing area of bells to the plan bearing area as a minimum. Ensure that the diameter of the bells does not exceed three times the specified shaft diameter. The Contractor may vary all other plan dimensions shown for the bells, when approved, to accommodate his equipment.

(g) Ensure that the top elevation of the drilled shaft concrete has a tolerance of +1 and -3 inches from the top of shaft elevation shown in the plans.

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

(i) 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 ±3/8 in/ft of diameter.

455-21 Drilled Shaft Excavations Constructed out of Tolerance.

Do not construct drilled shaft excavations in such a manner that the concrete shaft cannot be completed within the required tolerances. The Contractor may make corrections to an unacceptable drilled shaft excavation by any combination of the following methods:

(a) Overdrilling the shaft excavation to a larger diameter to permit accurate placement of the reinforcing steel cage with the required minimum concrete cover.

(b) Increasing the number and/or size of the steel reinforcement bars.

(c) Enlargement of the bearing area of the bell excavation within tolerance allowed.

When the tolerances are not met, the Contractor may request design changes in the caps or footings to incorporate shafts installed out of tolerance. The Contractor shall bear the costs of redesign and Unforeseeable Work resulting from approved design changes to incorporate shafts installed out of tolerance. The Contractor's Engineer of Record will perform any redesign and will sign and seal the redesign drawings and computations. Do not begin any proposed redesign until it has been reviewed for acceptability and approved by the Engineer.

Backfill any out of tolerance shafts in an approved manner when directed by the Engineer until the redesign is complete and approved. Furnish additional materials and work necessary, including engineering analysis and redesign, to effect corrections of out of tolerance drilled shaft excavations at no expense to the Department.

455-22 Load Tests.

When the plans include load testing, perform all load tests in accordance with 455-2 or as shown in the Contract Documents.

455-23 Method of Measurement.

455-23.1 Drilled Shafts: The quantity to be paid for will be the length, in feet, of the reinforced concrete drilled shaft of the diameter shown in the plans, completed and accepted. The length will be determined as the difference between the top of shaft elevation as shown in the plans and the final bottom of shaft elevation as authorized and accepted. When the Contractor elects to provide outside diameter (O.D.) sized casing rather than inside diameter (I.D.) sized casing as allowed in 455-15.7, the pay quantity measured as described above will be multiplied by a factor (F) determined as follows:

$$F = \frac{2D_2 - D_1}{D_2}$$

where:

F= factor to adjust pay quantities to compensate for smaller shafts.

D_1= casing inside diameter specified = shaft diameter specified.

D_2= casing inside diameter provided ($D_2 = D_1$ minus twice the wall thickness).

455-23.2 Drilled Shafts (Unreinforced): The quantity to be paid for will be the length, in feet, of unreinforced concrete drilled shaft of the diameters shown in the plans, completed and accepted. The length will be determined as the difference between the top of shaft elevation as shown in the plans and the final bottom of shaft elevation as authorized and accepted. When the

Contractor elects to use O.D. casing, the quantity as determined above will be multiplied by the factor "F" determined as described in 455-23.1.

455-23.3 Unclassified Shaft Excavation: The quantity to be paid for will be the length, in feet, of unclassified shaft excavation of the diameter shown in the plans, completed and accepted, measured along the centerline of the shaft from the ground surface elevation after any required excavation per 455-1.2 to the plan bottom of shaft elevation authorized and accepted plus up to 15 feet or 3 shaft diameters, whichever is deeper, of additional excavation as authorized by the Engineer. When drilled shafts are constructed through fills placed by the Contractor, the original ground surface before the fill was placed will be used to determine the quantity of unclassified shaft excavation. When the Contractor elects to use O.D. casing, the quantity as determined above will be multiplied by the factor "F" determined as described in 455-23.1.

455-23.4 Unclassified Extra Depth Excavation: When excavation is required by the Engineer to extend more than 15 feet or 3 shaft diameters, whichever is deeper, below the bottom of the shaft elevation shown in the plans, the work will be considered as Unforeseeable Work.

455-23.5 Drilled Shaft Sidewall Overreaming: The quantity to be paid for will be the length, in feet, of drilled shaft sidewall overreaming authorized, completed and accepted, measured between the elevation limits authorized by the Engineer. When the Contractor elects to use O.D. casing, the quantity as determined above will be multiplied by the factor "F" determined as described in 455-23.1.

455-23.6 Bell Footings: The quantity to be paid for will be the number of bells of the diameter and shape shown in the plans, completed and accepted.

455-23.7 Test Holes: The cost of all test holes will be included in the cost of Drilled Shafts.

455-23.8 Test Bells: The quantity to be paid for will be the number of test bells, completed and accepted.

455-23.9 Core (Shaft Excavation): The quantity to be paid for will be the length, in feet, measured from the bottom of shaft elevation to the bottom of the core-hole, for each authorized core drilled below the shaft excavation, completed and accepted. When the Engineer authorizes pilot holes extending through part or all of the shaft, prior to excavation, to some depth below the shaft bottom, the quantity paid as Core (Shaft Excavation) will be the length in feet, measured from the top elevation to the bottom elevation authorized by the Engineer, completed and accepted. When SPT tests are substituted for coring or pilot holes as provided in 455-15.6, the quantity will be determined as described above in this Section.

455-23.10 Casings: The quantity to be paid for will be the length, in feet, of each size casing as directed and authorized to be used. The length will be measured along the casing from the top of the shaft elevation or the top of casing whichever is lower to the bottom of the casing at each shaft location where casing is authorized and used, except as described below when the top of casing elevation is shown in the plans. Casing will be paid for only when the Permanent Casing Method is specified, when the plans show a casing that becomes a permanent part of the shaft, or when the Engineer directs the Contractor to leave a casing in place which then becomes a permanent part of the shaft. No payment will be made for casings which become bound or fouled during shaft construction and cannot be practically removed. The Contractor shall include the cost of all temporary removable casings for methods of construction other than that of the Permanent Casing Method in the bid price for Unclassified Shaft Excavation item.

When the Permanent Casing Method and the top of casing elevation are specified, the casing will be continuous from top to bottom. Authorization for temporary casing will not be given unless the Contractor demonstrates that he can maintain alignment of the temporary upper casing with the lower casing to be left in place during excavation and concreting operations. When artesian conditions are or may be encountered, the Contractor shall also demonstrate that he can maintain a positive water-tight seal between the two casings during excavation and concreting operations.

When the top of casing elevation is shown in the Contract Documents, payment will be from the elevation shown in the plans or from the actual top of casing elevation, whichever is lower, to the bottom of the casing. When the Contractor elects to use an approved special temporary casing system in open water locations, the length to be paid for will be measured as a single casing as provided above.

455-23.11 Protection of Existing Structures: The quantity to be paid for will be at the lump sum price.

455-23.12 Load Tests: The quantity to be paid for will be the number and type of load tests conducted.

455-23.13 Instrumentation and Data Collection: The quantity to be paid for will be at the lump sum price.

455-23.14 Cross-Hole Sonic Logging: The quantity of the cross-hole sonic logging test set-ups to be paid for will be the number of drilled shafts accepted based on cross-hole sonic logging tests.

455-24 Basis of Payment.

455-24.1 Drilled Shafts: Price and payment will be full compensation for all drilled shafts, including the cost of concrete, reinforcing steel and cross-hole sonic logging tubes, including all labor, materials, equipment, and incidentals necessary to complete the drilled shaft. The cost of the reinforcing steel, including lap lengths, to accommodate shaft lengths longer than shown in the plans is included in the cost of Drilled Shafts. Costs associated with repairing defects found in the drilled shaft shall be included in the cost of the drilled shaft.

455-24.2 Drilled Shafts (Unreinforced): Price and payment will be full compensation for all drilled shafts (unreinforced), including the cost of concrete and all labor, equipment, materials, and incidentals necessary to complete the drilled shaft.

455-24.3 Unclassified Shaft Excavation: Price and payment will be full compensation for the shaft excavation (except for the additional costs included under the associated pay items for casing); removal from the site and disposal of excavated materials; restoring the site as required; cleaning and inspecting shaft excavations; using slurry as necessary; using drilling equipment; blasting procedures, special tools and special drilling equipment to excavate the shaft to the depth indicated in the plans; and furnishing all other labor, materials, and equipment necessary to complete the work in an acceptable manner.

455-24.4 Bell Footings: Price and payment will be full compensation for forming and excavating the bell beyond the diameter of the drilled shaft, furnishing and casting additional concrete necessary to fill the bell outside the shaft together with any extra reinforcing steel required, removing excavated materials from the site, and all other expenses necessary to complete the work.

455-24.5 Test Holes: No separate payment will be made for Test Hole. All cost of Test Holes will be included in the cost of Drilled Shafts.

455-24.6 Test Bells: Price and payment will be full compensation for forming the test bell, providing inspection facilities, backfilling the bell when the test hole is drilled out of position, and all other expenses necessary to complete the work.

455-24.7 Core (Shaft Excavation): Price and payment will be full compensation for drilling and classifying the cores/pilot hole, delivering them to the Department, furnishing drilled shaft concrete to fill the core/pilot hole, and all other expenses necessary to complete the work. When SPT tests are substituted for cores/pilot holes as provided in 455-15.6, they will be paid for at the price per foot for coring.

455-24.8 Casings: Price and payment will be full compensation for additional costs necessary for furnishing and placing the casing in the shaft excavation above the costs attributable to the work paid for under associated pay items for Unclassified Shaft Excavation.

455-24.9 Protection of Existing Structures: Price and payment will include all cost of work shown in the plans or described herein for protection of existing structures. When the Contract Documents do not include an item for protection of existing structures, the cost of settlement monitoring as required by these Specifications will be included in the cost of Unclassified Shaft Excavation; however, work in addition to settlement monitoring will be paid for as Unforeseeable Work when such additional work is ordered by the Engineer.

455-24.10 Load Tests: Price and payment will include all costs related to the performance of the load test.

455-24.11 Instrumentation and Data Collection: Price and payment will include all labor, equipment, and materials incidental to the instrumentation and data collection, and, when required, the load test report.

455-24.12 Cross-Hole Sonic Logging: Price and payment will include all costs related to the performance of the CSL testing and incidentals to the cross-hole sonic test set-up.

455-24.13 Payment Items: Payment will be made under:

Item No. 455- 18-	Protection of Existing Structures - lump sum.
Item No. 455- 88-	Drilled Shaft - per foot.
Item No. 455- 90-	Bell Footings - each.
Item No. 455- 92-	Test Bells - each.
Item No. 455-107-	Casing - per foot.
Item No. 455-111-	Core (Shaft Excavation) - per foot.
Item No. 455-119-	Test Loads - each.
Item No. 455-122-	Unclassified Shaft Excavation - per foot.
Item No. 455-129-	Instrumentation and Data Collection - lump sum.
Item No. 455-142-	Cross-Hole Sonic Logging - each.

D. SPREAD FOOTINGS

455-25 Description.

Construct reinforced concrete spread footing foundations, including dewatering when necessary, excavating to the required limits, compacting the underlying soil as required, and constructing seals when required.

455-26 General Requirements.

Meet the following requirements for all spread footings:

1. Perform excavations, including the removal of all material, of whatever nature, necessary for the construction of spread footings. As used herein, the term "soil" shall constitute any material, whether soil, rock, or other materials.

2. Slope excavations as required, or support them with sheeting, and shore them if necessary, to provide a safe excavation that is adequate for construction purposes and that will adequately protect any existing adjacent structures.

3. Ensure that the foundation soils are firm, stable, and, in the opinion of the Engineer, meet or exceed the design bearing and compressibility requirements before constructing the footings or any required seals. The Department may elect to use any type of test(s) to evaluate the foundation soils that is appropriate in the opinion of the Engineer. Cooperate with the Engineer in the evaluation of the foundation soils, and assist the Engineer as necessary to provide access to the site.

4. The elevation of the bottom of footings or seals and/or the depth of over-excavation shown in the plans is approximate and the Engineer may order, in writing, such changes as may be necessary to secure a satisfactory foundation.

5. Place all spread footing concrete in the dry.

455-27 Protection of Existing Structures.

Protect existing structures in accordance with 455-1.1. Also, if not otherwise provided in the plans, evaluate the need for, design, and provide all reasonable precautionary features to prevent damage, including, but not limited to, the installation of sheet piling, shoring as necessary, maintenance of the water table beneath such structures as nearly as practical to existing conditions, and monitoring and controlling vibrations from construction activities including driving of sheeting or from blasting.

455-28 Dewatering.

The Contractor is responsible for the design, installation, and operation of an adequate dewatering system to dewater excavations for spread footings. Use a well point or well system. Submit a dewatering plan to the Engineer for his records before beginning construction.

Use well points or wells where the piezometric water level is above an elevation 3 feet below the bottom of the excavation. Maintain the water table 3 feet or more below the maximum depth of excavation. Provide continuous dewatering until completing construction of the footing and backfill the excavation at least 3 feet above the piezometric water table elevation. Continue dewatering until the Engineer considers conditions safe to discontinue dewatering. In the event of a dewatering failure, assist the Engineer as required in determining the effects of such a failure on the foundation soils, and take whatever corrective measures are required at no additional expense to the Department. When the Engineer approves the discontinuing of dewatering, decrease the rate of pumping, allowing the water level to rise slowly. Use a rate, in feet per hour, that the water table is allowed to rise equal to the total number of feet the water table was lowered, divided by ten hours or a rate of 1 ft/hr, whichever is less.

Install one piezometer well approximately every 15 feet of footing perimeter. Provide a minimum of two and a maximum of six piezometers at locations within 2 feet from the outside of the footing perimeter. Install piezometer wells to a depth at least 10 feet below the bottom of footing elevation or as directed by the Engineer. Measure water elevation in the piezometer wells prior to excavation and at 12-hour intervals between excavation and discontinuation of dewatering. Maintain the piezometers in working condition throughout the dewatering process, and repair or replace them when damaged at no expense to the Department.

455-29 Excavations.

455-29.1 Dry Excavations: Dry excavations are excavations that can be completed without the need to lower the piezometric water level. Perform dry excavations when the piezometric water level at the time of construction is and, in the opinion of the Engineer, will remain at least 3 feet below the bottom of the authorized excavation or over-excavation. Demonstrate to the Engineer that a stable excavation can be made without dewatering. Make adequate provisions to divert surface runoff and to collect and remove any water entering the excavation.

Excavate to the bottom of footing, to the over-excavation limits shown in the plans, or as directed by the Engineer. Save any suitable materials for backfill. Provide areas for the disposal of all unsuitable materials, and dispose of them in a satisfactory method. Compact the foundation soils below the footing as shown in the plans or described herein before constructing the footing.

455-29.2 Dewatered Excavations: Dewatered excavations are excavations made after first lowering the piezometric water level with wellpoints or wells. Perform dewatering as described in 455-28. Excavate in the dry after lowering of the water table.

When dewatering is required, the Contractor may excavate within 3 feet of the ground water table before dewatering begins if the dewatering system is operating and the Contractor has demonstrated that the water level has been lowered to and maintained at acceptable limits. Where large excavations require stage lowering of the water table (additional wellpoint systems installed at lower elevations), the Contractor may continue excavating as long as the water elevation is maintained at least 3 feet below the excavation.

Ensure that surface runoff is diverted from the excavation. Compact the foundation soils as shown in the plans or as described herein before constructing the footing.

455-29.3 Wet Excavations: Wet excavations are excavations made below the existing water table without prior dewatering. When the plans show a cofferdam and seal, perform the excavation in the wet. Maintain the water level during excavation at or above the water level outside the cofferdam.

Place the seal directly upon the foundation soils or rock when using wet excavations. Do not compact foundation soils for wet excavations. Ensure that the foundation soils or rock are disturbed as little as practical. Remove all materials that are determined by the Engineer to be loose or disturbed before placing the seal concrete.

455-30 Fill or Backfill.

Only use fill or backfill, including over-excavations below the footing, that is clean cohesionless material, free of rubble, debris, or rocks that would prevent uniform placement and compaction. For backfill materials, use A-1, A-2, or A-3 materials, materials as shown in the plans, or materials approved by the Engineer.

455-31 Compaction and Density Requirements.

Compact the bottom of the excavation with suitable equipment. Compact the soil beneath footing excavation (whether dug to the bottom of footing or over-excavated) to a density not less than 95% of the maximum density as determined by AASHTO T 180 for a minimum depth of 2 feet below the bottom of the excavation or to the depth shown in the plans before backfilling begins. Perform at least one density determination at each footing excavation at a depth of one to 2 feet below the bottom of the excavation. Compact the backfill in footing excavations which have been over-excavated in 12 inch maximum loose lifts to a density not less than 95% of the

maximum density as determined by AASHTO T 180 to the bottom of footing elevation. Perform at least one density determination in each lift of backfill at each footing excavation.

For compaction, use an approved heavy vibratory roller with a static drum weight of at least 4 tons. Compact each lift to the required density. Also, compact the final lift below the footing with a suitable sled vibratory compactor to remove any upper disturbance caused by the drum roller. When conditions require use of smaller compaction equipment, obtain the Engineer's approval for the equipment, and reduce the lift thickness to achieve the required density.

Perform backfilling to the original ground surface, finished grade, or subgrade as required by the plans in the immediate vicinity by approved mechanical compactors weighing less than 1,000 pounds. The Contractor may compact backfill located more than 15 feet away from the exterior periphery of the footing with heavier compactors. Do not place backfill on the footing until the Engineer has given permission and until the concrete is at least seven days old.

455-32 Forming.

Form spread footings if it can not be demonstrated that the natural soil or rock is strong enough to prevent caving during construction. For forms, meet the applicable requirements of 400-5. When forms are not required, meet the requirements of 400-5.4.4.

455-33 Materials.

455-33.1 Concrete: Meet the requirements of Section 346.

455-33.2 Reinforcing Steel: Meet the requirements of Section 415. For spread footing reinforcing steel, use Grade 60.

455-34 Reinforcing Steel Placement.

Place and fasten reinforcing steel for footings according to the applicable provisions of 415-5.

455-35 Concrete Placement.

455-35.1 Placement: Place all footing concrete in the dry and according to the applicable provisions of Section 400. Do not construct joints in footings.

455-35.2 Finish: After placing and consolidating the concrete, strike-off the top surface to the grades shown in the Contract Documents, leaving the surface smooth and free of undesirable cavities and other defects. Do not provide a special finish unless the footing will be visible after construction, in which case, meet the applicable provisions of Section 400.

455-35.3 Curing: Provide continuous-moisture-curing for footings. For cover materials, use clean sand, sawdust, or other materials meeting the approval of the Engineer. Continuously wet the cover materials for a period of 72 hours.

455-36 Method of Measurement.

455-36.1 Protection of Existing Structures: The quantity to be paid for, when included in the Contract Documents, will be at the Contract lump sum price.

455-36.2 Dewatering: The quantity to be paid for will be at the Contract unit price for each footing excavation, only at locations authorized by the Engineer and acceptably dewatered.

455-36.3 Excavation: No separate payment will be made for backfill or will separate payment be made for excavation above bottom of footing elevation. The cost of this work will be included in the Contract unit price for Concrete (Substructure). For footings with excavation

(over-excavation) below the bottom of the footing elevation shown in the plans, the cost of this excavation, backfilling, and compaction will be included in the Contract unit price for Excavation for Structures. The pay quantity will be the volume in cubic yards bounded by vertical planes 12 inches outside of the limits of the footing and parallel thereto and extending from the bottom of the footing elevation to the authorized bottom of over-excavation or within the pay limits shown in the plans.

455-36.4 Reinforcing Steel: The quantity to be paid for will be the total weight, in pounds , determined as described in Section 415.

455-36.5 Concrete: The quantity to be paid for will be the volume of the classes shown in the plans, in cubic yards, determined as described in Section 400.

455-37 Basis of Payment.

455-37.1 Protection of Existing Structures: When separate payment for Protection of Existing Structures is provided, price and payment will be full compensation for all work necessary to evaluate the need for, design of, and to provide the necessary features to protect existing structures, including all cost of work shown in the plans or described herein for protection of existing structures.

When a separate payment for Protection of Existing Structures is not provided, the cost of this work will be included in the Contract unit prices for Excavation for Structures and/or for Concrete (Substructure).

455-37.2 Dewatering: Price and payment will be full compensation for all work related to the successful dewatering of footings, including installing, maintaining, and monitoring piezometer wells. Dewatering will be considered Unforeseeable Work when the Engineer determines that dewatering is required and the plans do not include a Dewatering item.

455-37.3 Excavation: Price and payment will be full compensation for all work related to over-excavating below the bottom of footing elevation, backfill, and compaction as specified.

455-37.4 Reinforcing Steel: Price and payment will be full compensation for all work required to furnish and place the steel as shown in the plans and as specified herein.

455-37.5 Concrete: Price and payment will be full compensation for all work required to construct footings and seals as shown in the plans and described herein.

No separate payment will be made for sheeting and shoring required for excavation and footing construction except when a separate pay item for sheeting and shoring is included in the plans. The cost of all work not specifically mentioned in the other footing items will be included in the price per cubic yard for substructure Concrete.

455-37.6 Payment Items: Payment will be made under:

Item No. 125- 1-	Excavation For Structures - per cubic yard.
Item No. 400- 2-	Class II Concrete - per cubic yard.
Item No. 400- 3-	Class III Concrete - per cubic yard.
Item No. 400- 4-	Class IV Concrete - per cubic yard.
Item No. 400- 91-	Dewatering For Spread Footings - each.
Item No. 415- 1-	Reinforcing Steel - per pound.
Item No. 455- 18-	Protection of Existing Structures - lump sum.

E. STRUCTURES (OTHER THAN BRIDGE)
FOUNDATIONS-AUGER CAST PILES

455-38 Description.

Furnish and install auger cast piles used for structural support, other than bridge foundations.

455-39 General Requirements.

455-39.1 Contractor's Operations: Submit an Auger Cast Pile Installation Plan in accordance with 455-47. Prior to the start of production piles, demonstrate to the satisfaction of the Engineer, the dependability of the equipment, techniques, and source of materials by construction of a demonstration pile.

455-39.2 Protection of Existing Structures: Protect existing structures in accordance with 455-1.1.

455-40 Materials.

Meet the following material requirements:

(1) Portland Cement (Types I, II, III, IP, and IS) .....Section 921
(2) Fly Ash, Slag and other Pozzolanic Materials for Portland Cement Concrete .....Section 929
(3) Fine Aggregate (Sand)* .....Section 902
(4) Admixtures .....Section 924
(5) Water .....Section 923
(6) Fluidifier .....ASTM C 937

* The Contractor may use any clean sand with 100% passing 3/8 inch sieve and not more than 10% passing the 200 mesh sieve. The Engineer will only permit Silica Sand except as provided in 902-5.2.3.

455-41 Grout Mix Proportions.

Use a grout mix consisting of a mixture of Portland cement, fly ash, retarder, sand and water proportioned and mixed to produce a mortar capable of maintaining the solids in suspension without appreciable water gain and which may be pumped without difficulty and fill open voids in the adjacent soils. The grout mix may also include a fluidifier if desired. Proportion these materials to produce a hardened grout of the required strength shown on the plans.

455-42 Mixing and Pumping Cement Grout.

Meet the following requirements:

1. Only use pumping equipment approved by the Engineer in the preparation and handling of the grout. Before using the mixers, remove all oil or other rust inhibitors from the mixing drums, stirring mechanisms, and other portions of the equipment in contact with the grout.

2. Accurately measure all materials by volume or weight as they are fed to the mixer. Place the materials in the mixer in the following order: 1) water, 2) fluidifier, 3) other solids in order of increasing particle sizes. The fluidifier may be added at the option of the Contractor.

3. Use a quantity of water and mixing time that will produce a homogenous grout having a consistency of 21 seconds minimum, when tested with a flow cone in accordance with ASTM C 939 (3/4 inch diameter outlet), with a frequency at the discretion of the Engineer. Mix the grout at least one minute. If agitated continuously, the grout may be held in the mixer or agitator for a period not exceeding 2.5 hours at grout temperatures below 70ºF; two hours for temperatures from 70 to 100ºF. Do not place grout when its temperature exceeds 100ºF. If there is a lapse in the operation of grout injection, recirculate the grout through the pump, or through the mixer drum or agitator.

4. Use mixers capable of combining components of the cement grout into a thoroughly mixed and uniform mass, free from balls or lumps of cementitious material and capable of discharging the concrete with a satisfactory degree of uniformity. The Engineer's approval of grout mixers and all other equipment will be conditioned on proper performance during construction of the demonstration pile and subsequent production work.

5. Use a screen no larger than 3/4 inch mesh between the mixer and pump to remove large particles which might clog the injection system.

6. Use a positive displacement piston type grout pump capable of developing displacing pressures at the pump up to 350 psi.

7. Use a grout pump/system equipped with a pressure gauge to accurately monitor the pressure of the grout flow. Test and calibrate the equipment during construction of the demonstration pile to demonstrate flow rate measurement accuracy of ±3% over the range of grouting pressures anticipated during this work. Provide a pump stroke counter in good working condition on the grout pump. Also calibrate the equipment any time the Engineer suspects that the grout pump performance has changed.

455-43 Testing Cement Grout.

The Engineer will cast four 4"x8" cylinders in accordance with ASTM C 31 for each LOT, considered to be 50 yd^3 of cement grout placed, or one day of pile placement. The Department will test two cylinders at seven days and two cylinders at 28 days, in accordance with ASTM C 39. The minimum required strength for the LOT will be specified on the plans. When a cement grout acceptance strength test falls more than 10% or 500 psi below the specified minimum strength, whichever is less deviation from the specified minimum strength, perform one of the following:

(a) Remove and replace the cement grout represented by the LOT in question at no additional cost to the Department, or

(b) Submit a structural analysis performed by the Contractor's Engineer of Record. If the results of the analysis, approved by the Department, indicate adequate strength to serve the intended purpose with adequate durability, the concrete may remain in place. Otherwise, remove and replace the LOT of concrete in question at no additional cost to the Department.

All low strength cement grout accepted by the Engineer will be subject to reduced payment as follows: \$0.80/yd^3 for each 10 psi of strength test value below the specified minimum strength.

Reduction in pay will be applied to the entire length of all piles containing low strength cement grout, in any quantity. The quantity of cement grout affected by the price reduction may exceed the quantity of cement grout contained in the LOT. The dollar reduction will be equated to an equivalent length of pile not to exceed the total pile length constructed utilizing the subject LOT based on the following formula:

PLR = RC/UC

Where: PLR = Equivalent Pile Length Reduction in feet
RC = Total Reduction in payment, dollars
UC = Unit Cost of pile, dollars /foot

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 maximum diameter about the pile centerline, not to exceed 1/2 of the distance to the adjacent pile. 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 AASHTO T 180. Complete this work to the Engineer's satisfaction prior to auger cast pile construction. Should more than 5 feet 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 auger head to the top of auger with no gaps or other breaks, 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 drawings.

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 1/2 the prescribed finish diameter of the auger cast pile. Commence auger cast pile construction immediately upon 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/minute.

9. Plug the hole in the bottom of the auger while being advanced into the ground. Remove the plug by the grout or with the reinforcing bar.

10. Pump the grout with sufficient pressure as the auger is withdrawn to 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. Carry a 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 105% 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. Place the required steel reinforcement while the grout is still fluid, but no later than 1/2 hour after pulling of the 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 (105% 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 drawings.

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 drawings, unless otherwise approved by the Engineer.

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 significant loads, before the grout has set a minimum of seven days or reached the 28 day strength.

455-45 Construction Tolerances.

Locate piles as shown on the drawings, or as otherwise directed by the Engineer. Locate pile centers to an accuracy of ±3 inches. Ensure that the top of pile elevation is within an accuracy of ±3 inches of the plan elevation.

Locate all precast post, anchor bolts, etc. within the following tolerances unless otherwise shown in the plans: variation from plumb (±1/4 inch/post height); specified elevation (±1/2 inch); and specified location (±1/4 inch).

455-46 Unacceptable Piles.

Repair or replace unacceptable piles, as directed by the Engineer, at no cost to the Department. Unacceptable piles are defined as piles that fail for any reason, including but not limited to the following: piles placed out of position or to improper elevation; piles with reduced cross section, contaminated grout, lack of grout consolidation (honeycombed), or deficient grout strength; and piles with reinforcement, anchor devices or other components cast or placed into the fluid grout out of position.

455-47 Auger Cast Pile Installation Plan.

At the preconstruction conference, but no later than 30 days before auger cast pile construction begins, submit an auger cast pile installation plan for approval by the Engineer. Provide the following detailed information on the plan:

1. Name and experience record of auger cast pile superintendent or foreman in responsible charge of auger cast pile operations. Place a person in responsible charge of day to day auger cast pile operations who possesses satisfactory prior experience constructing shafts similar to those described in the Contract documents. The Engineer will give final approval subject to satisfactory performance in the field.
2. List and size of the proposed equipment, including cranes, augers, concrete pumps, mixing equipment etc., including details of proposed pump calibration procedures.
3. Details of pile installation methods.
4. Details of reinforcement placement and method of centering in pile, including details of all temporary supports for reinforcement, anchor bolts, precast columns, etc.
5. Details of how and by whom the grout volumes will be determined, monitored and documented.
6. Required submittals, including shop drawings and concrete grout design mixes.
7. Other information shown in the plans or requested by the Engineer.

455-48 Inspection and Records.

The Engineer will monitor pile installation.

455-49 Method of Measurement.

455-49.1 Protection of Existing Structures: The quantity to be paid for, when included in the Contract Documents, will be at the Contract lump sum price.

455-49.2 Auger Cast Pile: The quantity to be paid for will be at the Contract unit price per foot between tip and required pile top elevations for all piles completed and accepted.

455-50 Basis of Payment.

455-50.1 Protection of Existing Structures: When separate payment for Protection of Existing Structures is provided, price and payment will be full compensation for all work necessary to evaluate the need for, design of, and to provide the necessary features to protect the existing structures, including all cost of work shown in the plans or described herein for protection of existing structures.

When a separate payment for Protection of Existing Structures is not provided, the cost of settlement monitoring will be included in the cost of the structure. Work ordered by the Engineer for protection of existing structures, other than settlement monitoring, will be paid for as Unforeseeable Work.

455-50.2 Auger Cast Piles: Price and payment will be full compensation for all labor, materials, and incidentals for construction of auger cast piles of the sizes and depths indicated on the Contract drawings or otherwise required under this Contract. Price and payment will also include the removal and proper disposal off site of all spoil from the auger operation and all excess grout displaced from the auger hole, unless otherwise approved by the Engineer. Work to remove and replace unsuitable material when necessary as specified in 455-44 will be considered Unforeseeable Work.

455-50.3 Payment Items: Payment will be made under:

Item No. 455- 18- Protection of Existing Structures - lump sum.

Item No. 455-112- Auger Grouted Piles - per foot.

458 BRIDGE DECK JOINTS.
(REV 6-17-11) (FA 6-21-11) (1-12)

SECTION 458 (Pages 591 – 595) is deleted and the following substituted:

SECTION 458
BRIDGE DECK JOINTS

458-1 Description.

Furnish and install bridge deck joints of the types and at the locations shown in the plans. This Section covers the following types of joints:

Poured Joint
Poured Joint with Backer Rod System
Strip Seal Joint System

458-2 Materials.

458-2.1 Poured Joint: Furnish joint sealer or a Type A, B, or C silicone sealant material meeting the requirements of Section 932 that is listed on the Qualified Products List (QPL).

458-2.2 Poured Joint with Backer Rod System: Furnish poured joint with backer rod systems consisting of Type D silicone sealant material, foam backer rods, sidewalk cover plates (as required) and all associated miscellaneous components.

The Type D silicone sealant material used in the system shall be listed on the QPL and meet the requirements of Section 932.

458-2.3 Strip Seal Joint System: Furnish strip seal joint systems in accordance with ASTM D 5973 and Design Standards, Index No. 21100 that are listed on the QPL. Manufacturers seeking evaluation of their product for the QPL shall submit an application in accordance with Section 6. Design documentation showing the expansion joint system shall include installation details and temporary or sacrificial support brackets, bolts, clamps, etc. that are compatible with decks constructed with or without block-outs. Furnish joint systems consisting of watertight steel edge rails, elastomeric strip seals, sidewalk cover plates (as required) and all associated miscellaneous components. Obtain the elastomeric strip seals from the edge rail manufacturer.

458-2.4 Sidewalk Cover Plates: Furnish 1/4 inch thick, slip resistant galvanized steel sidewalk cover plates in accordance with ASTM A 36 or ASTM A 709, Grade 36 or 50 and Design Standards, Index Nos. 21100 and 21110. Sidewalk cover plates shall be an anti-slip steel surface consisting of a random hatch matrix or other suitable pattern. Do not use diamond plate or surface applied slip resistant tapes, films, nonmetallic coatings or other similar materials. Sidewalk cover plates shall have a minimum coefficient of friction on the top galvanized surface of 0.8 in dry condition, and 0.65 in a wet condition, as determined by FM 3-C 1028. After shop fabrication, hot-dip galvanize in accordance with Section 962 and the cover plate manufacturer's recommendations. Furnish flat head stainless steel sleeve anchors in accordance with ASTM F 593 Group 1 Alloy 304 for attaching sidewalk cover plates. Install sleeve anchors in accordance with the manufacturer's instructions. Submit shop drawings for sidewalk cover plates

showing all materials, project specific details and dimensions. Provide certification from the manufacturer that the sidewalk cover plates meet the minimum coefficient of friction requirements.

458-3 Fabrication and Installation.

458-3.1 General: Install the joint in accordance with the specific requirements of this Article, the plan details and the details shown on the Design Standards for the particular type of expansion joint called for.

458-3.2 Poured Joint: Install the joint at the locations and in accordance with the details shown in the plans and the manufacturer's recommendations.

458-3.3 Poured Joint with Backer Rod System:

458-3.3.1 Casting Expansion Joint Opening When casting the bridge deck, approach slab or raised sidewalk adjacent to the expansion joint at temperatures other than 70°F, adjust the joint opening (Dim. A) as shown on Design Standards, Index No. 21110 at 70°F by the amount of the adjustment per 10°F shown in the Structures Plans, Poured Expansion Joint Data Table. For temperatures above 70°F, decrease the opening. For temperatures below 70°F, increase the opening.

458-3.3.2 Installation of Poured Joint System: After deck profiling, grinding, and grooving operations are complete, install poured joint with backer rod in accordance with the manufacturer's recommendations, when the joint opening is plus or minus 1/4 inch of the design joint opening (Dim A at 70°F) shown in the Structures Plans, Poured Expansion Joint Data Table. The minimum opening must not be less than 1 inch at the time of installation. Place poured joint material only when the ambient temperature is between 55°F and 85°F and is expected to rise for the next three hours minimum to provide for adequate joint opening and compression of the poured joint material during curing.

458-3.4 Strip Seal System:

458-3.4.1 Elastomeric Seal Fabrication: Furnish continuous heavy duty bridge deck elastomeric seals sized in accordance with the manufacturer's recommendations, to perform satisfactorily for the opening range shown. Minimum movement classification is 4 inches. Shop vulcanization is restricted to use on horizontal turns on skewed bridges at upturn ends where the horizontal turn angle is greater than 35 degrees. Field vulcanization is not permitted.

458-3.4.2 Edge Rail Fabrication:

(a) Furnish extruded, hot rolled or machined solid steel edge rails in accordance with ASTM A 709, Grade 36, 50 or 50(W). Furnish edge rails with a minimum mass of 19.2 lb/ft excluding studs, a minimum height of 8 inches, a minimum thickness of 1/2 inch and a maximum top surface (riding surface) width of 2 inches. Edge rails manufactured from bent plate or built up pieces are not acceptable.

(b) Furnish anchor studs in accordance with ASTM A 108, and electric arc end-weld anchor studs with complete fusion. Anchor studs may be piggy backed to achieve required lengths.

(c) Perform all shop welding in accordance with the Bridge Welding Code ANSI/AASHTO/AWS D1.5. Do not weld to surfaces in contact with the elastomeric seal or the top surface (riding surface) except as shown in the shop splice detail. Do not weld inside seal cavity.

(d) Fabricate edge rail assemblies in one piece including upturns, except where the length or configuration prohibits shipping or proper installation or where phase construction requires separate assemblies. Shop splice sections of edge rail to obtain the required

length by partial penetration double V-groove welds on prepared beveled edges and seal welds as shown in the shop splice detail. Weld all around the joint as far as practical to achieve a watertight seal. Do not use short pieces of edge rail less than 6'-0" long unless required at curbs, sidewalks or phase construction locations.

(e) After shop fabrication, hot-dip galvanize edge rail in accordance with Section 962 and the manufacturer's recommendations.

(f) Furnish temporary or sacrificial support brackets, bolts, clamps, etc. that are capable of resisting shipping, handling and construction forces without damage to the edge rail assemblies or galvanized coating and are adjustable to account for variable temperature settings. Do not use temporary or sacrificial support brackets, bolts, clamps, etc. between the faces of the edge rails.

(g) Clearly match mark corresponding edge rail assemblies with joint location and direction of stationing.

(h) Submit shop drawings showing all joint materials and project specific details and dimensions. Include name of manufacturer, seal model number, seal movement range and the assigned QPL Number.

458-3.4.3 Installation:

(a) Install the edge rail assemblies at proper grade and alignment before or after deck planing in accordance with the manufacturer's instructions. When installed after deck planing and grinding, install the edge rail assemblies in the block-outs on a profile tangent between the ends of the deck and/or approach slab to within a plus 0" and minus 1/4" variation. When installed before deck planing, install the edge rail assemblies 3/8", plus or minus 1/16", below the top surface of the deck or approach slab to compensate for concrete removal during planing and grinding.

(b) Bolt, weld or clamp edge rail assemblies in position using temporary or sacrificial brackets as required. For phased construction, install edge rail assemblies in a given subsequent phase to align with those installed in an adjacent prior phase after deflection and rotation due to deck casting of adjoining spans has occurred.

(c) For installation of edge rail assemblies at temperatures other than 70°F, adjust the opening of the joint (Dim. A) as shown on Design Standards, Index No. 21100 by the amount of the adjustment per 10°F shown in the Structures Plans, Strip Seal Expansion Joint Data Table. For temperatures above 70°F decrease the opening. For temperatures below 70°F, increase the opening.

(d) After galvanizing, do not weld within 2 inches of edge rail surfaces exposed in the completed structure. Do not weld expansion joint components to or electrically ground to reinforcing steel or structural steel. Seal field butt joints and empty shipping and erection holes with caulk before placing deck concrete.

(e) Protect galvanized edge rail assemblies during screeding operations per the manufacturer's recommendations. Provide temporary blocking material in the edge rail seal cavities to prevent concrete intrusion during deck pour and finishing.

(f) Loosen any temporary or sacrificial support brackets, bolts, clamps, etc. that span across the joint after initial set of concrete, but not more than two hours after conclusion of concrete placement.

(g) Install elastomeric seal after completion of deck casting. Remove all joint form material and blocking material prior to installing elastomeric seal. Field install elastomeric seal in accordance with manufacturer's recommendations. Thoroughly coat all

contact surfaces between the elastomeric seal and the edge rail seal cavities with an adhesive lubricant before setting elastomeric seal in place.

458-4 Method of Measurement.

The poured joint without backer rod will be incidental to the concrete work and included in the cost of the concrete. Poured joints with backer rod and strip seal joints will be the plan quantity length of each type of joint constructed and accepted.

458-5 Basis of Payment.

458-5.1 Basic Items of Joints. The Contract unit price per foot for joints will be full compensation for all work and materials necessary for the complete installation. Such price and payment will include, but not be limited to, the following specific incidental work:

(a) Any work required to clean and prepare the adjacent bridge deck, deck block out or deck joint gap.

(b) Any repairs to the galvanizing on metallic joint components.

(c) Any additional work or materials required for non-standardized or special construction or installation techniques.

(d) Any cost of erection and removal of any temporary supports which may be necessary for ensuring proper alignment and positioning of the joint relative to the bridge deck.

458-5.2 Payment Items: Payment shall be made under:

Item No. 458 - 1- Bridge Deck Expansion Joint – per foot.

460 STRUCTURAL STEEL AND MISCELLANEOUS METALS (REV 5-18-10) (FA 6-1-10) (1-11)

SUBARTICLE 460-7.6 (Page 624) is deleted and the following substituted:

460-7.6 Tightening of Anchor Bolt/Rod Nuts:

460-7.6.1 Fixed and Expansion Pot Bearing: Tighten anchor bolts or rod nuts to a ‘snug tight’ condition such that the different mating surfaces (such as the top of concrete, neoprene and steel) are in firm contact. The nut or bolt is to be tight enough to develop friction between surfaces to prevent sliding, but not over-tightened that bulging or damage occurs in any of the mating materials.

460-7.6.2 Fixed and Expansion Bearings with Elastomeric Bearing Pads: Draw down the lower nut such that a total gap of 1/2 inch exists between the nut and bearing plate. Tighten a second nut of the same specification to a snug tight condition against the lower nut maintaining the required gap.

470 TIMBER STRUCTURES.
(REV 2-2-11) (FA 4-11-11) (1-12)

SUBARTICLE 470-12.2 (Pages 631 and 632) is deleted and the following substituted:

470-12.2 CCA, ACQ-D, CA-B, and CA-C, Treated Timber Structures: Use the fasteners and connectors as described in the following table:

TABLE – HARDWARE REQUIREMENTS FOR TREATED TIMBER		
Environmental condition where structure will be located	Fasteners	Connectors
Permanent wood foundations and/or where salt spray if prevalent	304 or 316 Stainless Steel	304 or 316 Stainless Steel
Structures that will be exposed to standing water or rainwater	304 or 316 Stainless Steel	304 or 316 Stainless Steel
Structures that will be situated indoors and remain dry in service	304 or 316 Stainless Steel Hot-dipped galvanized fasteners meeting ASTM A-153 requirements	304 or 316 Stainless Steel Hot-dipped galvanized connectors meeting the requirements of ASTM A-653 Class G185 sheet or better

Do not use aluminum in direct contact with treated wood.

471 POLYMERIC FENDER SYSTEMS.
(REV 5-10-11) (FA 5-19-11) (1-12)

SECTION 471 (Pages 633-634) is deleted and the following substituted:

SECTION 471
POLYMERIC FENDER SYSTEMS

471-1 Description.

Construct fender systems using components in accordance with this Section, the Plans, Design Standards and the Qualified Products List (QPL) Drawings.

471-2 Materials.

Meet the following requirements:

Fiberglass fiber reinforced lumber (Dimensional Lumber) .....Section 973

Fiberglass structurally reinforced composite lumber (Wales) .....Section 973

Concrete used to fill hollow piles .....Section 347

471-3 Polymeric Pile Product Acceptance.

Use polymeric pile configurations listed on the Department's QPL.

Manufacturers seeking evaluation of products for inclusion on the QPL must submit an application in accordance with Section 6, independently certified test reports, written certification that the piling configuration meets the requirements of this Section, and the following:

1. Design:

a. Design fender piling configurations and connections in accordance with the latest edition of the FDOT Structures Design Guidelines and applicable Structures Design Bulletins based on the desired energy capacity rating.

b. All design calculations and design details must be signed and sealed by a Professional Engineer licensed in the State of Florida.

2. Submittals:

a. Signed and sealed design calculations. Design calculations may be either by hand or by a computer program with hand calculations verifying the program output.

b. Report from an independent lab verifying the flexural properties of the piling as derived from ASTM D 6109 with the following modification. Supports shall be located to provide a minimum span to depth ratio of 20:1.

c. For pile sections remaining hollow under service conditions, a report from an independent lab verifying a minimum bolt pull-through and crushing resistance of 10 kip when equipped with manufacturer's detailed connection hardware at a maximum distance of two feet from the end of a pile with a minimum length of four feet.

d. Signed and sealed pile configuration drawings in 11" x 17" PDF format depicting information required by the latest edition of the FDOT Structures Design Guidelines and applicable Structures Design Bulletins.

e. Detailed material specifications showing material type, quality, certifications, acceptance and rejection criteria and placement procedures.

f. Other information pertinent to the design and performance of the pile configuration as necessary.

g. A field construction manual describing in detail, with illustrations, construction requirements and the step-by-step construction sequence for the pile handling and installation. Submit manual in 8.5" x 11" in PDF format.

471-4 Construction Details.

Unless otherwise shown in the manufacturer's approved field construction manual, use the following construction details.

Protect materials at all times against exposure to extreme heat or impact. Transport products in a manner that will minimize scratching or damage to the outer surfaces, stack on dunnage above ground so that it may be easily inspected and store in a manner that will avoid damage. Handle and lift products with nylon slings. Do not use sharp instruments in handling the product. Products damaged in shipping or handling will be rejected.

Products containing cracks in the reinforcing rods or cracks, partial or full depth, across the section or splits will be rejected.

Cut, bevel, drill, countersink and otherwise install products in accordance with the manufacturer's recommendations. Set all material accurately to required levels and lines, with members plumb and true and accurately cut and fitted. Securely attach all materials to substrate

by anchoring and fastening as shown on the plans. Perform all cutting and drilling in a manner that allows for the collection of all debris and dispose of properly.

Install piles in accordance with Section 455.

471-5 Method of Measurement.

The quantity of dimensional fiberglass fiber reinforced lumber and fiberglass structurally reinforced composite lumber to be paid for will be the plan quantity, in feet board measure, computed based upon the dimensions shown in the Plans.

The quantity of polymeric piles to be paid will be lump sum.

471-6 Basis of Payment.

Price and payment for plastic marine lumber will be full compensation for the work specified in this Section including all material, storage costs, disposal of unused material and waste, transportation costs, labor, equipment, fasteners and other necessary items required for completing the work. No separate payment will be made for plates, bolts, screws or other hardware necessary to complete the work.

Price and payment for polymeric piles will be full compensation for all labor, equipment and materials required to furnish and install the piles to the pile cut-off elevations shown in the Plans.

Payment will be made under:

Item No. 471-1	Fender System, Plastic Marine Lumber – MB.
Item No. 471-2	Fender System, Polymeric Piles - LS

502 SHEAR CONNECTORS.
(REV 2-22-10) (FA 4-15-10) (1-11)

ARTICLE 502-1 (Page 635) is deleted and the following substituted:

502-1 Description.

Furnish and install welded shear connectors on steel beams and girders at locations shown in the Contract Documents. Field weld shear connectors located on the top flange only after the deck forms are in place. Installation of shear connectors in the fabrication plant is not permitted.

521 CONCRETE BARRIERS, TRAFFIC RAILING BARRIERS AND PARAPETS.
(REV 5-31-11) (FA 6-10-11) (1-12)

ARTICLE 521-7 (Page 653) is deleted and the following substituted:

521-7 Repairs and Rejection.

For permanent precast concrete barrier wall that has not been installed, evaluate cracks, spalls and other deficiencies in accordance with 450-12. Repair deficiencies in accordance with 450-13 or the plant's approved repair methods that are included as part of the QCP. Ensure that the original performance and durability of the repaired barrier wall is maintained. Use materials for concrete repair that will meet or exceed the strength requirement for the class of concrete

used. Materials meeting the requirements of Section 930 may be substituted for non-shrink grout when required by 450-13. Concrete barrier wall is subject to rejection if it fails to conform to any of the Specification requirements after repair. The disposition of concrete cracks in barrier wall after installation shall be in accordance with 400-21. Cracks in unreinforced, plain concrete barrier walls as detailed in Design Standards Index No. 410 do not require repair unless directed by the Engineer.

522 CONCRETE SIDEWALK.
(REV 7-29-10) (FA 9-20-10) (7-11)

SUBARTICLE 522-7.2 (Page 654) is deleted and the following substituted:

522-7.2 Surface Requirements: Provide the concrete with a broom finish. Ensure that the surface variations are not more than 1/4 inch under a 10 foot straightedge, or more than 1/8 inch on a 5 foot transverse section. Finish the edge of the sidewalk with an edging tool having a radius of 1/2 inch.

523 PATTERNED PAVEMENT.
(REV 8-2-11) (FA 8-4-11) (1-12)

SECTION 523 (Pages 655 – 657) is deleted and the following substituted:

SECTION 523
PATTERNED PAVEMENT.

523-1 Description.

Construct 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 Qualified Products List (QPL), 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 surface markings applied either as an overlay to the pavement surface or imprinted in the pavement surface. Vehicular traffic areas are defined as those subject to vehicles within the traveled way, shoulders and auxiliary lanes. Non-vehicular travel areas include medians, islands, curb extensions, sidewalks, borders, plazas and other areas typically subject to foot traffic only.

For installation of overlay products in areas subject to vehicular traffic, the finished thickness shall not exceed 180 mils. Products requiring removal of pavement or requiring blockouts or trenches below the top of pavement, shall not be used.

Provide the pattern type and color as specified in the plans. 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 QPL. Meet manufacturer's specifications for all patterns, textures, templates, sealers, coatings and coloring materials.

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.

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 Qualified Products List (QPL): 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, 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, 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, QPL 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.

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.

523-3.2 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.

523-3.3 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.

Provide 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.

524 CONCRETE DITCH AND SLOPE PAVEMENT.
(REV 8-13-09) (10-6-09) (7-10)

ARTICLE 524-2 (Page 657) is deleted and the following substituted:

524-2 Materials.

Concrete.....Section 347
Preformed Expansion Joint Material and Hot Poured Sealer .....Section 932
Filter Fabric .....Section 985
Reinforcing Steel.....Section 415

ARTICLE 524-9 (Pages 658 – 659) is deleted and the following substituted:

524-9 Method of Measurement.

524-9.1 Concrete Ditch and Slope Pavement: The quantities to be paid for Concrete Ditch Pavement and Concrete Slope Pavement will be the plan quantity, in square yards, completed and accepted. Where the plans show headers or cut-off walls at the end or edge of the pavement, the volume of the additional thickness of pavement that constitutes the headers, calculated in accordance with plan dimensions, will be converted into equivalent square yards of standard thickness pavement and included in the quantity to be paid for.

No deduction will be made for any areas occupied by manholes, inlets, or other drainage structures or by public utility appurtenances within the pavement area. The square yard quantity includes any ditch blocks with ditch or slope pavement on top. When steel reinforcement is called for in the plans, payment will be included in the square yard item.

524-9.2 Concrete Core Ditch Blocks: The quantity to be paid for Concrete Core Ditch Blocks will be the plan quantity of concrete, in cubic yards, completed and accepted. When steel reinforcement is called for in the plans, payment will be included in the cubic yard pay item. The cubic yard pay item includes any ditch block within a grass or earth ditch, without other pavement on top.

ARTICLE 524-10 (Page 659) is deleted and the following substituted:

524-10 Basis of Payment.

Prices and payments will be full compensation for all work specified in this Section, including all earthwork, skimmers, and incidental materials necessary to complete the work.

Payment will be made under:

Item No. 524- 1- Concrete Ditch Pavement - per square yard.
Item No. 524- 2- Concrete Slope Pavement - per square yard.
Item No. 524- 3- Concrete Core Ditch Block- per cubic yard.

527 DETECTABLE WARNINGS ON WALKING SURFACES. (REV 1-12-11) (FA 1-21-11) (7-11)

SECTION 527 (Pages 662 – 664) is deleted and the following substituted:

SECTION 527
DETECTABLE WARNINGS ON WALKING SURFACES

527-1 Description.

Furnish and install Detectable Warning devices on newly constructed and/or existing concrete or asphalt walking surfaces (curb ramps, sidewalks, shared-use paths, etc.) constructed in accordance with the Design Standards Index No. 304.

527-2 Materials.

527-2.1 Detectable Warning: 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 the Design Standards, Index No. 304. Do not use detectable warnings with a diagonal pattern.

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 indicated Standard appropriate to the material.

PROPERTY	STANDARD	TEST VALUE
Slip Resistance	FM 3-C 1028	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^3
Water Absorption*	ASTM D-570	Not to exceed 5%.
Adhesion/Bond Strength**	FM 5-589	150 psi min. tensile adhesion strength
Non-Hazardous Classification	Submit Material Safety Data Sheet (MSDS)	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 Qualified Products List: Methods or products used to form Detectable Warnings in wet concrete will not be permitted. Use Detectable Warnings listed on the Department's Qualified Products List (QPL). Manufacturers seeking evaluation of products for inclusion on the QPL 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 Design Standards, Index No. 304 Acceptance Criteria and manufacturer's drawings, specifications and procedures for materials and installation, including touch-up and repair.

527-3 Installation Procedures.

527-3.1 Surface Preparation and Installation: Prepare the surface in accordance with the manufacturer's recommendations. 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. For surface-applied tiles or mats, use adhesives applied over the entire surface and mechanical fasteners.

527-4 Method of Measurement.

Detectable Warnings applied to newly constructed walking surfaces will be included in the cost of the walking surface. Detectable Warnings applied to existing walking surfaces will be paid per each location where Detectable Warnings are 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 for Detectable Warnings installed on existing walking surfaces.

Payment will be made under:

Item No. 527- 1- Detectable Warnings on Existing Walking Surfaces - each.

534 CONCRETE SOUND BARRIERS.
(REV 12-22-10) (FA 1-3-11) (7-11)

Section 534 (Pages 669 – 672) is deleted and the following substituted:

SECTION 534
CONCRETE SOUND BARRIERS

534-1 Description.

Furnish and install concrete sound barriers with pile, posts and panels constructed in accordance with Design Standards, Index No. 5200 or with pre-approved concrete alternatives listed on the Department's Qualified Products List (QPL), unless the Plans otherwise indicate limitations based on specific design or aesthetic criteria unique to the project.

Obtain Precast Concrete Sound Barrier components from a manufacturing plant that is currently on the list of Producers with Accepted Quality Control Programs. Producers seeking inclusion on the list shall meet the requirements of 105-3.

534-2 Materials.

Meet the following requirements:

Portland Cement Concrete	Section 346
Reinforcing Steel	Section 415

534-3 Component Construction.

Construct concrete components in accordance with Section 400. Precast wall components are produced using certification acceptance; therefore, assume responsibility for performance of all quality control testing and inspections required by Sections 346 and 400 for the precast component construction. Perform all Quality Control Testing using Construction Training and Qualification Program (CTQP) qualified testing personnel. Perform compressive strength testing in a laboratory inspected by the Cement and Concrete Reference Laboratory (CCRL) or Construction Materials Engineering Council (CMEC), with all deficiencies corrected.

Ensure that each panel and post is permanently and clearly marked by ink stamping the tongue and groove portion of the panel and post. Mark the panel with the panel type, date cast, project number, manufacturer's name or symbol and the post with the date cast, project number and manufacturer's name or symbol.

534-4 Approved Proprietary Concrete Sound Barrier Panels and Systems.

Proprietary concrete sound barrier panels or systems listed on the QPL that have been pre-determined by the Engineer to be in compliance with the project design and aesthetic criteria shown in the Plans may be used.

Manufacturers seeking evaluation of products for inclusion on the QPL must submit an application in accordance with Section 6, independently certified test reports, and written certification that the product meets the requirements of this Section, Design Standards, IndexNo. 5200, and the Concrete Sound Barrier Qualified Products List (QPL) Acceptance Criteria contained in the State Structures Design Office's Structures Manual.

Provide written certification from the manufacturer of the panels that the product meets the requirements of this Section and is the same product listed on the QPL.

534-5 Shop Drawing Submittal.

Do not include shop drawings of the basic concrete panel details, submit only the information requested. Submit shop drawings in accordance with Section 5, showing a plan and elevation of the sound walls with the following project specific information provided:

1. Begin and end wall stations with offsets
2. Horizontal and vertical alignments of the wall
3. Fire hose access hole locations
4. Drainage panel locations and type
5. Graphic details and graphic panel location
6. Panel locations
7. Post locations
8. Elevations of top of panel, bottom of panel, and panel joints
9. Existing and proposed ground elevations
10. Utility locations
11. Special post and panel details
12. Post and pile connection details
13. Post Cap Details
14. Lifting devices

534-6 Construction Methods.

A. Prior to beginning earthwork on the project, stake the wall location in the field, and establish the final ground line elevations at the base of the walls. Use these elevations to develop the shop drawings, including a complete elevation view of each wall indicating top and bottom elevations as well as the roadway grade. Protect the final ground elevations established in the field for the duration of the project, and do not adjust without prior approval of the Engineer. Keep to a minimum the clearing and grubbing, and trimming of trees as necessary to construct the walls.

B. Do not mix wall types or colors at any one site. Install the walls in accordance with the Plans, and in accordance with shop drawings submitted to and approved by the Engineer. Secure joints and connections in such a manner as to be structurally sound and without visible openings in the system allowing sound transmission.

C. Repair marred, chipped, scratched, or spalled areas of walls at no expense to the Department in accordance with the manufacturer's recommendations or at the Engineer's direction.

D. Place trench backfill for wall construction in accordance with 125-8. Use select materials for the trench backfill.

If, in the opinion of the Engineer, the trench is too narrow to compact, backfill the trench excavation with flowable fill meeting the requirements of Section 121 or concrete meeting the requirements of Section 346 or 347 to the satisfaction of the Engineer at no expense to the Department.

E. Dispose of all excess excavation in a manner satisfactory to the Engineer.

F. Keep right-of-way fence that is scheduled to be salvaged in place until completing the wall or, in the opinion of the Engineer, as long as possible.

G. After erecting the wall, leave the disturbed area in a finished condition at the direction of the Engineer, and grass or sod the area as indicated in the Plans.

H. Erection Tolerances:

1. Variation from plumb: plus or minus 1/4 inch/ post height

2. Panel alignment: plus or minus 1/4 inch
3. Top of panel elevation: plus or minus 3/4 inch
4. Elevation difference of adjacent panels: plus or minus 1/2 inch
5. Joint taper over panel length: plus or minus 1/2 inch
6. Top of collar elevation: plus or minus 3/4 inch
7. Post placement:
    a. Variation from specified location plus or minus 1/2 inch
    b. variation from specified elevation plus or minus 1/4 inch
8. Continuity of graphics, fracture fins, etc across joints: 1/4 inch

I. When building sound barriers on top of earth berms, construct the berms of fill material compacted to 95% of the maximum density as determined by AASHTO T 99.

J. Provide the concrete wall (Precast or Cast-in-Place) with a uniform color, pattern, and texture.

534-7 Test Wall.

Erect a test wall section not less than 50 feet in length before starting general wall construction at the project site. The Engineer will use the erection of the test wall to determine if the Contractor's methods and equipment are sufficient to produce a sound barrier that meets the requirements of the Contract Documents. The Contractor may revise his methods and equipment as necessary, at any time during the positioning of the test wall, in order to satisfactorily meet all Contract requirements. Build the test wall at a permanent wall location, as directed by the Engineer. If the test wall does not meet the construction tolerances, remove and dispose of it at no expense to the Department. Include the cost of the test wall in the cost of the sound barrier.

534-8 Repairs or Rejection.

For precast concrete sound barrier components that have not been installed, evaluate cracks, spalls and other deficiencies in accordance with 450-12. Repair deficiencies in accordance with 450-13 or the plant's approved repair methods that are included as part of the QCP. Ensure that the original performance and durability of repaired sound barrier components are maintained. Use materials for concrete repair that will meet or exceed the strength requirement for the class of concrete used. Materials meeting the requirements of Section 930 may be substituted for non-shrink grout when required by 450-13. Precast concrete sound barrier components are subject to rejection if they fail to conform to any of the requirements after repair. For precast concrete sound barrier components that have been installed, the disposition of concrete cracks shall be in accordance with 400-21.

534-9 Method of Measurement.

The quantity to be paid for will be the plan quantity, in square feet, measured in place, completed and accepted, of the area bounded by the top of the top panel and the bottom of the bottom panel without deductions for openings in the panels, and the beginning to end limits shown in the control drawings.

534-10 Basis of Payment.

Price and payment will be full compensation for all work specified in this Section, including but not limited to: furnishing all materials, labor, panels, special panels, posts, post caps, collars, reinforcing steel, foundations, drain holes, fire hose access holes, grating, neoprene pads, equipment, alignment pins, etc. necessary to construct the sound barriers. Include in this

price, the cost of any charges for power stoppages, sound barrier wall realignments, special erection methods, etc. required to construct the wall.

Payment will be made under:

Item No. 534- 72- Concrete Sound Barrier - per square foot.

536 GUARDRAIL.
(REV 6-9-10) (FA 7-16-10) (1-11)

SUBARTICLE 536-2.4 (Page 674) is deleted and the following substituted:

536-2.4 Offset Blocks: Use guardrail offset blocks of either timber, steel, recycled plastic, or rubber, and of the sizes specified in the Design Standards.

Treat timber blocks in accordance with the requirements for posts in 955-5.3. Ensure that penetration of preservative is in accordance with requirements for round piles and fence posts in 955-6.2. For timber offset blocks, meet the requirements of the latest edition of the Southern Pine Inspection Bureau's Standard Grading Rules for Southern Pine Lumber, for No.1 grade timber. Dress all timber offset blocks on all four sides (S4S). Ensure that timber offset blocks do not vary more than 0.25 inch from the specified length.

Use rubber or recycled plastic blocks that have a minimum Durometer hardness of 50 (ASTM D 2240), show no cracking at the end of an ozone exposure of 100 plus or minus 10 pphm for 15 hours at 100ºF (ASTM D 1149 mounting type A), do not exceed 15 points change in Durometer hardness in oven ageing for 70 hours at 158ºF (ASTM D 573), and show no cutting or tearing under a 6,500 lb load applied through a guardrail section. Ensure that the blocks present a neat appearance and have plane surfaces. Provide rubber or recycled plastic blocks that are 6 inches wide, 8 inches deep and 14 inches high. Allow dimensional tolerances of plus or minus 5/8 inch in height, plus or minus 3/8 inch in width, and plus or minus 3/8 inch in depth.

Use recycled plastic offset blocks that meet the requirements of Section 972 and are listed on the Qualified Products List (QPL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6 and include certified test reports from an approved independent test laboratory that shows the material meets all the requirements of this Section and Section 972.

538 RESETTING GUARDRAIL.
(REV 3-1-11) (FA 5-10-11) (1-12)

SECTION 538 (Pages 677 – 678) is deleted and the following substituted:

SECTION 538
RESETTING GUARDRAIL

538-1 Description.

Remove and reset the existing guardrail at locations shown in the Plans.

538-2 Materials.

Replace non-reusable hardware and posts as determined by the Engineer with new materials necessary to complete the reset installation.

Provide new offset blocks for all installations.

Meet the requirements specified in 536-2.

538-3 Construction Methods.

Prevent damage to reusable hardware and posts.

Set posts in accordance with the requirements of 536-3 using a consistent type of post throughout a run of guardrail.

Install guardrail panels, anchors, hardware, and reflector elements in accordance with the design standards and plan details.

Reusable materials damaged during resetting operations must be replaced at no cost to the Department.

Reset posts in a manner that prevents any subsequent settlement after the blocks and panels are reattached.

538-4 Method of Measurement.

The quantities to be paid for will be the length, in feet, of reset guardrail; the number of end anchorage assemblies of each type as designated; the number of special posts, and the number of bridge anchorage assemblies; all as actually constructed and accepted.

The plan length of a run of reset guardrail will be determined as a multiple of the nominal panel lengths except that any panel which is cut off will be field-measured.

538-5 Basis of Payment.

Prices and payments for resetting guardrail will be full compensation for all work specified in this Section.

Price and payment for end anchorage assemblies, special guardrail posts, and bridge anchorage assemblies will be as specified in Section 536.

Payment for new guardrail materials furnished to replace items determined to be non-reusable, excluding any items damaged by the Contractor, will be paid for at the actual invoiced cost including transportation charges, to which cost will be added an amount equal to 25% of the total charges.

Payment will be made under:

Item No. 538- 1- Resetting Guardrail - per foot.

544 CRASH CUSHIONS.
(REV 8-4-11) (FA 8-9-11) (1-12)

SECTION 544 (Pages 678 - 679) is deleted and the following substituted:

SECTION 544
CRASH CUSHIONS

544-1 Description.

Install redirective and non-redirective crash cushions (of the sizes and types designated in the plans. Redirective crash cushions are safety devices with capabilities to redirect the impacting vehicle over the full length of the device. Non-redirective crash cushions allow controlled penetration of the impacting vehicle over the full length of the device.

544-2 Qualified Products List (QPL).

Use crash cushions listed on the QPL. Manufacturers seeking evaluation of their crash cushions shall furnish certified test reports showing that their products meet all test requirements of NCHRP 350 or the Manual for Assessing Safety Hardware 2009 (MASH).

544-3 Construction.

Handle and install manufactured materials or articles in accordance with the manufacturer's instructions and the Design Standards.

Use crash cushions delineated with a Type I Object Marker specified in Section 705 or sheeting in accordance with 990-2.

Perform repairs necessary due to defective material, work, or operations without additional cost to the Department.

Restore crash cushions damaged by the traveling public after the installation is completed, accepted and serving its intended purpose on an open section of bridge or roadway within 24 hours.

544-4 Compensation.

Price and payment will be full compensation for the complete system or module in place and accepted, including object marker or sheeting. Payment for restoring damaged crash cushions will be 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.

Relocation of an existing crash cushion to a permanent location called for in the plans shall be paid for at the Contract unit price for relocating existing systems. Price and payment will be full compensation for relocating and reinstalling the system in accordance with the manufacturer's instructions and the Design Standards.

Payment will be made under:

Item No. 544- 74- Relocate Crash Cushion - each.
Item No. 544- 75- Crash Cushion - each.

546 RUMBLE STRIPS.
(REV 7-6-09) (FA 8-31-09) (1-10)

ARTICLE 546-2 (Page 679) is deleted and the following substituted:

546-2 Materials for Raised Rumble Strips.

Construct Raised Rumble Strips using one of the following:

(a) Thermoplastic materials listed on the Qualified Products List (QPL), meeting the requirements of 971-1 and 971-6. Ensure that the material used can be restored to its original dimensions by using a self bonding overlay meeting these requirements. Submit a certified test report to the Engineer indicating that the materials meet all requirements specified.

Before applying thermoplastic materials on portland cement concrete surfaces, apply a primer sealer recommended by the manufacturer.

(b) Any plant-mixed hot bituminous mixture meeting the requirements of a job-mix formula issued by the Department, except open-graded friction course.

Prior to the application of any plant-mixed hot bituminous material, apply a tack coat meeting the requirements of 300-2.3.

The mixture will be accepted on the basis of visual inspection by the Engineer with no further testing required.

548 RETAINING WALL SYSTEMS.
(REV 1-27-11) (FA 2-4-11) (7-11)

SECTION 548 (Pages 680 – 689) is deleted and the following substituted:

SECTION 548
RETAINING WALL SYSTEMS

548-1 Description.

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

Obtain each Precast Concrete Retaining Wall System from an approved incidental precast manufacturing plant that is currently on the list of Producers with Accepted Quality Control Programs. Producers seeking inclusion on the list shall meet the requirements of 105-3.

Ensure that each wall system component is permanently and legibly marked in accordance with 548-5.

Ensure that each shipment of products to the job site includes a signed or stamped delivery ticket in accordance with the Materials Manual, Section 8.2 Volume II, and the required

written certification statement for each product shipped. Provide these tickets and certifications to the Engineer.

548-2 Materials.

Purchase the precast components, soil reinforcement, attachment devices, joint filler, filter fabric, and all necessary incidentals from the wall supplier chosen.

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

Produce and supply concrete for the leveling pad meeting the requirements of Section 347. Assume responsibility for performance of all testing required by Section 346. Use Department approved mix designs.

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

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

Use steel wire mesh and embedded loops shop fabricated from cold drawn steel wire meeting the minimum requirements of ASTM A 82, and weld into the finished mesh fabric in accordance with ASTM A 185. Use longitudinal and transverse wires of equal and constant diameter within a given piece of mesh reinforcement.. Use steel strips hot rolled from bars to the required shape and dimensions with physical and mechanical properties meeting ASTM A 572 Grade 65 or as shown in the Contract Documents. Use shop-fabricated hot rolled steel tie straps meeting the minimum requirements of ASTM A 1011/A 1011 M, Grade 50, or as shown in the Contract Documents.

Ensure that steel reinforcing strips, tie strips, reinforcing mesh and connectors used in permanent walls are galvanized in accordance with ASTM A 123 or ASTM A 153, as applicable. For typical applications, punch or drill holes in metal items before galvanizing. Field drilled holes for bin walls are permitted. Repair field drilled holes, field cut ends and other damage to galvanized surfaces in accordance with Section 562.

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

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

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

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

548-2.5 Joint Materials and Filter Fabrics:

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

548-2.5.2 Joint Covers: Cover joints and other wall openings with geotextile fabric meeting the requirements of Section 985 and Type D-5, Design Standards, Index No. 199. Apply an adhesive approved by the Engineer to the back of the precast component for attachment of the fabric material.

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

548-2.6 Backfill Material:

548-2.6.1 General: Provide compacted select backfill or flowable fill within the retaining wall volume when the option for flowable fill is shown in the plans. The retaining wall volume is defined to extend from the top of the leveling pad or footing, or bottom of walls which do not have footing or leveling pads, to the finish grade line and from the face of the wall to a vertical plane passing through the end of the extreme wall component (straps, counterforts, etc.) plus 1 foot.

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

For constructing the retaining wall volume, do not use backfill material containing more than 2.0% by weight of organic material, as determined by FM 1-T 267 and by averaging the test results for three randomly selected samples from each stratum or stockpile of a particular material. If an individual test value of the three samples exceeds 3%, the stratum or stockpile will not be suitable for constructing the retaining wall volume.

Ensure that the material is non-plastic as determined by AASHTO T 90 and the liquid limit as determined by AASHTO T 89 is less than 15. The pH, as determined by FM 5-550, shall not be lower than 5.0 and not higher than 9.0.

Use backfill for walls using soil reinforcements that meets the following gradation limits determined in accordance with AASHTO T 27 and FM 1-T 011:

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

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

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

For walls not using soil reinforcement, use backfill that meets the following gradation limits determined in accordance with AASHTO T 27 and FM 1-T 011:

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

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

548-3.Qualified Products List.

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

1. Soil Reinforcement durability and/or corrosion data;
2. Differential settlement the wall system can tolerate without exceeding normal stress range of the soil reinforcement and wall facing, or the construction tolerances in this Section;
3. The effects of water flow;
4. Applicable environmental classifications as outlined in the SDG;
5. Provide signed and sealed design calculations. Design calculations may be either by hand or by a wall company program with hand calculations verifying the program output. It is only necessary to include sample hand calculations for a 20 foot height for each soil condition.

6. Corrosion and durability design procedures for soil reinforcement elements;

7. Provide 11" x 17" drawings showing:

a. Notes specific to the wall system;

b. Panel sizes and reinforcing;

c. Soil reinforcement connection to wall facings;

d. Wall panel abutment interfacing;

e. Slip joints;

f. Steps in leveling pad;

g. Soil reinforcing details around all vertical obstructions;

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

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

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

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

l. Details showing how to accommodate long term (post construction) wall settlement in excess of 4 inches without attaching soil reinforcement to the abutment; and,

m. Details of how to ground the wall system.

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

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

10. A field construction manual describing construction requirements and sequencing for the wall system. Submit manual in 8.5" x 11" format in either pdf or MS Word format.

548-4 Shop Drawings.

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

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

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

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

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

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

6. Design calculations for each wall height increment detailed in the Shop Drawings.

548-5 Concrete Component Construction.

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

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

548-5.2 Tolerances: Meet the following manufactured tolerances:

1. Precast Component Dimensions: Lateral position of soil reinforcement attachment devices-within 1 inch. All other dimensions-within 3/16 inch.

2. Precast Component Squareness: Angular distortion of the component shall not exceed 0.2 inches in 5 feet.

3. Precast Component Surface Finish: Surface defects on smooth formed surfaces measured on a length of 5 feet shall not exceed more than 0.1 inch. Surface defects on textured finished surfaces measured on a length of 5 feet shall not exceed 5/16 inch.

548-5.3 Marking of Precast Components: Permanently and legibly mark the following information on the back of each precast wall panel by etching: the panel number or type, piece mark, project number (if applicable), date cast and precast manufacturer's name or symbol with the approved producer's QC stamp affixed.

548-6 Repairs or Rejection of Precast Components.

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

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

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

1. Defects that indicate unsatisfactory molding.
2. Defects indicating honeycombed or open texture concrete.
3. Defects in the physical characteristics such as:

Signs of aggregate segregation;
Broken or cracked corners;
Soil reinforcement attachment devices improperly installed/damaged;
Lifting inserts not useable;
Exposed reinforcing steel;
Insufficient cover over reinforcing steel;
Cracks at the alignment pipe or pin;
Insufficient concrete compressive strength;
Precast component thickness in excess of plus or minus 3/16 inch from that shown in the Contract Documents; or
Stained front face, due to excess form oil or other reasons.

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

548-7 Handling Storage and Shipping.

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

548-8 Construction Requirements.

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

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

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

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

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

548-8.4 Wall Erection: Assemble, connect and support wall components as recommended by the wall supplier. As backfill material is placed behind the wall face, maintain the wall in the vertical position or slightly battered into the backfill to provide a final vertical alignment (by means of bracing, temporary wooden wedges placed in the joint at the junction of the two adjacent precast components on the external side of the wall or other alignment aids).

Remove wooden wedges as soon as the precast component above the wedged precast component is completely erected and backfilled. External bracing is required for the initial lift of MSE systems.

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

548-8.4.1 Tolerances for Permanent Walls: Ensure that vertical tolerances (plumbness) and horizontal alignment tolerances do not exceed 3/4 inch when measured with a 10 foot straight edge. The maximum allowable offset in the joint between precast components is 3/4 inch. The final overall vertical tolerance of the completed wall (plumbness from top to bottom) shall not exceed 1/2 inch per 10 feet of wall height. Horizontal and vertical joints between precast components shall not be less than 1/2 inch or more than 1 1/4 inch. Walls which do not meet these tolerances will not be accepted by the Department and must be removed and reconstructed at no cost to the Department.

548-8.4.2 Tolerances for Temporary Walls: Ensure that vertical tolerances (plumbness) and horizontal alignment tolerances do not exceed 3 inches when measured with a 10 foot straight edge. The final overall vertical tolerance of the completed wall (plumbness from top to bottom) shall not exceed 1 inch per 3 feet of wall height, not to exceed a total of 6 inches. Walls which do not meet these tolerances will not be accepted by the Department and must be removed and reconstructed at no cost to the Department.

548-8.5 Backfill Placement:

548-8.5.1 Compacted Select Backfill: Perform work in accordance with an approved QCP meeting the requirements of 105-3. A LOT is defined as a single lift of finished embankment not to exceed 500 feet in length. Isolated compaction operations will be considered as separate LOTs. For multiple phase construction, a LOT will not extend beyond the limits of the phase.

Place the backfill closely following the erection of each course of precast components or soil reinforcement layers and spread by moving the machinery parallel to the wall face. Do not allow equipment heavier than 8 tons closer than 3 feet behind the wall face. Place backfill in a manner to avoid any damage or disturbance to the wall materials or misalignment of the facing materials. Remove and replace any wall materials which become damaged or disturbed during backfill placement at no cost to the Department, or correct as directed by the Engineer. Remove and reconstruct any misalignment or distortion of the wall facing due to placement of backfill outside the limits of this specification at no cost to the Department.

Sheepfoot, grid rollers or other types of equipment employing a foot are not allowed. Achieve compaction within 3 feet of the back of the wall face using a power operated roller or plate weighing less than 1,000 lbs. At a distance greater than 3 feet from the back of the wall, a vibratory roller may be used, provided that the frequency and amplitude combined with bulk weight of the roller has performed satisfactorily at a trial section of the same type of wall. A smooth wheel or rubber tire roller is considered adequate. Ensure that the maximum lift thickness after compaction does not exceed 6 inches. Decrease the lift thickness if necessary, to obtain specified density.

Perform backfill compaction in a way that the compactor moves in a direction parallel to the wall face and proceeds from a distance not less than 3 feet behind the wall face toward the end of the soil reinforcement element.

Ensure that the moisture content of the backfill material prior to and during compaction is uniformly distributed throughout each layer of material. Use backfill material having a placement moisture content at the dry side of the Optimum Moisture content. To achieve the required compaction moisture content, use water that meets the requirements of Section 923. Do not use saltwater. Do not transport excessively moist backfill materials to the site for any reason. The Engineer will determine the Optimum Moisture Content in accordance with FM 5-521.

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

548-8.5.2 Flowable Fill: Perform work in accordance with an approved QCP meeting the requirements of 105-3. Metallic wall components (including metallic soil reinforcements) must not be in partial contact with the flowable fill. If the metallic components contact the flowable fill, the metallic components must be completely encapsulated by the flowable fill.

548-9 Acceptance Program.

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

548-9.2 Maximum Density Determination: Obtain a minimum QC density of 100% of the maximum density as determined by FM 1 T-180.

Perform gradation tests on the sample collected in accordance with AASHTO T 27 and FM 1-T 011. Classify soils in accordance with AASHTO M–145 in order to determine compliance with embankment utilization requirements.

548-9.3 Density Testing Requirements: Ensure compliance with the requirements of nuclear density testing in accordance with FM 1-T 238. Determine the in-place moisture content for each density test. Use FM 1-T 238, FM 5-507 (Determination of Moisture Content by Means of a Calcium Carbide Gas Pressure Moisture Tester), or FM 5-535 (Laboratory Determination of Moisture Content of Granular Soils by Use of a Microwave Oven) for moisture determination.

Perform these tests at a minimum frequency of one set of tests per LOT. One set of tests is defined as a density test for the fill within 3 feet behind the wall face and another density test for the fill beyond 3 feet behind the wall face.

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

548-9.4 Acceptance Criteria: Obtain a minimum density of 90% of the maximum dry density as determined by FM 1 T-180 within 3 feet behind the wall face and obtain a minimum density of 95% of the maximum dry density as determined by FM 1 T-180 from beyond 3 feet behind the wall face.

548-9.5 Frequency: Conduct sampling and testing at a minimum frequency listed in the table below. The Engineer will perform Verification sampling and tests at a minimum frequency listed in the table below.

Test Name	Quality Control	Verification
Maximum Density	One per soil type	One per soil type
Density	One set of tests per LOT	One set of tests per four LOTs for each type of QC test.
Gradation	One per Maximum Density	One per Maximum Density
LL&PI	One per Maximum Density	One per Maximum Density
Soil Classification	One per Maximum Density	One per Maximum Density
Organic Content	One per soil type	One per soil type

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

548-9.6 Verification Comparison Criteria and Resolution Procedures:

548-9.6.1 Maximum Density Determination: The Engineer will collect enough material to split and create two separate samples and retain one for Resolution until LOTs represented by the samples are accepted.

The Engineer will meet the requirements of 120-10.4.1 except replace AASHTO T 99, Method C with FM 1-T 180, Method D.

548-9.6.2 Density Testing: Meet the requirements of 120-10.4.2.

548-9.6.3 Soil Classification: The Engineer will meet the requirements of 120-10.4.3 except test the sample retained in 548-9.6.1 instead of taking the additional one.

548-9.6.4 Gradation: The Engineer will verify the QC results if the Verification result meets the gradation limits set forth in the gradation table of 548-2.6. Otherwise, the Engineer will test the sample retained in 548-9.6.1. The State Materials Office or an AASHTO accredited laboratory designated by the State Materials Office will perform Resolution testing. The material will be sampled and tested in accordance with AASHTO T 27 and FM 1-T 011.

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

548-9.6.5 Liquid Limit and Plasticity Index (LL&PI): The Engineer will verify the QC results if the Verification result satisfies the plasticity index and liquid limit criteria set forth in 548-2.6. Otherwise, the Engineer will test the sample retained in 548-9.6.1. The State Materials Office or an AASHTO accredited laboratory designated by the State Materials Office will perform Resolution testing. The material will be sampled and tested in accordance with AASHTO T 90 and AASHTO T 89 respectively.

If the Resolution Test result satisfies the required criteria, LOTS of that soil type will be verified. If the Resolution Test results do not meet the required criteria,

reconstruct the corresponding LOTS with acceptable material. The Engineer will perform new verification testing.

548-9.6.6 Corrosiveness: The Engineer will verify the QC results if the Verification result satisfies the electro-chemical test criteria set forth in 548-2.6. Otherwise, the Engineer will test the sample retained in 548-9.5. The State Materials Office or an AASHTO accredited laboratory designated by the State Materials Office will perform Resolution testing. The material will be sampled and tested in accordance with FM 5-550, FM 5-551, FM 5-552 and FM 5-553.

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

548-9.6.7 Organic Content: The Engineer will verify the QC results if the Verification result satisfies the organic content test criteria set forth in 548-2.6. Otherwise, the Engineer will collect three additional samples. The material will be sampled and tested in accordance with FM 1-T 267 and by averaging the test results for three randomly selected samples from at least one lift per soil type. The State Materials Office or an AASHTO accredited laboratory designated by the State Materials Office will perform Resolution testing.

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

548-10 Certification.

Furnish a copy of all test reports which are necessary to document compliance with the Specifications, at least ten days prior to wall construction.

Also furnish the Engineer a Certificate of Compliance certifying that the retaining wall materials, backfill and construction practices comply with this Section.

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

548-11 Method of Measurement.

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

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

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

548-12 Basis of Payment.

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

Payment will be made under:

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

550 FENCING
(REV 5-14-10) (FA 7-20-10) (1-11)

SUBARTICLE 550-3.1 (Page 690) is deleted and the following substituted:

550-3.1 Type A Fence (Farm Fence): Meet the requirements of Section 954 for timber posts and braces. For metal posts and braces, and for recycled plastic fence posts, meet the requirements of the Design Standards.

For the fabric and all other accessories, meet the requirements of the Design Standards.

560 COATING STRUCTURAL STEEL.
(REV 10-4-10) (FA 11-9-10) (7-11)

PAGE 714. The following new Section is added after Section 557:

SECTION 560
COATING STRUCTURAL STEEL

560-1 Description

Coat new structural steel in accordance with the requirements of this Section.

560-2 Materials.

560-2.1 Coating System: Use only coating products and systems meeting the requirements of Section 975 and listed on the Departments Qualified Products List (QPL).

Use Type M coal tar epoxy coatings meeting the requirements of Section 926 and listed on the Department's QPL for coating of permanent bulkhead sheet piles and H piles.

560-2.2 Thinners, Solvents and Cleaners: Use thinners, solvents and cleaners listed on the coating manufacturer's product data sheet.

560-2.3 Caulking: Use caulks that are paintable, compatible with the coating system and recommended by the coating manufacturer as part of the coating system.

560-2.4 Soluble Salts Test Kit: Use a soluble salts test kit in accordance with SSPC-Guide 15 utilizing a Class A retrieval method. Ensure the test sleeve or cell creates a sealed, encapsulated environment during ion extraction and is suitable for testing all structural steel surfaces.

560-2.5 Abrasives: Use properly sized abrasives to achieve the required cleanliness and anchor profile. Use abrasives meeting the requirements of SSPC-AB 1, Mineral and Slag Abrasives, SSPC-AB 2, Cleanliness of Recycled Ferrous Metallic Abrasives, or SSPC-AB 3, Newly Manufactured or Re-Manufactured Steel Abrasive and do not introduce any contamination that interferes with the coating application and performance.

Provide certification to the Engineer that the abrasives used meet the requirements of this Section and do not contain any chlorides and other salts.

For recycled abrasives, verify compliance with the conductivity and cleanliness requirements of SSPC-AB 2 after each recycling or more frequently if required by the Engineer. Select a sample from each recycling machine in use and conduct the water-soluble contaminant and oil content tests outlined in SSPC-AB 2 at least one time each week or more frequently if directed by the Engineer. Conduct the non-abrasive residue and lead content tests as directed by the Engineer. If test results do not meet requirements, notify the Engineer immediately, remove and replace the abrasive, clean the recycling equipment, and conduct tests each day to confirm the equipment is functioning properly. Return to the weekly testing interval as directed by the Engineer.

560-2.6 Rust Preventative Compound: Use a Class 3 rust preventative compound meeting the requirements of Military Specification MIL-C-11796C, Corrosion Preventative Compound, Petrolatum, Hot Applied.

560-2.7 Storage: Store materials in conformance with the manufacturer's recommendations.

560-3 Equipment.

560-3.1 Compressed Air: Use a compressed air system capable of delivering clean, dry, continuous nozzle pressure to achieve the required surface cleanliness and profile or spray pattern. The system must comply with the instructions and recommendations of the manufacturer of the abrasive blasting system or coating application system.

560-3.2 Abrasive Blasting System: Design the blasting system to produce the specified cleanliness and profile.

560-3.3 Coating Application System: Use the coating application equipment approved by and in accordance with the Coating Manufacturer's technical data requirements.

560-4 Environmental, Health and Safety Requirements.

Isolate the work areas with containment devices, canvasses, tarpaulins or screens during all surface preparation and coating application operations. Dispose of all debris and waste products generated in accordance with all Federal, State and Local regulations.

560-5 Quality Control.

560-5.1 Shop Preparation and Application: Prior to applying coatings, provide a current Corporate Quality Control Plan approved by the American Institute of Steel Construction (AISC) under the Sophisticated Paint Endorsement program or SSPC under the SSPC-QP3 certification to the State Materials Office for approval.

560-5.2 Field Preparation and Application: Provide a current Corporate Quality Control Plan approved by SSPC under the SSPC-QP1 and/or SSPC-QP2 certifications as appropriate and a site specific Coating Quality Control Plan to the Engineer at least 14 calendar days prior to beginning coatings work. Do not begin coatings work until the site specific Coating Quality Control Plan has been approved by the Engineer.

560-5.3 Inspection: Ensure that all inspection equipment is maintained in accordance with the manufacturer's instructions, calibrated, and in good working condition. Ensure that all activities are observed and approved by a quality control coatings inspector meeting the requirements of this Section. Maintain daily inspection reports at the job site for review by the

Engineer. Provide all daily inspection reports upon completion of the project to the Engineer or more frequently as requested by the Engineer.

560-6 Qualifications.

560-6.1 Shop: Provide documentation to the Engineer at least 14 days prior to beginning work that the shop performing any work in accordance with this Section is certified by AISC Sophisticated Paint Endorsement or by SSPC to the requirements of SSPC-QP3.

560-6.2 Field Contractor: Provide documentation to the Engineer at least 14 days prior to beginning work that the field contractor performing any work in accordance with this Section is certified by SSPC to the requirements of SSPC-QP1 and/or SSPC-QP2 as appropriate.

560-6.3 Quality Control Inspectors in the Shop and Field: Provide documentation to the Engineer that all personnel performing quality control inspections are certified at a minimum as a National Association of Corrosion Engineers (NACE) Coating Inspector Level I or a SSPC Level 1 Bridge Coating Inspector and that they report directly to a Quality Control Supervisor who is certified either as a NACE Coating Inspector Level 3 or a SSPC Level 2 Bridge Coating Inspector.

560-6.4 Certifications: Maintain certifications for the duration of the Contract. If the certifications expire, do not perform any work until certifications are reissued.

Notify the Engineer of any change in certification status.

560-7 Surface Preparation.

560-7.1 General: Ensure all surfaces to be coated are clean, dry, and free from oil, grease, dirt, dust, soluble salts, corrosion, peeling coating, caulking, weld spatter, mill scale and any other surface contaminants. Prepare all surfaces that will become inaccessible after fabrication, erection, or installation while accessible. Sequence the surface preparations and coating operations so that freshly applied coatings will not be contaminated by dust or foreign matter. Protect all equipment and adjacent surfaces not to be coated from surface preparation operations. Protect working mechanisms against intrusion of abrasive. In the event that any rusting or contamination occurs after the completion of the surface preparation, prepare the surfaces again to the initial requirements. Perform surface preparation work only when the temperature of the steel surface is at least 5ºF above the dew point temperature.

560-7.2 Mechanical Removal of Surface Defects: Break all corners resulting from sawing, burning, or shearing. In areas where burning has been used, remove the flame hardened surface of the steel to the extent necessary to achieve the required surface profile after abrasive blast cleaning. Remove all weld slag and weld spatter. Conduct all of this work in accordance with AASHTO/NSBA Steel Bridge Collaboration S 8.1.

560-7.3 Cleaning: Clean all steel surfaces in accordance with the requirements of SSPC-SP 1.

560-7.4 Washing: Wash all steel surfaces in accordance with the requirements of SSPC-SP 12.

560-7.5 Soluble Salts Detection and Removal: Determine the chloride, sulfate and nitrate concentrations on all steel surfaces using soluble salts test kits meeting the requirements of 560-2.4. Measure the concentration levels using the method described in SSPC-TU 4. Perform the tests after washing and after each applied coat of the coating system. Test three random locations in the first 1000 square feet and one random location for each subsequent 1000 square feet. Ensure the non-visible surface contaminant concentrations on blast-cleaned surfaces do not exceed the levels in SSPC-SP 12 Table A1 NV12 for chloride, soluble ferrous iron and sulfate

and 10 $\mu g/cm^2$ for nitrate. When any concentration exceeds these levels rewash the entire surface area and retest. If additional washing does not reduce the concentration to the acceptable level, a surface treatment or water additive may be used. Use a surface treatment or water additive that is approved by the coating system supplier and the Engineer.

560-7.6 Abrasive Blast Cleaning: Prepare steel by abrasive blast cleaning to "Near-White" metal condition as defined in SSPC-SP 10. Use SSPC VIS 1 as an aid in establishing cleanliness. After abrasive blast cleaning, ensure the surface profile meets the requirements of the coating manufacturer's product data sheet. Determine the surface profile using replica tape in accordance with ASTM D 4417, Method C.

Perform all abrasive blast cleaning within a containment system to ensure confinement of all particulates. Design the containment system to comply with all applicable Federal, State, and Local regulations. Ensure the abrasive blast cleaning does not produce holes, cause distortion, remove metal, or cause thinning of the substrate.

560-7.7 Hand and Power Tool Cleaning: Prepare steel by power and hand tool cleaning as defined in SSPC-SP 11, SSPC-SP 3, and SSPC-SP 2 for touch up and repair when approved by the Engineer. Use SSPC-VIS 3 as an aid in establishing cleanliness.

560-8 Surfaces Not to be Coated.

560-8.1 Galvanized Surfaces: Do not coat galvanized surfaces unless specified in the Contract Documents.

560-8.2 Surfaces to be in contact with Concrete: Do not coat the areas of contact surfaces of steel to be encased or embedded in concrete, or coated with concrete unless specified in the Contract Documents. When specified, prepare the contact surfaces and apply primer.

560-8.3 Faying Surfaces: After application of the primer, protect the contact surfaces of members to be joined by high-strength bolts in friction type joints from all other coatings and foreign material.

560-8.4 Machine Finished Surfaces: Apply a coating of rust preventative compound to all machine finished or similar surfaces that are not to be coated, or will not be coated immediately.

560-8.5 Surfaces to be Welded: Mask off surfaces within 1 inch of field welded connections before the application of any shop coating. Apply a mist coat of primer that is less than 1 mil dry film thickness to surfaces where shear studs will be welded.

560-9 Application.

560-9.1 General: Apply a complete coating system to all structural steel surfaces except surfaces indicated in 560-8. Apply a complete coating system to all surfaces that will become inaccessible after fabrication, erection, or installation.

Apply the prime coat in the shop. Apply the intermediate coat in the shop or field. Only apply the finish coat after erection and after concrete work is complete.

Prior to the application of any coating, inspect the substrate for contamination and defects, and prepare the surface in accordance with 560-7 before application of the next coat.

Apply each coat including a stripe coat in a color that contrasts with the substrate or preceding coat. For exterior surfaces, apply a finish coat color meeting Federal Standard, 595B, Shade 36622, unless otherwise specified in the Contract Documents.

560-9.2 Weather and Temperature Limitations: Do not spray coating when the measured wind speed in the immediate coating area is above 15 miles per hour. Do not apply coatings when contamination from rainfall is imminent or when the ambient air temperature,

relative humidity, dew point temperature, or temperature of the steel is outside limits of the coating manufacturer's product data sheet.

560-9.3 Sealing Using Caulk: Completely seal the perimeter of all faying surfaces, cracks and crevices, joints open less than 1/2 inch, and skip-welded joints using caulk. Apply the caulk to the joint following the caulk manufacturer's recommendations. Ensure the caulk bead has a smooth and uniform finish and is cured according to the caulk manufacturer's recommendation prior to the application of the coating system.

560-9.4 Protection of Adjacent Surfaces: Protect all surfaces and working mechanisms not intended to be coated during the application of coatings. Clean surfaces that have been contaminated with coatings until all traces of the coating have been removed. Do not allow material from cleaning and coating operations to be dispersed outside the work site.

560-9.5 Mixing and Thinning: Mix all coatings in accordance with the manufacturer's product data sheet. Only mix complete kits. Use thinners and solvents in accordance with the requirements of the coating manufacturer's product data sheet and confirm that the amount of thinner added does not result in the coating exceeding VOC regulations stated in Section 975.

Perform all mixing operations over an impervious surface with provisions to prevent runoff to grade of any spilled material.

560-9.6 Application Methods: Use coating application equipment and apply coatings per the coating manufacturer's product data sheet. Application with brushes may be permitted for minor touchup of spray applications, stripe coats, or when otherwise approved by the Engineer. Adjust spray equipment to produce an even, wet coat with minimum overspray. Apply coatings in even, parallel passes, overlapping 50 percent. Agitate coatings during application as required by the coating manufacturer's product data sheet.

560-9.7 Stripe Coating: Apply stripe coats to achieve complete coverage and proper thickness on welds, corners, crevices, sharp edges, bolts, nuts, rivets, and rough or pitted surfaces.

560-9.8 Thickness of Coats: Apply coatings to the thickness as identified in the manufacturer's product data sheet. After application of each coat, thoroughly inspect the surfaces and measure the dry film thickness (DFT) in accordance with SSPC-PA 2. When the DFT is deficient or excessive, correct in accordance with the coating manufacturer's recommendations and retest the area.

560-9.9 Coating Drying, and Curing: Apply coatings within the time specified by the coating manufacturer's product data sheet for drying and recoating. Test the coating for proper cure before handling and shipping. Test for cure in accordance with the manufacturer's recommended method. Meet the requirements of ASTM D 4752 for inorganic zinc primers or ASTM D5402 for organic zinc primers when the manufacturer's technical data sheet does not state a specified cure test. Obtain the acceptance criteria from the coating manufacturer and report the results to the Engineer.

Prior to assembling bolted connections, test and verify that the primer coating on the faying surfaces has cured to a resistance rating of 5 in accordance with ASTM D 4752, ASTM D 5402, or the coating manufacturer's requirements. If cure testing is performed per the coating manufacturer's requirements, submit the test results to the Engineer for approval prior to assembling the bolted connection.

560-9.10 Coating Finish: Apply each coat free of runs, sags, blisters, bubbles, and mud cracking; variations in color, gloss, or texture; holidays; excessive film buildup; foreign contaminants; orange peeling; and overspray.

560-10 Touchup and Repair.

Clean and coat all welds, rivets, bolts, and all damaged or defective coating and rusted areas in accordance with 560-7 and 560-9. Upon approval by the Engineer, aluminum mastic may be used in accordance with the manufacturer's recommendations. Aluminum mastic must contain aluminum pigment and minimum 80% volume solids.

560-11 Coal Tar-Epoxy Coating of Permanent Bulkhead Sheet Piles and H Piles.

560-11.1 Surface Preparation: Prepare the substrate in accordance with 560-7. Provide a depth of anchor profile in accordance with the manufacturer's product data sheet, but in no case less than 2.5 mils. Re-blast piles not coated during the same shift or if the surface to be coated no longer meets the requirements SSPC-SP 10.

560-11.2 Application of Coating: Unless otherwise shown in the Contract Documents, apply the inorganic zinc and coal tar-epoxy coatings to all sides of H piles and the exposed side of sheet and pipe piles from the top of the piles to a depth of five feet below the lower of the design ground surface or the design scour depth. Apply the inorganic zinc in accordance with this Section. Apply the coal tar-epoxy in accordance with the following specific requirements:

(1) Apply the coal tar-epoxy system in two coats. The time interval between the first coat and the second coat will be in strict accordance with the coating manufacturer's published specifications. Apply the first coat to yield a dry film thickness of 8 to 10 mils. Apply the second coat to attain a total dry film thickness of the two coats between 16 and 20 mils.

(2) Ensure that no portion of the coating is less than the specified minimum film thicknesses. The total minimum film thickness for any combination of coats will be the sum total of the averages of the specified thickness range of the individual coats.

(3) After applying the coating on the steel piles, the Engineer will thoroughly inspect the surfaces and make film thickness measurements at the approximate rate of one for each 25 ft^2 of area unless deficient thickness is found. In this case, the rate of sub-measurements will be increased as required to determine the extent of the deficient area.

560-12 Basis of Payment.

No separate payment will be made for coating new structural steel. Include the cost in the cost of the structural steel.

562 REPAIR OF GALVANIZED SURFACES.

(REV 3-2-11) (FA 5-10-11) (1-12)

ARTICLE 562-2 (Page 714) is deleted and the following substituted:

562-2 Materials.

562-2.1 Areas 100 Square Inches or Less: Use a cold galvanizing compound containing at least 92% zinc dust in the dry film.

562-2.2 Areas Greater than 100 Square Inches: Use a galvanizing compound as specified in 975-2.4.1 and listed on the Qualified Products List (QPL).

563 ANTI-GRAFFITI COATING SYSTEM – DESCRIPTION.
(REV 4-27-09) (FA 5-27-09) (1-10)

ARTICLE 563-1 (Page 715) is deleted and the following substituted:

563-1 Description.

Apply an anti-graffiti coating system to the areas shown in the plans. Perform the painting in accordance with this Section, using materials meeting the requirements of Section 975 and listed on the Department's Qualified Products List (QPL). Use anti-graffiti coating systems that are recommended for the substrate by the anti-graffiti coating system manufacturer. On concrete substrates, use sacrificial or non sacrificial anti-graffiti coatings. On steel substrates, use non sacrificial anti-graffiti coatings only.

570 PERFORMANCE TURF.
(REV 10-14-09) (FA 12-28-09) (7-10)

SECTION 570 (Pages 717 - 722) is deleted and the following substituted:

SECTION 570
PERFORMANCE TURF

570-1 Description.

Establish a growing, healthy turf over all areas designated on the plans. Use sod in areas designated on the plans to be sodded. Use seed, hydroseed, bonded fiber matrix, or sod in all other areas. Maintain turf areas until final acceptance of all contract work in accordance with Section 5-11.

570-2 Materials.

Meet the following requirements:

Turf Materials	Section 981
Fertilizer	Section 982
Water	Section 983

570-3 Construction Methods.

570-3.1 General: Incorporate turf installation into the project at the earliest practical time.

Shape the areas to be planted to the plan typical sections and lines and grade shown in the Contract Documents.

Except in areas where the Contract Documents requires specific types of grass to match adjoining private property, any species of grass designated in Section 981 may be used. Use the methods and materials necessary to establish and maintain the initial grassing until acceptance of the Contract work in accordance with 5-11. All of the permanent grassing material shall be in place prior to final acceptance.

The Department will only pay for replanting as necessary due to factors determined by the Engineer to be beyond control of the Contractor.

Complete all grassing on shoulder areas prior to the placement of the friction course on adjacent pavement.

570-3.2 Seeding: At the Contractor's option, wildflower seed may be included in the turf seeding operation or performed separately from the turf seeding.

Use of compost meeting the requirements of Section 987 as mulch is acceptable unless otherwise specified.

570-3.3 Sod: Place the sod on the prepared surface, with edges in close contact. Do not use sod which has been cut for more than 48 hours.

Place the sod to the edge of all landscape areas as shown in the plans and as shown in the Design Standards.

Peg sod at locations where the sod may slide. Drive pegs through sod blocks into firm earth, flush with the sod soil surface, at intervals approved by the Engineer. The work and materials for pegging of sod as directed by the Engineer will be paid for as Unforeseeable Work.

Place rolled sod parallel with the roadway and cut any exposed netting even with the sod edge.

Monitor placed sod for growth of pest plants and noxious weeds. If pest plants and/or noxious weeds manifest themselves within 30 days of placement of the sod during the months April through October, within 60 days of placement of the sod during the months of November through March treat affected areas by means acceptable to the Department at no expense to the Department. If pest plants and/or noxious weeds manifest themselves after the time frames described above from date of placement of sod, the Engineer, at his sole option, will determine if treatment is required and whether or not the Contractor will be compensated for such treatment. If compensation is provided, payment will be made as Unforeseeable Work as described in 4-4.

Remove and replace any sod as directed by the Engineer.

570-3.4 Hydroseeding: Use equipment specifically designed for mixing the mulch, seed, fertilizer, tackifier and dye, and applying the slurry uniformly over the areas to be hydroseeded.

Use mulch that does not contain reprocessed wood or paper fibers. Ensure that 50% of the fibers will be retained on a twenty-five mesh screen.

Mix fertilizer as required into the hydroseeding slurry.

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Ensure that the dye does not contain growth or germination inhibiting chemicals.

When polyacrylamide is used as part of hydroseeding mix, only anionic polymer formulation with free acrylamide monomer residual content of less than 0.05% is allowed. Cationic polyacrylamide shall not be used in any concentration. Do not spray polyacrylamide containing mixtures onto pavement. These may include tackifiers, flocculants or moisture-holding compounds.

570-3.5 Bonded Fiber Matrix (BFM): Meet the minimum physical and performance criteria of this Specification for use of BFM in hydroseeding operations or temporary non-vegetative erosion and sediment control methods.

Provide evidence of product performance testing, manufacturer's certification of training and material samples to the Engineer at least seven calendar days prior to installation.

Provide documentation to the Engineer of manufacturer's testing at an independent laboratory, demonstrating superior performance of BFM as measured by reduced water runoff, reduced soil loss and faster seed germination in comparison to erosion control blankets.

Use only BFMs that contain all components pre-packaged by the manufacturer to assure material performance. Deliver materials in UV and weather resistant factory labeled packaging. Store and handle products in strict compliance with the manufacturer's directions.

When polyacrylamide is used as part of hydroseeding mix, only anionic polymer formulation with free acrylamide monomer residual content of less than 0.05% is allowed. Cationic polyacrylamide shall not be used in any concentration. Do not spray polyacrylamide containing mixtures onto pavement. These may include tackifiers, flocculants or moisture-holding compounds.

Meet the following requirements after application of the formed matrix:

Ensure that the tackifier does not dissolve or disperse upon re-wetting.

Ensure that the matrix has no gaps between the product and the soil and that it provides 100% coverage of all disturbed soil areas after application.

Ensure that the matrix has no germination or growth inhibiting properties and does not form a water-repelling crust.

Ensure that the matrix is comprised of materials which are 100% biodegradable and 100% beneficial to plant growth.

Mix and apply the BFM in strict compliance with the manufacturer's recommendations.

Apply the BFM to geotechnically stable slopes at the manufacturer's recommended rates.

Degradation of BFM will occur naturally as a result of chemical and biological hydrolysis, UV exposure and temperature fluctuations. Re-application, as determined by the Engineer, will be required if BFM-treated soils are disturbed or water quality or turbidity tests show the need for an additional application. The work and materials for re-application, will be paid for as Unforeseeable Work.

570-3.6 Watering: Water all turf areas as necessary to produce a healthy and vigorous stand of turf. Ensure that the water used for turf irrigation meets the requirements of Section 983.

570-3.7 Fertilizing: Fertilize as necessary based on soil testing performed in accordance with Section 162. Refer to Section 982 for fertilizer rates.

For bid purposes, base estimated quantities on an initial application of 265 lbs/acre and one subsequent application of 135 lbs/acre of 16-0-8.

570-4 Turf Establishment.

Perform all work necessary, including watering and fertilizing, to sustain an established turf until final acceptance, at no additional expense to the Department. Provide the filling, leveling, and repairing of any washed or eroded areas, as may be necessary.

Established turf is defined as follows:

Established root system (leaf blades break before seedlings or sod can be pulled from the soil by hand).

No bare spots larger than one square foot.

No continuous streaks running perpendicular to the face of the slope.

No bare areas comprising more than 1% of any given 1,000 square foot area.

No deformation of the turf areas caused by mowing or other Contractor equipment.

Monitor turf areas and remove all competing vegetation, pest plants, and noxious weeds (as listed by the Florida Exotic Pest Plant Council, Category I "List of Invasive Species", Current

Edition, www.fleppc.org). Remove such vegetation regularly by manual, mechanical, or chemical control means, as necessary. When selecting herbicides, pay particular attention to ensure use of chemicals that will not harm desired turf or wildflower species. Use herbicides in accordance with 7-1.7.

If at the time that all other work on the project is completed, but all turf areas have not met the requirements for established turf set forth in 570-4, continuously maintain all turf areas until the requirements for established turf set forth in 570-4 have been met.

During the entire establishment period and until turf is established in accordance with this specification, continue inspection and maintenance of erosion and sedimentation control items in accordance with Section 104. Take responsibility for the proper removal and disposal of all erosion and sedimentation control items after turf has been established.

Notify the Engineer, with a minimum of seven calendar days advance notice, to conduct inspections of the turf at approximate 90-day intervals during the establishment period to determine establishment. Results of such inspections will be made available to the Contractor within seven calendar days of the date of inspection. Determination of an established turf will be based on the entire project and not in sections.

Upon the determination by the Engineer that the requirements of 570-4 have been met and an established turf has been achieved and all erosion and sedimentation control items have been removed, the Engineer will release the Contractor from any further responsibility provided for in this Specification.

The Contractor's establishment obligations of this specification will not apply to deficiencies due to the following factors, if found by the Engineer to be beyond the control of the Contractor, his Subcontractors, Vendors or Suppliers:

a. Determination that the deficiency was due to the failure of other features of the Contract.

b. Determination that the deficiency was the responsibility of a third party performing work not included in the Contract or its actions.

The Department will only pay for replanting as necessary due to factors determined by the Department to be beyond the control of the Contractor.

570-5 Responsible Party.

For the purposes of this Specification, the Contractor shall be the responsible party throughout construction and establishment periods.

Upon final acceptance of the Contract in accordance with 5-11, the Contractor's responsibility for maintenance of all the work or facilities within the project limits of the Contract will terminate in accordance with 5-11; with the sole exception that the facilities damaged due to lack of established turf and the obligations set forth in this Specification-for Performance Turf shall continue thereafter to be responsibility of the Contractor as otherwise provided in this Section.

570-6 Disputes Resolution.

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.

570-7 Failure to Perform.

Should the Contractor fail to timely submit any dispute to the Statewide Disputes Review Board, refuse to submit any dispute to the Statewide Disputes Review Board, fail to provide an established turf in accordance with 570-4 within one-year of final acceptance of the Contract in accordance with 5-11, or fail to compensate the Department for any remedial work performed by the Department in establishing a turf and other remedial work associated with lack of an established turf, including but not limited to, repair of shoulder or other areas due to erosion and removal of sediments deposited in roadside ditches and streams, as determined by the Statewide Disputes Review Board to be the Contractor's responsibility, the Department shall suspend, revoke or deny the Contractor's certificate of qualification under the terms of Section 337.16(d)(2), Florida Statutes, until the Contractor provides an established turf or makes full and complete payment for the remedial work performed by the Department. In no case shall the period of suspension, revocation, or denial of the Contractor's certificate of qualification be less than six (6) months. Should the Contractor choose to challenge the Department's notification of intent for suspension, revocation or denial of qualification and the Department's action is upheld, the Contractor shall have its qualification suspended for a minimum of six (6) months or until the remedial action is satisfactorily performed, whichever is longer.

570-8 Method of Measurement.

The quantities to be paid for will be plan quantity in square yards based on the area shown in the plans, completed and accepted.

570-9 Basis of Payment.

Prices and payments will be full compensation for all work and materials specified in this Section.

Payment will be made under:

Item No. 570- 1- Performance Turf - per square yard.

580 LANDSCAPE INSTALLATION – PLANT ESTABLISHMENT PERIOD AND CONTRACTOR'S WARRANTY.

(REV 8-9-10) (FA 10-8-10) (7-11)

ARTICLE 580-5 (Page 725-726) is deleted and the following substituted:

580-5 Plant Establishment Period and Contractor's Warranty:

Take responsibility for the proper maintenance, survival and condition of all plants for a period of one year after final acceptance in accordance with 5-11. Notify the Engineer upon completion of installation of all plants.

Mowing as part of the landscape work will be identified in the Contract Documents. Continue any mowing of the landscape areas specified in the Contract Documents throughout the establishment period.

As a condition precedent to final acceptance in accordance with 5-11, provide a Warranty/Maintenance Bond to the Department in the amount of the total sums bid for all landscape items as evidence of warranty during this plant establishment period. The cost of the bond will not be paid separately, but will be included in the costs of other bid items.

In addition to satisfying the provisions of Section 287.0935, Florida Statutes, the bonding company is required to have an A.M. Best rating of "A" or better. If the bonding company drops below the "A" rating during the Warranty/Maintenance Bond period, provide a new Warranty/Maintenance Bond for the balance of the establishment period from a bonding company with an "A" or better rating. In such event, all costs of the premium for the new Warranty/Maintenance Bond will be at the Contractor's expense.

The Engineer may conduct interim inspections of all landscape items during the plant establishment period, as well as at the end of the plant establishment period. As part of the warranty to the Department, and at no cost to the Department, replace all plants found not to meet minimum specifications as shown in 580-2.1.1 and 580-3.5 within ten days after each inspection.

Prior to the end of the establishment period and after plant establishment has been verified, remove all staking and guying from the project.

At the end of the establishment period, the Engineer will release the Contractor from further warranty work and responsibility provided all plants are established and all previous warranty and remedial work, if any, has been completed to the satisfaction of the Engineer.

603 GENERAL REQUIREMENTS FOR THE INSTALLATION AND EVALUATION OF TRAFFIC CONTROL SIGNALS AND DEVICES.

(REV 6-16-11) (FA 8-5-11) (1-12)

SECTION 603 (Pages 727 – 730) is deleted and the following substituted:

SECTION 603
GENERAL REQUIREMENTS FOR THE INSTALLATION AND EVALUATION OF TRAFFIC CONTROL SIGNALS AND DEVICES

603-1 Description.

The provisions contained in this Section include general requirements for all traffic control signals and devices.

603-2 Equipment and Materials.

603-2.1 General: Except as provided in 603-2.2, only use traffic control signals and devices meeting the requirements of the Minimum Specifications for Traffic Control Signals and Devices (MSTCSD), the Contact Documents, and listed on the Department's Approved Product List (APL).

Only use new equipment and materials, except as specified in the Contract Documents.

603-2.2 Exceptions: The Department may grant exceptions to the requirements of 603-2.1 by Temporary Permit to evaluate new technology or for other circumstances that are found to be in the public interest.

603-2.3 Uniformity: Only use compatible units of any one item of equipment, such as signal heads, detectors, controllers, cabinets, poles, signal system or interconnection equipment, etc.

603-2.4 Hardware and Fittings: Ensure that all bolts and nuts less than 5/8 inch in diameter are passivated stainless steel, Type 316 or Type 304 and meet the requirements of ASTM F 593 and ASTM F 594 for corrosion resistance.

Ensure that all bolts and nuts 5/8 inch and over in diameter are galvanized and meet the requirements of ASTM A 307.

Use high-strength steel anchor bolts and U-bolts, having a minimum yield strength of 55,000 psi and a minimum ultimate strength of 90,000 psi.

603-2.5 Galvanizing: Meet the requirements of Section 962 when galvanizing for fittings and appurtenances for all structural steel (including steel poles).

603-3 Definitions.

Traffic Control Signals and Devices: Any signal or device, manually, electrically or mechanically operated by which traffic is alternately directed to stop and permitted to proceed or controlled in any manner. Traffic Control Signals and Devices regulate, warn, or guide traffic on, over or adjacent to a street, highway, pedestrian facility, or bikeway by authority of a public agency having jurisdiction. Traffic Control Signals and Devices include, but are not limited to, controller assemblies (controller cabinets and their contents); signal heads including their hanging or mounting devices; vehicle detection systems (loops, sealant, amplifier, lead-in wire, or cable); pedestrian detection systems (push button, push button housing, lead-in wires, and signal); Motorist Information Systems, Video Equipment, Network Devices, Dynamic Message Signs, Highway Advisory Radios, Cameras, Vehicle Detection Systems, and other equipment used within a traffic control system.

Minimum Specifications for Traffic Control Signals and Devices: The minimum specifications used for the evaluation, certification, and approval of official traffic control signals and devices and ancillary devices for use on the streets and highways of Florida. The specifications are available on the Traffic Engineering and Operations web site.

Approved Product List (APL): A listing of approved traffic control signals and devices, and ancillary devices or system equipment that the Department has reviewed for compliance to specifications and authorized for use on the streets and highways of Florida. The APL is available on the Traffic Engineering and Operations web site.

Temporary Permit: A permit issued by the Traffic Engineering and Operations Office to a public or private entity for the purpose of evaluating the operational effectiveness and safety of a device for a specified time period at specific locations. This permit is issued only when the limited use of the device is in the best interest of the public.

603-4 Systems Approval Requirement.

The Engineer will review and approve any system design plan of traffic control signals and devices, that is controlled and/or operated from a remote location by computers or similar devices, and which affects the movement of traffic on any portion of the State Highway System, prior to installation. Within such system, only use traffic control signals and devices that meet all certification or approval requirements contained herein.

603-5 Device Approval Process.

The Department's Approved Product List certification and approval process is described in the FDOT Traffic Engineering Manual, Section 7.1

603-6 Marking of Approved Equipment.

Ensure that traffic control signals and devices are marked in accordance with Section A601 of the MSTCSD.

603-7 Submittal Data Requirements.

Prior to the installation of equipment and within 30 days after the preconstruction conference, submit a completed listing of all traffic control signals, devices, or hardware with FDOT APL approval number(s) to the Engineer for approval on the form provided by the Department. For non-structural equipment or materials that do not have a FDOT APL approval number, submit one copy of the manufacturer's descriptive literature and technical data fully describing the equipment to the Engineer for approval.

Develop shop drawings for all structural support materials and other special designs, such as non-electrical, non-mechanical, or other fabricated items, which may not be specifically detailed in the plans. Have the Specialty Engineer approve all shop drawings. Do not submit shop drawings for those items that have been previously evaluated and approved. Meet the requirements of 5-1.4 for shop drawings. Send two copies of the shop drawings signed and sealed by the Specialty Engineer to the Engineer.

Provide a complete operable signal installation as specified in the Contract regardless of any failure of the Department to discover or note any unsatisfactory material. Meet the requirements of Section 608.

603-8 Documentation for Electronic Equipment.

Prior to final acceptance, furnish the Engineer with two copies of the following documentary items obtained from the manufacturer for the electronic equipment listed below:

1. Operation Manual
2. Troubleshooting and Service Manual
3. Assembly and Installation Instructions
4. Pictorial layout of components and schematics for circuit boards
5. Parts list, including the location
6. Diagram of the field installation wiring (not applicable to the detectors)
7. Warranty information

Furnish documentary items for the following equipment:

1. Controllers
2. Vehicle detectors
3. Load switches
4. Flasher units
5. Preemption units
6. Conflict monitors
7. Special sequence relays
8. Cameras
9. Dynamic Message Signs
10. Highway Advisory Radios
11. Road Weather Information Systems

12. Any other equipment which has a logic, timing, or communications function
13. Other equipment specified in the Contract Documents

603-9 Department-Furnished Equipment Installed By Contractor.

Where the Contract includes installation of Department-furnished equipment, the Department will turn over such equipment to the Contractor when the construction progress allows or as designated in the Contract Documents. The Department will test and certify the equipment to be in proper condition and ready to use and will bear the costs of correcting any defects in the equipment prior to pick-up by the Contractor. The Engineer will coordinate the pick-up and installation of the equipment. Maintain the equipment in proper operational condition after pick-up at no cost to the Department, until either final acceptance or the equipment is returned to the Department.

608 GUARANTIES FOR TRAFFIC CONTROL SIGNALS AND DEVICES. (REV 1-20-10) (FA 1-28-10) (7-10)

SECTION 608 (Page 730) is deleted and the following substituted:

SECTION 608
GUARANTIES FOR TRAFFIC CONTROL SIGNALS AND DEVICES

608-1 Description.

This Section sets forth guaranty requirements for traffic control signals and devices furnished to the Department. The Department will consider manufacturer and Contractor costs associated with providing and delivering equipment guaranties, requirements, terms, and conditions incidental to the payment for equipment or construction feature utilizing the equipment.

608-2 Guaranty Provisions.

608-2.1 Contractor's Responsibility: Secure all guaranties that are customarily issued by the equipment manufacturer for the specific equipment included in the Contract. Ensure that all manufacturers' warranties are fully transferable to the Department and meet or exceed the Department's minimum warranty requirements for the equipment. The Contractor shall ensure that the form in which such guaranties are delivered to the Contractor includes the provision that they are subject to transfer to the maintaining agency as named by the Department, and is accompanied by proper validation of such fact. Transfer guaranties at final acceptance of the work (or equipment) by the Department.

608-2.2 Terms: Ensure that the terms of guaranties are stipulated by the manufacturer when submitting a request to the Department for certification and equipment submittals 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.

608-2.3 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 maintaining agency and 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.

611 ACCEPTANCE PROCEDURES FOR TRAFFIC CONTROL SIGNALS AND DEVICES.

(REV 5-12-11) (FA 8-5-11) (1-12)

SECTION 611 (Pages731 – 736) is deleted and the following substituted:

SECTION 611
ACCEPTANCE PROCEDURES FOR TRAFFIC CONTROL SIGNALS AND DEVICES

611-1 Description.

This Section sets forth Contract acceptance procedures for installations of traffic control signals and devices and for equipment purchase contracts.

611-2 Acceptance of Traffic Control Signal and Device Installations.

611-2.1 Partial Acceptance: The Engineer may make inspection for partial acceptance under the Contract in accordance with 5-10 of a complete traffic control signal and device installation upon its completion in accordance with the Contract Documents and at such time that other parts of the total Contract are at a stage of completion that either require or allow the installation to operate in a manner which is in accordance with the Contract Documents. Before inspection for partial acceptance, the Engineer will require the satisfactory completion of all field tests of completed installations in accordance with the requirements of 611-4. The Engineer will make inspection for partial acceptance in accordance with 5-10 in company with a Contractor's representative and, when applicable, a representative of the agency designated to accept maintenance responsibility.

611-2.2 Final Acceptance: The Engineer will make inspection for final acceptance of traffic control signal and device installations as part of all work under the Contract in accordance with 5-11, only after satisfactory completion of all field tests of completed installations in accordance with the requirements of 611-4 and on the basis of a comprehensive final field inspection of all equipment installations. Submit three copies of Form 750-010-02, Submittal Data – Traffic Control Equipment, to the Engineer. The Engineer will make the final inspection with a Contractor's representative and, when applicable, a representative of the agency designated to accept maintenance responsibility. Transfer warranties and guarantees on equipment to the Department in accordance with Section 608. For traffic signal installations, submit three completed copies of form 700-010-22, Final Acceptance of Traffic Signal Installation(s) and Transfer of Maintenance, to the Engineer.

611-2.3 As-Built Drawings: As a condition precedent to acceptance under 611-2.1 or 611-2.2, furnish as-built drawings of all installations in accordance with the following requirements:

611-2.3.1 Submittal Requirements: Submit three sets of as-built plans for

review by the Engineer on reproductions of the original 11 by 17 inch sheets. Record all as-built information using block lettering or typed text to ensure legibility. Signing and pavement marking plan sheets may be used instead of signalization plan sheets, if a substantial number of changes from the original plans must be recorded. ITS as-built plans must include an accurate table (spreadsheet) that provides the true final location of devices by mile post to three decimal places, plus an offset dimension given for each above-ground structure. Global positioning system (GPS) coordinates can be utilized as supplemental information in the table. Aerial photographs may be furnished with the table to provide supplementary information. The aerials should not include the extra features of the ROW, baseline, or roadway edges being drawn in. The aerials may be used as a base for the as-built plans with mile post and offset dimensions. If, in the opinion of the Engineer, the changes can not be clearly delineated on reproductions of the original 11 by 17 inch sheets, clearly delineate all changes on 11 by 17 inch detail sheets, enlarged 200% from the reproductions. Make any corrections resulting from the Engineer's review, and resubmit three sets of the completed as-built plans as a condition precedent to acceptance of the installation.

611-2.3.2 Components: Include as-built information for all components of the installation. As a minimum, identify the following components in the format indicated below.

611-2.3.2.1 Conduit and Cable: Identify all conduit and cable with unique linestyles for routing (overhead, conduit, saw cut, etc.) that are clearly identified in a legend on each sheet. Identify the type of cable (i.e., 7 conductor signal cable) and label the number of conductors, fiber strands or other identifying features of the cable. For conduit, clearly note conduit size and number of runs.

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

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

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

611-2.3.2.5 Signal Heads: Locate all signal heads with respect to the pavement markings. Each signal head shall be identified by its corresponding movement number.

611-2.3.2.6 Cabinet: Clearly locate all cabinets. The type of cabinets and inventory of internal components must be documented. Controller manufacturer along with the controller model number shall be provided for all traffic signal cabinets. A cabinet corner "blow up" shall be provided detailing pull box locations with all conduit and cable per 611-2.3.2.1 and 611-2.3.2.3.

611-2.3.2.7 Preemption: Clearly locate all preemption equipment. The type of preemption equipment and the manufacturer along with the model number shall be provided. Additionally, the type of communication medium (i.e. closed loop) shall be identified. Any underground conduit and cable as well as pull boxes shall be per 611-2.3.2.1 and 611-2.3.2.3.

611-2.3.3 Compensation: All costs involved with providing as-built drawings are incidental to the other items of work associated with traffic control signals and devices.

611-2.4 Installation Inspection Requirements: Meet the requirements of Section 105.

611-3 Signal Timing.

Set the timing of a traffic signal or system of traffic control devices in accordance with the Contract Documents, unless approved otherwise in writing by the Engineer.

611-4 Field Tests of Installations.

Perform the following tests in the presence of the Engineer and, when applicable, a representative of the agency designated to accept maintenance responsibility.

Continuity: Test each signal head circuit, pedestrian detector circuit, vehicle detector loop circuit, and interconnect signal circuit for continuity.

Functional: Perform a functional test that demonstrates that each and every part of the installation functions as specified.

Induced Voltage on traffic signal connections: Measure the voltage between each signal head indication field terminal and the AC neutral circuit in the controller cabinet during the off (dark) state of each signal head indication. Ensure that the voltage does not exceed 2 $V_{AC, RMS}$. If this value is exceeded, take the following action to reduce the value to 2 $V_{AC, RMS}$:

(1) Check for loose or broken connections in the signal head circuit from the controller cabinet to the signal heads.

(2) If (1) above does not correct the problem, connect additional neutral circuits between the signal head and the controller cabinet.

Inductive Loop Assembly: An inductive loop assembly is defined as a loop plus the lead-in cable. Measure and record the series resistance of each inductive loop assembly. Ensure that the resistance does not exceed 10 Ω. Perform an insulation resistance megger test, at 500 V_{DC}, for each inductive loop assembly at the cabinet in which the inductive loop assembly is terminated. Do not connect the inductive loop assembly to the cabinet terminal strips during the test, except for the drain wire of a shielded lead-in cable. Insulation resistance is defined as the resistance between one wire of the lead-in cable and a ground rod or bussbar. Record the insulation resistance of each inductive loop assembly. Ensure that the resistance is equal to or greater than 100 MΩ.

Perform the 48 hour test only after achieving acceptable results from the other tests listed in 611-4.

Forty-Eight Hour Test for Traffic Signal installations:

(a) Before beginning the 48 hour test, place all new signal installations (no existing signals) in flash for 48 to 336 hours. The length of the flash period will be determined by the Engineer.

(b) Continuously operate each new or modified traffic signal installation or system for not less than 48 hours. If unsatisfactory performance of the system develops, correct the condition, and repeat the test until obtaining 48 hours of satisfactory continuous operation.

(c) During the 48 hour test period, the Contractor is fully responsible for the signal or signal systems. Provide a responsible representative (technically qualified) who can monitor signal operation and troubleshoot any malfunctions within a one hour period.

When coordination is specified in the Contract Documents, provide a two hour training session on the operation and programming of the coordination features of the controller units during the 48 hour test. Arrange the time and place of the training session with the Engineer.

(d) Perform a 48 hour test for flashing beacon installations in the same manner as for traffic signal installations.

(e) Start the 48 hour test on a Monday, Tuesday, or Wednesday. Ensure the 48 hour test does not include weekends, Holidays, or Special Events.

(f) Start the 48 hour test between 9:00 AM and 2:00 PM.

(g) Before the 48 hour test, install and have standing by all equipment specified in the Contract Documents.

611-5 Contractor's Warranty Period for Installations.

611-5.1 General Requirements: After satisfactory completion of all field tests in accordance with 611-4, repair or replace any defective components or work of the installations for a 90 day period after final acceptance in accordance with 5-11.

611-5.2 Contractor's Responsibilities: During the warranty period, the Contractor is responsible for the following:

(a) Repair or replacement of equipment that fails to function properly due to defective materials or workmanship.

(b) Upon notification by the Engineer of a malfunction, restore the equipment to proper operating condition within 12 hours after notification by the Engineer.

If the Contractor fails to restore the equipment to proper operating condition within 12 hours after notification, the Engineer has the authority to have the remedial work performed by other forces. The Contractor is responsible for all incurred costs of the work performed by other forces. Remedial work performed by other forces does not alter any of the requirements, responsibilities or obligations of this warranty.

(c) In the event that the equipment does not function or malfunctions due to defective materials or workmanship, the Contractor is liable for any impairment to the safety of pedestrian and vehicular traffic resulting from such malfunction.

611-5.3 Department's Responsibilities: During the warranty period, the Department is responsible for the following:

(a) Electrical energy costs which are paid for by the local maintaining agency.

(b) All adjustments, such as timing, necessary for the normal operations of equipment.

(c) Documentation of the individuals involved and the time of Contractor notification upon failure or malfunction of equipment.

(d) Repair or replacement of any part of the installation damaged as a result of natural causes or those resulting from vehicular or pedestrian traffic not associated with Contractor activities.

611-6 Manufacturer's Tests and Certifications.

For materials which may not require formal testing, the Engineer reserves the right to require certifications from the manufacturer of such equipment and material, to the effect that they meet all Specification requirements, and, in the event of questionable equipment or material, to require that such material or equipment be tested at no expense to the Department.

The Engineer reserves the right to withhold any payments which may be due; if the Engineer determines that the equipment does not meet the Specifications or evaluation criteria.

611-7 Contracts for Purchase of Equipment.

611-7.1 Acceptance Tests Required: For each unit of equipment furnished under purchase contracts (furnish only), the Engineer will perform the following tests:

(a) Visual inspection within five days after delivery.

(b) Operational tests which determine whether the equipment performs in accordance with the requirements of the Contract Documents. The Engineer will complete such tests within 15 days after delivery. If the equipment is listed on the Department's Approved Product List (APL), the Engineer may verify the APL Certification number in lieu of the operational tests.

611-7.2 Eligibility for Payment:

The Department will base payment for equipment furnished under purchase contracts on satisfactory completion of the visual inspection and operational tests required by 611-7.1.

Before any payment will be made for each functional group, deliver to the Engineer and receive from the Engineer acceptance of all units of each functional group of equipment required to be furnished by the Contract Documents. The Department will make separate payment for a staged delivery of each functional group of equipment only when staged delivery is specified in the Contract Documents.

611-7.3 Equipment Failing to Pass Acceptance Tests:

When any unit of equipment fails to pass the acceptance tests, correct the deficiencies (by repair or replacement), at no expense (including all freight costs) to the Department, to attain compliance. If the original Contract Time has expired, the Department will charge and continue to assess liquidated damages in accordance with 8-10 until final acceptance of the equipment. Upon compliance with such correction requirements, the Engineer will perform tests on the equipment as specified above and will determine their eligibility for payment.

The Department will not assess liquidated damages during the acceptance test period in 611-7.1. The Department will allow only one acceptance test exclusion with regard to liquidated damages assessment per lot of units required to be delivered.

630 CONDUIT – FIBER OPTIC CABLE LOCATE WIRE.
(REV 11-22-10) (FA 1-6-11) (7-11)

SUBARTICLE 630-3.1.2 (Pages 739 - 740) is deleted and the following substituted:

630-3.1.2 Fiber Optic Cable Locate Wire: Install locate wire in the trench or bore with all underground conduits to provide end-to-end electrical continuity for electronically locating the underground conduit system.

For direct burial conduit or trench, bury locate wire along the centerline of the top outer surface of installed conduit. Install the locate wire no more than 3 inches above the conduit.

For bored conduit, place locate wire within its own inner duct or use conduit with integral locate wire.

Ensure that the locate wire enters all pull boxes and splice boxes, and that a minimum of 10 feet of slack locate wire is coiled and neatly stored in each box. Drill a hole in

the pull box or splice box for wire entry. Fill any gaps between the locate wire and the hole it passes through with non-shrink grout or a similar sealant suitable for the application and approved by the Engineer.

Do not run locate wires into field cabinets. Terminate locate wires at the first and last pull boxes in the conduit run. Ensure that wire termination occurs only at the top of a pull box. Perform continuity tests and insulation resistance tests on all locate wires. Provide the Engineer with all test results. Replace or repair defective locate wire at no additional cost.

Make locate wire splices in a flush grade-level box. Ensure that locate wire splices are waterproof and suitable for direct burial. Ensure that locate wire splices at the pull box meet NEC requirements. Ensure that locate wire splices include a mechanical crimp connection with a butt sleeve, an oxide-preventing aerosol lacquer, mastic electrical splicing tape, and standard electrical tape using methods and materials approved by the Engineer. At the completion of the installation, provide the Engineer with as-built drawings that document all splice locations.

634 SPAN WIRE ASSEMBLY.
(REV 11-4-10) (FA 1-3-11) (7-11)

SUBARTICLE 634-2.3 (Page 746) is deleted and the following substituted:

634-2.3 Hardware and Fittings: For Utility or Siemens-Martin Grade wires, use the connection hardware as specified herein. For installations that use other grades of wire, provide the hardware and fittings indicated on the plans. Provide only hardware and fittings made of galvanized steel or non-corrosive metal unless the fiberglass insulators specified in 634-2.4 are also required. Provide hardware and fittings of sufficient strength to resist the breaking strength of the wire with which they are used, with the exception of "S" hooks on tether wires.

Use an alloy steel eyebolt (ASTM F 541, Type 2) and a matching heavy hex nut (ASTM A 563, Grade C or D), both zinc coated in accordance with ASTM A 153, Class C, to connect the automatic compression dead-end clamp of the catenary wire or messenger wire to the wood or concrete strain poles. Sizes of eyebolts, supplied with nuts and washers, are as following: Use a 3/4 inch diameter bolt for maximum of one 7/16 inch diameter catenary (or messenger) wire, or maximum of two 3/8 inch diameter catenary (or messenger) wires. Use a 1 inch diameter bolt for maximum of one 1/2 inch diameter catenary (or messenger) wire, or maximum of two 7/16 inch diameter catenary (or messenger) wires. Use 1-1/4 inch diameter bolt for maximum of two 1/2 inch diameter catenary (or messenger) wires. For two point attachments, connect the messenger wire at the lower attachment location. Do not use thimbleye bolts for these connections.

Only use thimbleye and eye bolts, 3/4 inch in diameter, minimum, to connect the automatic compression dead-end clamps of tether wires to wood or concrete strain poles.

Only use stainless steel (Grade 316) "S" hooks with a material gauge of 11/32 inch, when connecting the tether wire to all poles.

Ensure that other hardware and fittings, as required for the attachment of a span wire assembly to support poles or structures, are in accordance with the details shown in the Design Standards.

SUBARTICLE 634-3.3 (Pages 747 – 748) is deleted and the following substituted:

634-3.3 General Requirements:

(a) Provide a span wire assembly with catenary, messenger and tether wires of one continuous length of wire cable with no splices except when an insulator is required by 634-2.4. Connect the insulator, if required, to the cable with automatic compression dead-end clamps.

(b) Attach the span wire assemblies to the support poles or structures by means of automatic compression clamps and accessory hardware.

(c) Assemble the washer and nut on the oval eye bolt with the flat washer next to the pole. Tighten the nut sufficiently to prevent the oval eye bolt from rotating.

(d) For two point attachments, install the messenger wire with the following tensions per 100 feet. Linearly prorate cable tensions for other lengths from these values:

Cable Size Inch	Wire Tension Lbs.
3/8	340.0
7/16	500.0
1/2	645.0

(e) The catenary wire shall be tensioned to provide a 5% plus or minus 0.5% sag for two point span wire attachments. The catenary wire shall be tensioned to provide a 3% plus or minus 0.5% sag for single point span wire attachments.

(f) Install the span wire assemblies in accordance with the Design Standards, Index No. 17727, and at a height on the support poles which will provide a clearance from the roadway to the bottom of the signal head assemblies as shown in Index 17727.

(g) Connect all span wires to the pole grounding system in accordance with Section 620.

(h) Obtain and meet all provisions of the National Electric Safety Code (ANSI-C2) regarding clearance from electric lines, contacting of utility owners, and safety requirements prior to span wire installation.

(i) Prior to installation of the two point attachment span wire assembly, submit the method of providing the required tension in the messenger wire to the Engineer for approval.

635 PULL AND JUNCTION BOXES.
(REV 7-28-10) (FA 8-3-10) (1-11)

ARTICLE 635-3 (Page 749) is deleted and the following substituted:

635-3 Pull Boxes Installation.

Install pull boxes in accordance with the Design Standards, Index No. 17700. Ensure that the pull box cover is flush with the finished grade or sidewalk. Do not install pull boxes in roadways, driveways, parking areas, ditches or public sidewalk curb ramps.

649 GALVANIZED STEEL STRAIN POLES, MAST ARMS AND MONOTUBE ASSEMBLIES – MATERIALS.

(REV 6-8-11) (FA 6-16-11) (1-12)

ARTICLE 649-2 (Pages 754 – 755) is deleted and the following substituted:

649-2 Materials.

Use pole assemblies as shown in the Design Standards when standard mast arm assemblies or standard strain pole assemblies are required by the Contract Documents. Obtain strain poles, mast arm, and monotube assemblies from a fabrication facility that is listed on the Department's list of metal producers with accepted quality control program, meeting the requirements of 105-3.

Provide shop drawings and signed and sealed calculations, as needed, in accordance with Section 5 for configurations shown in the plans.

Use coating products meeting the requirements of Section 975.

Use grouts meeting the requirements of Section 934 listed on the QPL.

Use water meeting the requirements of Section 923.

Use membrane curing compounds meeting the requirements of Section 925.

SUBARTICLE 649-4.3. (Pages 755 and 756) is deleted and the following substituted:

649-4.3 Painting:

649-4.3.1 General: When required by the Contract Documents, provide painted strain poles, mast arms and monotube assemblies. Provide products from a fabricator on the Department's list of Prequalified Fabricators of Painted Galvanized Steel Strain Poles, Mast Arms and Monotube Assemblies. Provide products that will meet specification requirements throughout the warranty period. Meet the color requirement as specified in the Contract Documents. Provide the Engineer with two metal sample coupons, a minimum of 2 x 4 inches, painted concurrently and with the same paint as was used on the first lot of any strain poles, mast arms and monotube assemblies delivered to the jobsite. Provide sample coupons and manufacturer product data sheets to the Engineer along with the delivery of the first shipment of any painted strain poles, mast arms or monotube assemblies delivered to the jobsite. At the time of their delivery, the sample coupons described in this paragraph shall match the color of the strain poles, mast arms and monotube assemblies to within 1ΔE measured as specified in 975-4. If the delivered sample coupons exhibit a difference in color from the strain poles, mast arms and monotube assemblies greater than 1ΔE then the sample coupons will be considered unacceptable and no payment shall be made for the materials which the sample coupons represent. Those materials shall not be accepted by the Department until acceptable representative sample coupons in accordance with the requirements of this Section have been delivered to the Engineer.

649-4.3.2 Responsible Party Warranty: When the Contract Documents call for painted galvanized steel strain poles, mast arms or monotube assemblies, the Contractor shall designate a Responsible Party to accept responsibility. The Responsible party designated by the Contractor must execute and deliver to the Department a form, provided by the Department, prior to the first delivery to the jobsite of any painted strain poles, mast arms or monotube

assemblies, stipulating that the Responsible Party accepts responsibility for ensuring the coating system adhesion and color retention requirements as specified in 975-4 are met for a period of five years after final acceptance in accordance with 5-11. The Responsible Party shall also bear the continued responsibility for performing all remedial work associated with repairs of any adhesion or color retention failure as defined in Section 975, as to which notice was provided to the Responsible Party within the five year warranty period. Failure to timely designate the Responsible Party will result in the Contractor being the Responsible Party unless otherwise agreed to in writing by the Department. The responsible Party shall be either the Contractor or the Fabricator. When the Responsible Party is the Fabricator, the Responsible Party shall be one of the Fabricators listed on the "Prequalified Fabricators of Painted Galvanized Steel Strain Poles, Mast Arms and Monotube Assemblies." This list may be viewed on the Department's website at the following URL:
www.dot.state.fl.us/construction/ .

Upon final acceptance of the Contract in accordance with 5-11, the Contractor's responsibility to ensure that the coating system adhesion and color retention requirements specified in 975-4 will terminate. The obligations of the Responsible Party set forth in this Section shall start at final acceptance of the Contract in accordance with 5-11 and continue thereafter until expiration of the five year warranty period.

650 VEHICULAR SIGNAL ASSEMBLIES
(REV 2-2-11) (FA 2-7-11) (7-11)

ARTICLE 650-2 (Page 760) is deleted and the following substituted:

650-2 Materials.

Use signal housings, light emitting diode (LED) modules, backplates, and signal auxiliaries currently listed on the Department's Approved Product List (APL). Ensure that all equipment is marked in accordance with Section 603.

SUBARTICLE 650-3.1(Page760) is deleted and the following substituted:

650-3.1 Preassembly: Pre-assemble the signal heads when more than one signal section is required prior to installation at the site. Furnish signal heads with LED modules, backplates, and visors. Use tunnel visors unless otherwise specified in the Contract Documents. Install the LED ball module in the door so that the UP arrow or the word UP or TOP is in the up orientation of the signal housing. Install the LED arrow modules in the signal housing door in the direction of the intended use.

SUBARTICLES 650-3.7 thru 650-3.10 (Page761) are deleted and the following substituted:

650-3.7 Vertically Mounted Polycarbonate (Light-Weight) Signal Head Assemblies:

The top section of all multi- section (5- section, 3- section), vertically mounted, light- weight signal heads must be constructed of die cast aluminum, unless the entire 3- section polycarbonate signal head assembly is specifically approved and listed on the APL as a 12" Polycarbonate 3- Section Vehicle Assembly. Ensure that all sections of multi- section assemblies are from the same manufacturer.

Single section signals may be constructed of die cast aluminum or polycarbonate construction.

650-3.8 Backplates: Install louvered backplates on all signal head assemblies. On posted speed limits of 45 mph or greater, provide backplates with a reflectorized border.

650-3.9 Sealing Installed Signal Head Assembly: Ensure that the installed signal head assembly is sealed to exclude dust and moisture. Drill two 1/4 inch drain holes in the bottom of the installed signal head assembly.

650-3.10 Concealing Signals Not in Use: Where traffic signals are installed and not put into service immediately, conceal the signal head assembly by placing burlap bags or other covering approved by the Engineer over a weather resistant covering of non-transparent material open at the bottom to prevent condensation buildup.

650-3.11 Installation Sequence: Install all traffic signal assemblies at any intersection as a single operation unless a staged operation is approved by the Engineer.

SUBARTICLE 650-4.2 (Page 761) is deleted and the following substituted:

650-4.2 Furnish and Install: The Contract unit price per assembly for Traffic Signal, furnished and installed, will consist of the traffic signal assembly, including all attachment hardware necessary to make a complete unit, all mounting brackets, drop-pipe, disconnect hangers, backplates, visors, LED modules, labor, and materials necessary for a complete and accepted installation.

ARTICLE 650-5 (Page 762) is deleted and the following substituted:

650-5 Basis of Payment.

Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 650- 5- Traffic Signal–per assembly.

690 REMOVAL OF EXISTING TRAFFIC CONTROL SIGNALS AND DEVICES. (REV 6-16-10) (FA 7-26-10) (1-11)

SECTION 690 (Pages 772 – 775) is deleted and the following substituted:

SECTION 690
REMOVAL OF EXISTING TRAFFIC CONTROL SIGNALS AND DEVICES

690-1 Description.

Remove existing traffic control signals and devices including electrical and electronic equipment, supporting hardware and structures, electrical wiring, conduit, and all other elements specified and required to clear the areas of concern for new installations.

When removing existing traffic signals and devices , salvage and protect all equipment and materials designated for removal in the Contract Documents.

690-2 Ownership.

The Department retains ownership of the equipment removed unless otherwise stated in the Contract Documents.

690-3 General Removal Operations.

Remove and salvage all equipment, appurtenances, and materials designated on the plans to remain the property of the Department or other owner.

Where the removals require excavation, backfill, compact, and level the excavated areas (unless to be used as areas for other installations) so as to form a smooth contour, uniform in density with adjacent ground areas.

Where the removal operations require the removal or disturbance of overlying pavement, curb, grass, or sidewalk, remove such pavement and subsequently replace it in kind (or equivalent).

Remove, handle, and transport electronic equipment to be removed with all due care. Correct any damage to such equipment caused by negligence at no expense to the Department regardless of whether the damage occurs before or after removal of the equipment.

When removing all electronic equipment, also remove all attaching devices and all other devices and auxiliaries related to the electronic unit which the Department does not require to remain in place for use with replacing equipment.

Perform all removals in such a manner as to not damage or disturb adjacent property, utilities, or other equipment.

When replacing existing functioning installations with new installations, do not remove the existing installations until the new installations are in place and operating or until temporary traffic control approved by the Engineer is in place.

Notify the proper authorities or the owners of affected adjacent installations at least 24 hours in advance of any removal operations which might endanger or otherwise affect the operations of their facilities.

When the Contract Documents indicate that owners (or others) will remove their own poles, carefully remove and handle all equipment from such poles prior to such removal of the poles.

690-4 Specific Removal Operations.

690-4.1 Removal of Poles: Remove direct burial, strain poles, steel strain poles, mast arm and monotube assemblies and associated foundations as specified in the plans. Obtain the Engineer's approval for the removal process before beginning any removal work. These requirements do not apply to poles used for highway lighting, unless they are jointly used to support traffic control signals and devices, signal mast arm, or span wire assemblies.

Accomplish the removal process of each pole/foundation in such a manner as not to result in a safety hazard to motorists or adjacent property or damage to existing utilities. Ensure that all utilities have been located prior to removal.

When shallow pole removal is specified in the plans, ensure the remaining pole/foundation and any protrusions, such as pole keys, dead men, guying apparatus, conduit, anchor bolts, or reinforcing steel, are removed to a minimum depth of 4 feet below existing grade.

When deep pole removal is specified in the plans completely remove each pole including the foundation and all accessories or attachments, such as pole keys, dead men, guying apparatus, conduit, anchor bolts, and reinforcing steel.

Do not remove or disturb utility poles located within the right-of-way.

690-4.2 Removal of Signal Pedestal: Remove each signal pedestal and associated foundations as specified in the plans. Obtain the Engineer's approval for the removal process before beginning any removal work.

Accomplish the removal process of each pedestal/foundation in such a manner as not to result in a safety hazard to motorists, pedestrians or adjacent property or damage to existing utilities. Ensure that all utilities have been located prior to removal.

Completely remove each pedestal including the foundation and all accessories or attachments, such as pole keys, conduit, anchor bolts, and reinforcing steel.

690-4.3 Removal of Controllers and Cabinets: When removing controller assemblies, also remove the cabinet. For base mounted cabinets, completely remove the concrete base and technician pad.

Prior to removal, conduct an inventory of the cabinet and all cabinet contents, including identification of the model number and serial numbers of each item. Submit the inventory list to the Engineer for retention by the Department and provide a copy of the list to the equipment owner.

690-4.4 Removal of Signal Heads (Vehicular and Pedestrian): Remove all signal head assemblies and attachment hardware in such a manner as to avoid unnecessary damage.

690-4.5 Removal of Detectors (Vehicular and Pedestrian): Divide the removal of detector assemblies into the following categories:

(a) Vehicular Detector Assemblies: When the removal of vehicular detector assemblies is specified in the Contract Documents, remove the amplifier from the controller cabinet, the loop, and the lead-in wiring that is in the conduit and pull boxes.

When removing pressure type vehicular detector assemblies, remove the amplifier and the detector pad and its framework from the roadway pavement. After removing such detector assemblies, repair the roadway areas by backfilling and tamping with an approved asphalt concrete mix or concrete pavement mix so as to restore the roadway to the satisfaction of the Engineer.

When removing non-intrusive detectors that are not embedded in or under pavement, remove the roadside detector assembly, cabling, mounting hardware, and detector electronics in cabinet.

(b) Pedestrian Detector Assemblies: Include in the removal of pedestrian detector assemblies the removal of the push button detector, sign, and all mounting hardware, including the supporting post and foundation.

690-4.6 Removal of Mast Arms and Span Wires: Disconnect the mast arms and span wires carefully at the pole, and salvage all usable hardware and attachment devices as determined by the Engineer. Remove all devices supported by the mast arm or span wire (including wiring) prior to the removal of the mast arm or span wire.

For integrally installed mast arms and mast arm poles, remove the pole and mast arm combination as a unit after removing the devices supported by the mast arms.

690-4.7 Removal of Cabling and Conduit: After removing the conductor cable and conduit, carefully stub, or protect with other appropriate procedures, the remaining conductor cable and conduit at the point of removal.

If the removal of any cables and conduit requires excavation, restore disturbed areas compatible with adjacent ground areas.

690-5 Transporting and Storing Removed Equipment.

When the Contract Documents specify special handling, deliver equipment and materials that are not stipulated to be reused in the new installations to the location(s) designated in the Contract. When the Contract Documents note no special handling, stockpile or dispose of the removed materials as approved by the Engineer. The Engineer will determine ownership of removed equipment and will approve of the removal of any salvaged equipment from the project in advance.

Provide disposal areas, and dispose of removed concrete strain poles in such areas.

690-6 Method of Measurement.

690-6.1 General: The quantities to be paid for will be measured in accordance with the different work tasks required in this Section. The Contract unit price for each different work task as specified in the Contract Documents will include all labor and equipment required to remove the specified items specified by the Pay Item Numbers.

690-6.2 Remove Poles:

690-6.2.1 Pole Removal Shallow: The quantity to be paid for will be the removal of each pole including the foundation and all accessories or attachments to a depth not less than 4 feet below existing grade.

690-6.2.2 Pole Removal Deep: The quantity to be paid for will be the complete removal of the pole and foundation including all accessories or attachments.

690-6.3 Remove Signal Pedestal: The quantity to be paid for will be the complete removal of each pedestal including the foundation and all accessories or attachments.

690-7 Basis of Payment.

Prices and payments will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 690- 10-	Remove Traffic Signal Head Assembly - each.
Item No. 690- 20-	Remove Pedestrian Signal Assembly - each.
Item No. 690- 31-	Remove Signal Pedestal - each.

Item No. 690- 32-	Pole Removal Shallow - each.
Item No. 690- 34-	Pole Removal Deep - each.
Item No. 690- 50-	Remove Controller or Cabinet - each.
Item No. 690- 60-	Remove Vehicular Detector Assembly - each.
Item No. 690- 70-	Remove Pedestrian Detector Assembly - each.
Item No. 690- 80-	Remove Span Wire Assembly - each.
Item No. 690- 90-	Remove Cabling and Conduit - per intersection or interchange.
Item No. 690-100-	Remove Miscellaneous Traffic Control Signals and Devices - per site.

699 INTERNALLY ILLUMINATED SIGNS.
(REV 11-15-10) (FA 1-4-11) (7-11)

ARTICLE 699-3 (Page 776) is deleted and the following substituted:

699-3 Submittal Requirements.

699-3.1 General: Free-swinging, internally illuminated signs and clamp-on cantilever arms mounted on the upright poles of mast arm assemblies or monotube signal structures may be accepted either by certification or by shop drawing submittal and approval as stipulated in this Section.

699-3.2 Acceptance of signs by Certification: Meet all of the following requirements:

1. Article 699-2,
2. Are not more than 18.0 sq. ft. in area, and
3. Weigh no more than 8 lbs. per sq. ft.

699-3.3 Acceptance of signs by Shop Drawing Approval: Submit Shop Drawings in accordance with Section 5 for internally illuminated street name signs not meeting all of the requirements of 699-3.2. Signs submitted for acceptance by shop drawing approval must be manufactured by a vendor with an approved internally illuminated sign listed on the APL.

699-3.4 Acceptance of Clamp-On Cantilever Arms: For Cantilever arms supporting signs meeting the requirements of 699-3.2, certify to the Engineer that the arm meets the criteria in this Section. For Cantilever Arms supporting signs which do not meet the requirements of 699-3.2, submit shop drawings and design calculations for the arm design in accordance with Section 5.

700 HIGHWAY SIGNING.
(REV 11-15-10) (FA 1-4-11) (7-11)

SECTION 700 (Pages 779-786) is deleted and the following substituted:

SECTION 700
HIGHWAY SIGNING

700-1 Description.

Furnish and erect roadway signs, at the locations shown in the plans, in accordance with the details shown in the plans. All overhead cantilever and truss mounted signs are to be lighted and retroreflective unless otherwise noted in the plans.

The Department designates Ground Traffic Signs as signs erected on the shoulders, slopes, or medians, but not extending over the traveled roadway.

The Department designates signs erected partially or completely over the traveled roadway or mounted on bridges as Overhead Traffic Signs, and may further classify some of these signs as Overhead Cantilever or Span Traffic Signs.

The Department designates signs that include certain electronic display components as Electronic Display Signs (EDS) and may further classify them as Electronic Warning Signs (EWS), Electronic Regulatory Signs (ERS), Electronic Speed Feedback Signs (ESFS), or Blank Out Signs (BOS). EDS may be erected on the shoulders, slopes, or in the medians, or installed on mast arms, monotube assemblies, or span wires.

Obtain multi-post and overhead sign structures from a fabrication facility that is listed on the Department's list of metal producers with an accepted quality control program, meeting the requirements of 105-3.

700-2 Sign Assembly Design Requirements.

700-2.1 General: Sign assemblies as specified in the plans fall into three general categories: ground sign assemblies, overhead sign assemblies, and electronic display signs.

700-2.2 Sign Panels: All sign panels shall be aluminum. Fabricate standard sign panel messages in accordance with details included in the Standard Highway Signs Manual published by the U.S. Department of Transportation. The Engineer will not require the submittal of shop drawings for these signs or for non-standard sign panels and messages fabricated in accordance with details shown in the plans. Submit seven copies of shop drawings indicating detailed layout of the sign legend, spacing, and border for all other signs to the Engineer prior to fabrication.

If the size of a sign is not specified in the plans, provide the size sign for conventional roadways as shown in the MUTCD.

700-2.3 Breakaway Support Mechanisms for Ground Traffic Signs:

700-2.3.1 Frangible Supports: Provide posts for all frangible sign assemblies consisting of aluminum tubes up to 3 1/2 inches outside diameter with 3/16 inch wall thickness in accordance with the requirements in the Design Standards.

700-2.3.2 Slip Bases: For posts with slip base assemblies, use galvanized steel in accordance with the requirements in the Design Standards.

700-2.4 Overhead Sign Structures:

700-2.4.1 Shop Drawings: Submit shop drawings to the Department for approval as specified in Section 5. Prior to the submittal of the shop drawings, determine the actual length

of support columns for all sign structures on the basis of existing field conditions and include these lengths on the shop drawings.

700-2.4.2 Installation: Install nuts on anchor bolts in accordance with 649-5 and 649-6. Use ASTM A325 bolt, nut and washer assemblies for all installations other than anchor bolts as follows. Use bolt, nut and washer assemblies that are free of rust and corrosion and that 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 the full effort of an ironworker using an ordinary spud wrench to bring the faying surfaces of the assembly into full contact which is referred to as snug tight condition. After bringing the faying surfaces of the assembly into full contact and to a snug tight condition, tighten nuts to achieve the minimum torque as specified in Table 700-1 unless the connection is an alternate splice connection of a span sign structure, in which case, tighten nuts in accordance with the turn-of-nut method of Table 460-7 of Section 460. Maintain uniform contact pressure on the faying surfaces during snugging and the subsequent final tightening process, by using 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. Within 24 hours after final tightening, the Engineer will witness a check of the minimum torque using a calibrated torque wrench for 3 bolts or a minimum of 10% of the bolts, whichever is greater, for each connection; however, do not perform this check on alternate splice connections of span sign structures.

Table 700-1

Bolt Diameter (in.)	Minimum Torque (ft.-lbs.)
3/8	15
1/2	37
5/8	74
3/4	120
7/8	190
1	275
1 1/8	375
1 1/4	525

700-2.5 Sign Retroreflective Sheeting: Meet the requirements of Section 994. Use Type III, IV, V or VII sheeting for background sheeting, white legends, borders and shields on all signs, excluding STOP, DO NOT ENTER, and WRONG WAY. Use Type VII sheeting for STOP, DO NOT ENTER and WRONG WAY signs. Use Type III, IV, V or VII yellow-green fluorescent sheeting for S1-1 school advance signs and supplemental panels used with S1-1, S3-1 and S4-5 school signs. Do not mix signs having fluorescent yellow-green sheeting with signs having yellow retroreflective sheeting.

Use fluorescent orange Type VI or VII for all orange work zone signs.

Mesh signs shall meet the color, daytime luminance and nonreflective property requirements of Section 994, Type VI.

700-2.6 Breakaway Support Mechanisms for Electronic Display Signs: Provide posts or posts with slip bases as shown in the plans.

700-3 Materials.

700-3.1 General: Meet the materials requirements shown below and any additional requirements which the plans might show.

700-3.2 Concrete: Use concrete meeting the requirements of Section 346.

700-3.3 Reinforcing Steel: For reinforcing steel in footings, meet the requirements of Section 415.

700-3.4 Aluminum Materials:

700-3.4.1 General: For aluminum materials, meet the general provisions of 965-1.

700-3.4.2 Sheets and Plates: For aluminum sheets and plates for sign panels, meet the requirements of ASTM B 209, Aluminum Association Alloy 6061-T6, 5154-H38 or 5052-H38 and those shown in the plans.

700-3.4.3 Extruded Tubing: For extruded aluminum tubing, meet the requirements shown in the plans.

700-3.4.4 Castings: Provide aluminum castings of the alloys shown in the plans. For aluminum alternates the Engineer will allow a cast base, provided the Contractor submits test reports giving evidence that the base to be used for each pole size is as strong as the pole with which it is to be used. Perform physical tests and submit certified reports for one base to be used with each pole size. Use Alloy A 356-T6 for the castings. Use aluminum bolts for connecting parts of the cast base.

700-3.4.5 Channels: For aluminum channels, meet the requirements of ASTM B 308 for the alloys shown in the plans.

700-3.4.6 Bolts, Nuts, and Lockwashers: For aluminum bolts, nuts, and lockwashers, meet the requirements shown in the plans. Ensure that finished bolts and washers are given an anodic coating of at least 0.0002 inch in thickness and are chromate-sealed.

700-3.5 Steel:

700-3.5.1 General: Only use structural steel, including bolts, nuts, and washers, that have been hot dip galvanized or metalized after fabrication. Perform hot dip galvanizing in accordance with ASTM A 123 or ASTM A 153 and metalizing in accordance with Section 562. For galvanized steel members meet the general requirements of Section 962 and the specific requirements of 962-9.

700-3.5.2 Specific Uses of Aluminum and Galvanized Steel: Use aluminum bolts, nuts, and hardware to connect parts of the cast base.

Use galvanized steel anchor bolts for anchoring base plates to concrete bases and for the nuts and washers.

For all other metal parts of the cast base, the Engineer will allow galvanized steel as an alternate to aluminum.

700-3.6 Bearing Pads: For bearing pads, meet the requirements of 932-2.

700-3.7 Retroretroreflective Sheeting: All retroreflective sheeting must be listed on the QPL and meet the retroreflective sheeting requirements of Section 994.

700-3.8 Process Colors: Use transparent and black opaque process colors listed on the QPL meeting the requirements of 994-4 on retroreflective and nonreflective sheeting.

700-3.9 Electronic Display Signs: Use electronic display signs and mounting hardware that meet the requirements of the MSTCSD and are listed on the Department's Approved Products List.

Use only new signs and mounting hardware.

Provide signs marked in accordance with Section 603 and ensure the markings are visible after installation.

Provide installation guides and operator's manuals for each EDS. Ensure the manuals include functional block diagrams and wiring diagrams; with information required to operate, maintain, troubleshoot, and repair the EDS; and with recommended maintenance and calibration procedures.

Ensure signs have a manufacturer's warranty covering defects in assembly, fabrication, and materials for a minimum of three years from the date of final acceptance in accordance with 5-11. Ensure Guaranties on EDS comply with Section 608.

700-4 Preparation of Sign Blanks.

700-4.1 De-greasing and Etching for Aluminum Sign Blanks:

700-4.1.1 General: Prior to the application of retroreflective sheeting, use any of the methods shown below to de-grease and etch the aluminum sign blanks.

700-4.1.2 Hand Method: Under this method, de-grease and etch the blanks in one operation, using steel wool (medium grade) with any of the following combinations of materials:

(1) An abrasive cleanser of a commercial grade kitchen scouring powder.

(2) Acid and a suitable detergent solution.

(3) An alkaline solution.

Thoroughly rinse the blanks with clean water following all hand de-greasing operations.

700-4.1.3 Power-Washer Method: Under this method, de-grease the blanks with an inhibited alkaline cleanser, by spraying for 90 seconds with the solution between 135 and 249ºF, the exact temperature to be as recommended by the manufacturer of the cleanser. After the spraying, rinse the blanks with clean water. Then etch the blanks by immersing them in a 6 to 8% solution of phosphoric acid at a temperature of 100 to 180ºF for 60 seconds. After immersion, rinse the blanks in clean water.

700-4.1.4 Immersion Method: Under this method, de-grease the blanks by immersing them in a solution of inhibited alkaline cleanser at a temperature between 160 and 180ºF for three to five minutes, and then rinsing with clean water. Then etch blanks by immersing them in a 6 to 8% solution of phosphoric acid at a temperature of 100ºF for three minutes. After immersion, rinse the blanks in clean water.

700-4.1.5 Vapor De-greasing Method: Under this method, de-grease the blanks by totally immersing them in a saturated vapor of trichloroethylene. Remove trademark printing with lacquer thinner or a controlled alkaline cleaning system.

700-4.1.6 Alkaline De-greasing Method: De-grease the blanks by totally immersing them in a tank containing an alkaline solution, controlled and titrated in accordance with the solution manufacturer's directions. Adapt immersion time to the amount of soil present and the thickness of the metal. After immersion, thoroughly rinse the blanks with running water.

700-4.1.7 Etching Method when De-greasing is Separate Operation: If using either of the de-greasing methods described under 700-4.1.5 and 700-4.1.6, accomplish etching by one of the following alternate methods:

(1) Acid Etch: Etch well in a 6 to 8% phosphoric acid solution at 100ºF, or in a proprietary acid etching solution. Rinse thoroughly with running cold water, which may be followed by a hot water rinse.

(2) Alkaline Etch: Etch aluminum surfaces in an alkaline etching material that is controlled by titration. Meet the time, temperature, and concentration requirements specified by the solution manufacturer. After completing etching is complete, rinse the panel thoroughly.

700-4.2 Drying: Dry the panels using a forced-air drier. Use a device or clean canvas gloves, to handle the material between all cleaning and etching operations and the application of retroreflective sheeting. Do not allow the metal to come in contact with greases, oils or other contaminants prior to the application of retroreflective sheeting.

700-4.3 Fabrication of Sign Blanks: Fabricate all metal parts to ensure a proper fit of all sign components. Complete all fabrication, with the exception of cutting and punching of holes, prior to metal de-greasing and applying the retroreflective sheeting. Cut metal panels to size and shape and keep free of buckles, warp, dents, burrs, and defects resulting from fabrication. Provide all sign panels with a flat surface.

700-5 Fabrication of Retroreflectorized Sign Faces.

700-5.1 Application of Sheeting: Apply retroreflective sheeting to the base panels with mechanical equipment in a manner specified for the manufacture of traffic control signs by the sheeting manufacturer. Ensure that sheeting applied to extruded aluminum sections adheres over and around the side legs of all panels to a minimum distance of 1/16 inch beyond the radius of top edge.

Match sign faces comprising two or more pieces of retroreflective sheeting for color and retroreflectivity at the time of sign fabrication. Reverse and apply consecutively alternate successive width sections of either sheeting or panels to ensure that corresponding edges of sheeting lie adjacent on the finished sign. The Engineer will not accept nonconformance that may result in non-uniform shading and an undesirable contrast between adjacent widths of applied sheeting.

700-5.2 Finish: Seal retroreflective sheeting splices and sign edges with materials the sheeting manufacturer supplies in a manner the sheeting manufacturer specifies for traffic control signs.

700-5.3 Screening-on Message: Screen message and borders on retroreflective sheeting in accordance with the recommendations of the ink or overlay manufacturer. Process either before or after applying the sheeting to the base panels.

700-5.4 Finished Sign Face: Provide finished signs with clean cut and sharp messages and borders. Ensure that finished background panels are essentially a plane surface.

700-5.5 Stenciling: For permanent roadway signs, mark the back of all finished panels at the bottom edge with “FDOT”, the date of fabrication, the date of installation, and the fabricator’s initials. Make the markings unobtrusive, but legible enough to be easily read by an observer on the ground when the sign is in its final position. Apply the markings in a manner that is at least as durable as the sign face.

700-6 Acceptance of Signs.

700-6.1 Manufacturer’s Certification and Recommendations: Ensure that the sign manufacturer certifies that the delivered signs conform to this Section and provides recommendations for storing and repairing signs.

700-6.2 Packaging and Shipping: Have the manufacturer package and ship the signs in a manner which will minimize possible damage.

700-6.3 Storage of Signs: If signs are stored prior to installation, store them in accordance with the manufacturer's recommendations.

700-6.4 Sign Inspection: Do not install signs until the Engineer inspects them for conformance with this Section. Provide all manufacturer certifications and recommendations prior to the Engineer's inspection. The Engineer will inspect the signs upon delivery to the storage or project site and again at the final construction inspection. Repair and replace signs deemed unacceptable by the Engineer at no expense to the Department.

700-6.5 Imperfections and Repairs: Repair and replace signs containing imperfections or damage regardless of the kind, type, or cause of the imperfections or damage. Make repairs according to the manufacturer's recommendations and to the satisfaction of the Engineer. Ensure that completed repairs provide a level of quality necessary to maintain the service life warranty of the sign and are satisfactory in appearance to the Engineer.

700-6.6 Electronic Display Signs: In addition to the requirements of this Section, meet the requirements of Section 611.

700-7 Foundations.

700-7.1 Footings:

700-7.1.1Excavation and Backfilling: Perform excavation and backfilling for the footings in accordance with Section 125, with the exceptions that no specific density is required and that the backfill may be tamped in 4 inches maximum layers. Use material that is at near optimum moisture and neither dry or saturated, and tamp to the extent directed by the Engineer. The Department may require that the backfilling be done with poured concrete.

Install spread footings which support sign structures overhanging the roadway as required in 455-25 through 455-37.

700-7.1.2 Mixing and Placing Concrete: For batching and mixing of concrete for footings, meet the requirements of Section 346, except that the Engineer will allow hand mixing by approved methods where the quantity to be mixed does not exceed 1/2 yd^3. Use cast-in-place or precast concrete for the footings. Obtain precast concrete footings from a plant that is currently on the list of Producers with Accepted Quality Control Programs. Producers seeking inclusion on the list shall meet the requirements of 105-3.

700-7.1.3 Forms: The Engineer will not require forms when the ground is sufficiently firm, in which case, sufficiently moisten the adjacent earth to prevent it from absorbing the moisture from the concrete. Where forms are required and the soil is not moist, place sufficient water, as directed by the Engineer, in the hole, and pour the concrete as soon as the water has been absorbed. Place at least 4 inches of loose earth, free from clods or gravel, over the top of the footing to effect curing.

700-7.1.4 Finishing Concrete: Trowel the top of the concrete to a smooth finish.

700-7.2 Drilled Shafts: Meet the requirements of Section 455.

700-8 Erection of Signs and Sign Supports.

Do not erect overhead sign supports until the concrete strength in the support footing 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 C 31 and ASTM C 39 and verifying test results have been provided to the Engineer.

Erect the signs and sign structures in accordance with the details shown in the plans. The Contractor may fabricate the structural steel sign trusses in sections that will fit into available

galvanizing vats. Prior to galvanizing, weld the joints as specified in 460-6 and in accordance with the details shown in the plans. Re-galvanize damaged parts as specified in Section 562.

Weld aluminum structures in accordance with 965-3.

Attach electronic display signs to the supporting structure in accordance with the manufacturer's recommendations using the mounting hardware provided by the manufacturer.

700-9 Removal or Relocation of Signs.

Relocation of signs shall consist of removing the existing sign assembly and installing the sign on a new foundation.

When the plans call for existing ground-mounted signs to be relocated or removed, immediately remove supports and footings that project more than 6 inches above the ground surface after removing the sign panel from the assembly. Remove existing footings to a depth at least 12 inches below the ground surface. The costs will be included in the Contract unit price of the item to which it is incidental.

Notify the Engineer a minimum of 30 days prior to removal of existing Logo sign structures.

700-10 Overlay Existing Sign Panels.

Use 0.040 inch thick aluminum sheeting for overlays larger than 3 square feet placed on a sign panel. Replace hex head bolts on the sign surface using stainless steel flat head machine screws with nuts and lock washers to give a flat surface for the overlay panel. Install the overlay panels starting at the edge away from traffic. Place each panel against the sign using a clamp at the top to hold the panel in place. Drill 1/8 inch holes 1 inch inside the panel edge every 6 inches to 8 inches and install 1/4-inch to 3/8 inch length pop rivets. Install additional rivets along the outer edge 6 inches to 8 inches. Place the remaining panels using the same procedure with the overlap in the direction away from the traffic and with rivets along the overlap on 12 inch centers.

700- 11 Method of Measurement.

The quantities to be paid for will be:

(1) The number of ground traffic signs of each designated class of assembly, complete.

(2) The number of lighted overhead traffic signs of each designated class of assembly, complete.

(3) The number of existing signs removed, relocated, modified of each designated class of assembly, complete.

(4) The number of overhead signs span wire mounted, bridge mounted, and lighted sequential, of each designated class of assembly, complete.

(5) The number of electronic display signs, of each designated class of assembly, complete.

(6) The number of flashing beacon signs, of each designated class of assembly, complete.

For the purpose of payment, a sign assembly consists of all the signs mounted on a single structure (one, two or three posts, or overhead structure) or all the signs on a bridge mounted sign structure and the sign structure.

700-12 Basis of Payment.

Price and payment will be full compensation for furnishing and installation of all materials necessary to complete the signs in accordance with the details shown in the plans; including sign panels complete with sheeting, painting, and message; sign posts and supports, foundations, excavation, etc.; for lighted signs, include all costs of the electrical installation for lighting, up to the point of connection by others; for flashing beacon signs, include all costs of beacons, controllers, and electrical installation, up to the point of connection by others; and all other work specified in this Section, including all incidentals necessary for the complete item.

701 AUDIBLE AND VIBRATORY PAVEMENT MARKINGS. (REV 11-4-10) (FA 1-4-11) (7-11)

SECTION 701 (Pages 787 – 790) is deleted and the following substituted:

SECTION 701
AUDIBLE AND VIBRATORY PAVEMENT MARKINGS

701-1 Description.

Apply audible and vibratory pavement markings in accordance with the Contract Documents.

701-2 Materials.

701-2.1 Thermoplastic: Use thermoplastic material meeting the requirements of 971-1 and 971-9 and listed on the Qualified Products List (QPL) as an approved system. The Engineer will take random samples of the materials in accordance with the Department's Sampling, Testing and Reporting Guide schedule.

701-2.2 Retroreflective Elements: Use reflective elements recommended by the manufacturer that meet the requirements of 971-1.7 and are part of the system listed on the QPL.

701-3 Equipment.

Use equipment capable of providing continuous, uniform heating of the striping material to temperatures exceeding 390ºF, mixing and agitating the material in the reservoir to provide a homogenous mixture without segregation. Use equipment that will maintain the striping material in a plastic state, in all mixing and conveying parts, including the line dispensing device until applied. Use equipment which is capable of producing a consistent pattern of transverse bumps positioned at regular and predetermined intervals. Use equipment which meets the following requirements:

(a) capable of traveling at a uniform rate of speed, both uphill and downhill, to produce a uniform application of striping material and capable of following straight lines and making normal curves in a true arc.

(b) capable of applying reflective elements to the surface of the completed stripe by automatic dispensers attached to the striping machine such that the reflective elements are dispensed closely behind the installed line. Use reflective element dispensers equipped with an automatic cut-off control that is synchronized with the cut-off of the thermoplastic material and

applies the reflective elements uniformly on the entire traffic stripe surface with 50 to 60% embedment.

(c) equipped with a special kettle for uniformly heating and melting the striping material. The kettle must be equipped with an automatic temperature control device and material thermometer for positive temperature control and to prevent overheating or scorching of the thermoplastic material.

(d) meets the requirements of the National Fire Protection Association, state and local authorities.

701-4 Application.

701-4.1 General: Before applying traffic stripes and markings, remove any material that would adversely affect the bond of the traffic stripes by a method approved by the Engineer.

Before applying traffic stripes to any Portland cement surface, apply a primer, sealer or surface preparation adhesive of the type recommended by the manufacturer. Offset longitudinal lines at least 2 inches from construction joints of Portland cement concrete pavement.

Apply traffic stripes or markings only to dry surfaces, and when the ambient air and surface temperature is at least 50ºF and rising for asphalt surfaces and 60°F and rising for concrete surface.

Apply striping to the same tolerances in dimensions and in alignment specified in 710-5. When applying traffic stripes and marking over existing markings, ensure that not more than 2 inches on either end and not more than 1 inch on either side of the existing line is visible.

Conduct field tests in accordance with FM 5-541. Take test readings representative of the striping performance. Remove and replace markings not meeting the requirements of this Section.

701-4.2 Thickness: Apply flat base lines having a thickness of 0.100 to 0.150 inches, exclusive of the audible bumps, when measured above the pavement surface.

As an alternative to the flat baseline, a profiled baseline meeting the following dimensions may be applied. For profiled thermoplastic markings make profile measurements above the pavement surface. Provide a baseline thickness not to exceed 0.050 inches. Provide individual profiles across the full width of the marking on approximately 1.0 inch centers with a space between profiles of approximately .25 inches and an average thickness of at least 0.110 inches above the baseline profile.

Measure, record and certify on a Department approved form and submit to the Engineer, the thickness of white and yellow pavement markings in accordance with FM 5-541.

701-4.3 Dimensions of Audible Bumps: Apply the raised bumps with a profile such that the leading and trailing edges are sloped at a sufficient angle to create an audible and vibratory warning.

Bumps on shoulder and centerline markings shall be at least 0.45 inches at the highest point of the bump, above the pavement surface, including the base line. The height shall be measured after application of drop-on reflective elements. Bumps shall have a minimum baseline coverage dimension of 2.5 inches in both transverse and longitudinal directions. The bumps may have a drainage channel, the width of each drainage channel will not exceed 1/4 inch at the bottom of the channel. The longitudinal distance between bumps shall be approximately 30 inches.

701-4.4 Retroreflectivity: Apply white and yellow audible and vibratory markings that will attain an initial retroreflectance of not less than 300 mcd/lx·m^2 and not less than

250 mcd/lx·m^2, respectively. Measure, record and certify on a Department approved form and submit to the Engineer, the retroreflectivity of white and yellow pavement markings in accordance with FM 5-541.

701-4.5 Color: Use pavement marking materials that meet the requirements of 971-1.

701-4.6 Reflective Elements: Apply reflective elements to all markings at the rates determined by the manufacturer's recommendations as identified for the QPL System.

701-4.7 Loss: If more than 1% of the bumps or more than three consecutive bumps are missing or broken (less than half a bump remaining) within the first 45 days under traffic, replace all failed bumps at no expense to the Department. If more than 2% of the bumps fail within the first 45 days under traffic, the replacement period will extend an additional 45 days from the date all replacement bumps were installed. If, at the end of the additional 45 days, more the 2% of all bumps (initial and replacement) fail, replace all failed bumps at no expense to the Department. Measure, record and certify on a Department approved form and submit to the Engineer, the loss of bumps.

701-5 Contractor's Responsibility for Notification.

Notify the Engineer prior to the placement of audible and vibratory markings. Furnish the Engineer with the manufacturer's name and batch numbers of the thermoplastic materials and reflective elements to be used. Ensure that the batch numbers appear on the thermoplastic materials and reflective elements packages.

701-6 Protection of Newly Applied Audible and Vibratory Markings.

Do not allow traffic onto or permit vehicles to cross newly applied pavement markings until they are sufficiently dry. Remove and replace any portion of the pavement markings damaged by passing traffic or from any other cause.

701-7 Observation Period.

Pavement markings are subject to a 180 day observation period under normal traffic. The observation period will begin with the satisfactory completion and acceptance of the pavement marking work.

The pavement markings shall show no signs of failure due to blistering, excessive cracking, chipping, discoloration, poor adhesion to the pavement, loss of reflectivity or vehicular damage. The retroreflectivity shall meet the initial requirements of 701- 4.4. The Department reserves the right to check the color and retroreflectivity anytime prior to the end of the observation period.

Replace, at no expense to the Department, any pavement markings that do not perform satisfactorily under traffic during the 180 day observation period.

701-8 Corrections for Deficiencies.

Correct all deficiencies by removal and reapplication of a 1.0 mile section centered around the deficiency at no cost to the Department.

701-9 Submittals.

701-9.1 Submittal Instructions: Prepare a certification of quantities, using the Department's current approved form, for each project in the Contract. Submit the certification of quantities and daily worksheets to the Engineer. The Department will not pay for any disputed items until the Engineer approves the certification of quantities.

701-9.2 Contractor's Certification of Quantities: Request payment by submitting a certification of quantities 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 done or completed. Ensure the certification of quantities consists of the following:

(a) Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

(b) The basis for arriving at the amount of the progress certification, less payments previously made and less any amount previously retained or withheld. The basis will include a detailed breakdown provided on the certification of items of payment.

701-10 Method of Measurement.

The quantities to be paid for under this Section will be as follows:

(a) The length, in net miles, of 6 inches Solid Traffic Stripe, authorized and acceptably applied.

(b) The total traversed distance in gross miles of 10-30 skip line. The actual applied line is 25% of the traverse distance for a 1:3 ratio. This equates to 1,320 feet of marking per mile of single line.

701-11 Basis of Payment.

Prices and payments will be full compensation for all work specified in this Section, including, all cleaning and preparing of surfaces, furnishing of all materials, application, curing and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

Payment will be made under:

Item No. 701- 1 Audible and Vibratory Pavement Markings.

705 OBJECT MARKERS AND DELINEATORS.

(REV 5-17-10) (FA 7-16-10) (1-11)

SUBARTICLE 705-2.1 (Page 790) is deleted and the following substituted:

705-2.1 General: Meet the following requirements:

Object Markers and Delineators.....Section 993
Retroreflective and Nonreflective
Sign Sheeting.....Section 994

709 TRAFFIC STRIPES AND MARKINGS – TWO REACTIVE COMPONENTS. (REV 11-4-10) (FA 1-4-11) (7-11)

SECTION 709 (Pages 793 – 795) is deleted and the following substituted:

SECTION 709
TRAFFIC STRIPES AND MARKINGS – TWO REACTIVE COMPONENTS

709-1 Description.

Apply Two Reactive Component traffic stripes and markings in accordance with the Contract Documents.

709-2 Materials.

709-2.1 Two Reactive Components: Use only Two Reactive Component materials listed on the Qualified Products List (QPL) as an approved system and meet the requirements of 971-1 and 971-8. The Engineer will take random samples of the materials in accordance with the Department's Sampling, Testing and Reporting Guide schedule.

709-2.2 Reflective elements: Use only reflective elements recommended by the manufacturer that meet the requirements of 971-1.7 and are part of the system listed on the Qualified Products List (QPL).

709-3 Equipment.

Use equipment capable of applying the Two Reactive Component material to the pavement. Use equipment which can produce varying width traffic stripes and which meets the following requirements:

(a) capable of traveling at a uniform rate of speed, both uphill and downhill, to produce a uniform application of the Two Reactive Component material and capable of following straight lines and making normal curves in true arcs.

(b) capable of applying reflective elements to the surface of the completed stripe by an automatic reflective element dispenser attached to the striping machine such that the reflective elements are dispensed closely behind the installed line. Use a reflective element dispenser equipped with an automatic cut-off control that is synchronized with the cut-off of the material and applies the reflective elements in a manner such that the reflective elements appear uniform on the entire traffic stripes and markings surface with, 50 to 60% embedment.

(c) capable of providing the manufacturer's recommended mixing ratio between the components in a thorough and consistent manner.

709-4 Application.

709-4.1 General: Remove existing pavement markings, such that scars or traces of removed markings will not conflict with new stripes and markings by a method approved by the Engineer.

Before applying traffic stripes and markings, remove any material by a method approved by the Engineer that would adversely affect the bond of the traffic stripes.

Offset longitudinal lines at least 2 inches from construction joints of portland cement concrete pavement.

Apply traffic stripes or markings only to dry surfaces, and when the ambient air and surface temperature is at least 40ºF and rising. Do not apply pavement markings when winds are sufficient to cause spray dust.

Apply striping to the same tolerances in dimensions and in alignment specified in 710-5. When applying traffic stripes and marking over existing markings, ensure that not more than 2 inches on either end and not more than 1 inch on either side of the existing line is visible.

Apply the Two Reactive Component product to the pavement in accordance with the manufacturer's instructions or as directed by the Engineer.

Conduct field tests in accordance with FM 5-541. Take test readings representative of the striping performance. Remove and replace traffic stripes and markings not meeting the requirements of this Section at no additional cost to the Department.

Apply all final pavement markings prior to opening the road to traffic.

709-4.2 Thickness: Apply traffic stripes and markings to attain a minimum wet film thickness in accordance with the manufacturer's recommendations as identified on the QPL system.

Measure, record and certify on a Department approved form and submit to the Engineer, the thickness of white and yellow pavement markings in accordance with FM 5-541.

709-4.3 Retroreflectivity: Apply white and yellow traffic stripes and markings that will attain an initial retroreflectivity of not less than 450 mcd/lx·m^2 and not less than 350 mcd/lx·m^2, respectively for all longitudinal and transverse lines.

Measure, record and certify on the Department approved form and submit to the Engineer, the retroreflectivity of white and yellow pavement markings in accordance with Florida Method FM 5-541.

709-4.4 Color: Use materials that meet the requirements of 971-1.

709-4.5 Reflective elements: Apply reflective elements to all white and yellow traffic stripes or markings, at the rates determined by the manufacturer's recommendations as identified on the QPL system.

709-5 Contractor's Responsibility for Notification.

Notify the Engineer prior to the placement of the materials. Furnish the Engineer with the manufacturer's name and batch numbers of the materials and reflective elements to be used. Ensure that the approved batch numbers appear on the materials and reflective elements packages.

709-6 Protection of Newly Applied Traffic Stripes and Markings.

Do not allow traffic onto or permit vehicles to cross newly applied pavement markings until they are sufficiently dry. Remove and replace any portion of the pavement markings damaged by passing traffic or from any other cause, at no additional cost to the Department.

709-7 Observation Period.

Pavement markings are subject to a 180 day observation period under normal traffic. The observation period shall begin with the satisfactory completion and acceptance of the work. The pavement markings shall show no signs of failure due to blistering, excessive cracking, chipping, discoloration, poor adhesion to the pavement, loss of reflectivity or vehicular damage. The retroreflectivity shall meet the initial requirements of 709-4.3. The Department reserves the right to check the color and retroreflectivity any time prior to the end of the observation period.

Replace, at no additional expense to the Department, any pavement markings that do not perform satisfactorily under traffic during the 180 day observation period.

709-8 Corrections for Deficiencies.

Deficiencies will be corrected by removal and reapplication of a 1.0 mile section centered around the deficiency at no additional cost to the Department.

709-9 Submittals.

709-9.1 Submittal Instructions: Prepare a certification of quantities, using the Department's current approved form, for each project in the Contract. Submit the certification of quantities and daily worksheets to the Engineer. The Department will not pay for any disputed items until the Engineer approves the certification of quantities.

709-9.2 Contractor's Certification of Quantities: Request payment by submitting a certification of quantities 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 done or completed. Ensure the certification of quantities consists of the following:

(a) Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

(b) The basis for arriving at the amount of the progress certification, less payments previously made and less any amount previously retained or withheld. The basis will include a detailed breakdown provided on the certification of items of payment.

709-10 Method of Measurement.

The quantities to be paid for under this Section will be as follows:

(a) The length, in net miles, of 6 inch Solid Traffic Stripe, authorized and acceptably applied.

(b) The total traversed distance in gross miles of 10-30 or 3-9 skip line. The actual applied line is 25% of the traverse, distance for 1:3 ratio. This equates to 1,320 feet of marking per mile of single line.

(c) The net length, in feet, of all other types of lines and stripes, authorized and acceptably applied.

(d) The area, in square feet, of Remove Existing Pavement Markings, acceptably removed.

709-11 Basis of Payment.

Prices and payments will be full compensation for all work specified in this Section, including, all cleaning and preparing of surfaces, furnishing of all materials, application, curing and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

Payment will be made under:

Item No. 709	Two Reactive Components Traffic Stripes, Solid – per net mile. Traffic Stripes, Solid – per foot. Traffic Stripes, Skip – per gross mile. Traffic Stripe – Two Reactive Components, Remove – per square foot.

710 PAINTED PAVEMENT MARKINGS.
(REV 7-9-09) (FA 7-20-09) (1-10)

ARTICLE 710-2 (Page 796) is deleted and the following substituted:

710-2 Materials.

Use only materials listed on the Qualified Products List (QPL) meeting the following requirements:

Raised Retro-reflective Pavement Markers and Bituminous Adhesive	Section 970
Standard Waterborne Fast Dry Traffic Paint	971-1 and 971-3
Fast Dry Solvent Paint	971-1 and 971-4
Glass Spheres	971-1 and 971-2

The Engineer will take random samples of all material in accordance with the Department's Sampling, Testing and Reporting Guide schedule.

SUBARTICLE 710-4.1 (Pages 796 and 797) is deleted and the following substituted:

710-4.1 General: Remove existing pavement markings, such that scars or traces of removed markings will not conflict with new pavement markings, by a method approved by the Engineer. Payment for marking removal will be in accordance with 102-5.8.

Before applying traffic stripes and markings, remove any material by a method approved by the Engineer that would adversely affect the bond of the traffic stripes.

Apply traffic stripes and markings only to dry surfaces, and when the ambient air and surface temperature is at least 40ºF and rising. Do not apply traffic stripes and markings when winds are sufficient to cause spray dust.

Apply traffic stripes and markings, having well defined edges, over existing pavement markings such that not more than 2 inches on either end and not more than 1 inch on either side is visible.

Mix the paint thoroughly prior to pouring into the painting machine. Apply paint to the pavement by spray or other means approved by the Engineer.

Conduct field testing in accordance with FM 5-541. Remove and replace traffic stripes and markings not meeting the requirements of this Section at no additional cost to the Department.

Apply all pavement markings prior to opening the road to traffic.

SUBARTICLE 710-4.1.1 (Page 797) is deleted and the following substituted:

710-4.1.1 Final Surface: Painted Pavement Markings (Final Surface) will include two applications of standard painted pavement markings and one application of retro-reflective pavement markers applied to the final surface. Wait at least 14 days after the first application to apply the second application of Painted Pavement Markings (Final Surface). Second application must be applied prior to final acceptance of the project.

Apply all retro-reflective pavement markers per the requirements of Section 706.

SUBARTICLE 710-4.3 (Page 797) is deleted and the following substituted:

710-4.3 Retroreflectivity: Apply white and yellow standard pavement markings that will attain an initial retroreflectance of not less than 300 mcd/lx·m^2 and not less than 250 mcd/lx·m^2, respectively. Measure, record and certify on a Department approved form and submit to the Engineer, the retroreflectivity of white and yellow pavement markings in accordance with Florida Method FM 5-541.

The Department reserves the right to test the markings within 3 days of receipt of the Contractor's certification. Failure to afford the Department opportunity to test the markings will result in non-payment. The test readings should be representative of the Contractor's striping performance. If the retroreflectivity values measure below values shown above, reapply the striping at no additional cost to the Department.

For standard pavement markings, ensure that the minimum retroreflectance of white and yellow pavement markings are not less than 150 mcd/lx m^2. If the retroreflectivity values fall below the 150 mcd/lx m^2 value within six months of initial application, the striping will be reapplied at the Contractor's expense.

711 THERMOPLASTIC TRAFFIC STRIPES AND MARKINGS. (REV 11-4-10) (FA 1-6-11) (7-11)

SECTION 711 (Pages 800 – 804) is deleted and the following substituted:

SECTION 711
THERMOPLASTIC TRAFFIC STRIPES AND MARKINGS

711-1 Description.

Apply new thermoplastic traffic stripes and markings, or refurbish existing thermoplastic traffic stripes and markings, in accordance with the Contract Documents.

711-2 Materials.

711-2.1 Thermoplastic: Use only thermoplastic materials listed on the Qualified Products List (QPL). The Engineer will take random samples of all material in accordance with the Department's Sampling, Testing and Reporting Guide schedule.

711-2.1.1 Initial or Recapped Stripes and Markings: Use materials meeting the requirements of 971-1 and 971-5.

711-2.1.2 Refurbishing Existing Stripes and Markings: Use materials meeting the requirements of 971-1 and 971-5.

711-2.1.3 Preformed Stripes and Markings: Use Materials meeting the requirements of 971-1 and 971-6.

711-2.2 Glass Spheres: Use only glass spheres listed on the Qualified Products List (QPL), meeting the requirements of 971-1 and 971-2. The Engineer will take random samples of

all glass spheres in accordance with ASTM D 1214 and the Department's Sampling, Testing and Reporting Guide schedule.

711-2.3 Sand: Use materials meeting the requirements of 971-5.4.

711-3 Equipment.

Use equipment capable of providing continuous uniform heating of striping materials to temperatures exceeding 390ºF, mixing and agitation of the material reservoir to provide a homogeneous mixture without segregation. Use equipment that will maintain the striping material in a plastic state, in all mixing and conveying parts, including the line dispensing device until applied. Use equipment which can produce varying width traffic stripes and which meets the following requirements:

(a) capable of traveling at a uniform, predetermined rate of speed, both uphill and downhill, in order to produce a uniform application of striping material and capable of following straight lines and making normal curves in a true arc.

(b) is capable of applying glass spheres to the surface of the completed stripe by a double drop application for initial traffic striping and marking and a single drop application for recapping and refurbishing. The bead dispenser for the first bead drop shall be attached to the striping machine in such a manner that the beads are dispensed closely behind with the thermoplastic material. The second bead dispenser bead shall be attached to the striping machine in such a manner that the beads are dispensed immediately after the first bead drop application. Glass spheres dispensers shall be equipped with an automatic cut-off control that is synchronized with the cut-off of the thermoplastic material and applies the glass spheres in a manner such that the spheres appear uniform on the entire traffic stripes and markings surface with, 50 to 60% embedment.

(c) equipped with a special kettle for uniformly heating and melting the striping material. The kettle must be equipped with an automatic temperature control device and material thermometer for positive temperature control and to prevent overheating or scorching of the thermoplastic material.

(d) meet the requirements of the National Fire Protection Association, state, and local authorities.

711-4 Application.

711-4.1 General: Remove existing pavement markings such that scars or traces of removed markings will not conflict with new stripes and markings by a method approved by the Engineer. Cost for removing conflicting pavement markings during maintenance of traffic operations to be included in Maintenance of Traffic, Lump Sum.

Before applying traffic stripes and markings, remove any material by a method approved by the Engineer that would adversely affect the bond of the traffic stripes. Before applying traffic stripes to any Portland cement concrete surface, apply a primer, sealer or surface preparation adhesive of the type recommended by the manufacturer. Offset longitudinal lines at least 2 inches from any longitudinal joints of Portland cement concrete pavement.

Apply traffic stripes or markings only to dry surfaces, and when the ambient air and surface temperature is at least 50ºF and rising for asphalt surfaces and 60°F and rising for concrete surfaces.

Apply striping to the same tolerances in dimensions and in alignment specified in 710-5. When applying traffic stripes and markings over existing markings, ensure that not more than 2 inches on either end and not more than 1 inch on either side of the existing line is visible.

Apply thermoplastic material to the pavement either by spray, extrusion or other means approved by the Engineer.

Conduct field tests in accordance with FM 5-541.Take test readings representative of the striping performance. Remove and replace traffic stripes and markings not meeting the requirements of this Section at no additional cost to the Department.

Apply all final pavement markings prior to opening the road to traffic.

711-4.1.1 Preformed Thermoplastic: Apply markings only to dry surfaces and when ambient air temperature is at least 32°F. Prior to installation, follow the manufacturer's recommendations for pre-heating.

711-4.2 Thickness:

711-4.2.1 Initial or Recapped Stripes and Markings: Apply or recap traffic stripes or markings such that all lane lines, center lines, transverse markings and traffic stripes and markings within traffic wearing areas, will have a thickness of 0.10 to 0.15 inch when measured above the pavement surface.

Also, all gore, island, and diagonal stripe markings, bike lane symbols and messages, wherever located, will have a thickness of 0.09 to 0.12 inch when measured above the pavement surface.

Measure, record and certify on Department approved form and submit to the Engineer, the thickness of white and yellow pavement markings in accordance with Florida Method FM 5-541.

711-4.2.2 Refurbishing Existing Traffic Stripes and Markings: Apply a minimum of 0.06 inch of thermoplastic material. Ensure that the combination of the existing stripe and the overlay after application of glass spheres does not exceed the maximum thickness of 0.150 inch for all lines.

711-4.3 Retroreflectivity: Apply white and yellow traffic stripes and markings that will attain an initial retroreflectivity of not less than 450 mcd/lx·m^2 and not less than 350 mcd/lx·m^2, respectively for all longitudinal lines. All transverse lines, messages and arrows will attain an initial retroreflectivity of not less than 300 mcd/lx·m^2 and 250 mcd/lx·m^2 for white and yellow respectively. All pedestrian crosswalks, bike lane symbols or messages in a proposed bike lane shall attain an initial retroreflectivity of not less than 275 mcd/lx·m^2.

Measure, record and certify on Department approved form and submit to the Engineer, the retroreflectivity of white and yellow pavement markings in accordance with Florida Method FM 5-541.

711-4.4 Glass Spheres:

711-4.4.1 Longitudinal Lines: For initial traffic striping and marking, apply the first drop of Type 4 or larger glass spheres immediately followed by the second drop of Type 1 glass spheres. For refurbishing, apply a single drop of Type 3 glass spheres. Apply reflective glass spheres to all markings at the rates determined by the manufacturer's recommendations.

711-4.4.2 Transverse Stripes and Markings: Apply a single drop of Type 1 glass spheres. Apply reflective glass spheres to all markings at the rates determined by the manufacturer's recommendations.

Apply a mixture consisting of 50% glass spheres and 50% sharp silica sand to all thermoplastic pedestrian crosswalk lines and bike lane symbols at the rates determined by the manufacturer's recommendations.

711-4.4.3 Preformed Markings: These markings are factory supplied with glass spheres and skid resistant material. No additional glass spheres or skid resistant material should be applied during installation.

711-5 Contractor's Responsibility for Notification.

Notify the Engineer prior to the placement of the thermoplastic materials. Furnish the Engineer with the manufacturer's name and batch numbers of the thermoplastic materials and glass spheres to be used. Ensure that the approved batch numbers appear on the thermoplastic materials and glass spheres packages.

711-6 Protection of Newly Applied Traffic Stripes and Markings.

Do not allow traffic onto or permit vehicles to cross newly applied pavement markings until they are sufficiently dry. Remove and replace any portion of the pavement markings damaged by passing traffic or from any other cause, at no additional cost to the Department

711-7 Observation Period.

Pavement markings are subject to a 180 day observation period under normal traffic. The observation period shall begin with the satisfactory completion and acceptance of the work.

The pavement markings shall show no signs of failure due to blistering, excessive cracking, chipping, discoloration, poor adhesion to the pavement, loss of reflectivity or vehicular damage. The retroreflectivity shall meet the initial requirements of 711-4.3. The Department reserves the right to check the color and retroreflectivity any time prior to the end of the observation period.

Replace, at no additional expense to the Department, any pavement markings that do not perform satisfactorily under traffic during the 180 day observation period.

711-8 Corrections for Deficiencies.

Recapping applies to conditions where additional striping material is applied to new or refurbished traffic stripes or markings to correct a deficiency. Recap a 1.0 mile section centered around the deficiency with additional striping material or by complete removal and reapplication at no additional cost to the Department.

If recapping will result in a thickness exceeding the maximum allowed, the traffic stripes or markings will be removed and reapplied.

711-9 Submittals.

711-9.1 Submittal Instructions: Prepare a certification of quantities, using the Department's current approved form, for each project in the Contract. Submit the certification of quantities and daily worksheets to the Engineer. The Department will not pay for any disputed items until the Engineer approves the certification of quantities.

711-9.2 Contractor's Certification of Quantities: Request payment by submitting a certification of quantities 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 done or completed. Ensure the certification of quantities consists of the following:

(a) Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

(b) The basis for arriving at the amount of the progress certification, less payments previously made and less any amount previously retained or withheld. The basis will include a detailed breakdown provided on the certification of items of payment.

711-10 Method of Measurement.

The quantities to be paid for under this Section will be as follows:

(a) The length, in net miles, of 6 inch Solid Traffic Stripe, authorized and acceptably applied.

(b) The total traversed distance in gross miles of 10-30 or 3-9 skip line. The actual applied line is 25% of the traverse distance, for a 1:3 ratio. This equates to 1,320 feet of marking per mile of single line.

(c) The net length, in feet, of all other types of lines and stripes, authorized and acceptably applied.

(d) The area, in square feet, of Removal of Existing Pavement Markings, acceptably removed.

(e) The number of pavement messages, symbols and directional arrows, authorized and acceptably applied.

711-11 Basis of Payment.

Prices and payments will be full compensation for all work specified in this Section, including, all cleaning and preparing of surfaces, furnishing of all materials, application, curing and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

Payment will be made under:

Item No. 711- Thermoplastic

Traffic Stripes, Solid - per net mile.
Traffic Stripes, Solid - per foot.
Traffic Stripes, Skip - per gross mile.
Dotted/Guideline - per foot.
Messages - each.
Arrows - each.
Yield Markings - per foot.
Thermoplastic, Remove – per square foot.

713 PERMANENT TAPE STRIPES AND MARKINGS. (REV 12-22-10) (FA 1-4-11) (7-11)

SECTION 713 (Pages 805 - 807) is deleted and the following substituted:

SECTION 713
PERMANENT TAPE STRIPES AND MARKINGS

713-1 Description.

Apply permanent tape traffic stripes and markings, in accordance with the Contract documents. Stripes and markings are divided into two classes, Standard and High Performance, and are differentiated by their retroreflectivity and durability. High performance tapes are required for all longitudinal markings. Standard tapes are limited to transverse lines, arrows and messages.

713-2 Materials.

Use only permanent tape traffic stripes and markings materials listed on the Qualified Products List (QPL), meeting the requirements of 971-1 and 971-7. The Engineer will take random samples of the materials in accordance with the Department's Sampling, Testing and Reporting Guide schedule.

713-3 Equipment.

Use equipment that is mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc.

Ensure the mechanical applicator is equipped with film cut-off device and a measuring device that automatically and accumulatively measures the length of each line placed with an accuracy tolerance of plus or minus 2 percent. Tape may be placed by hand on short sections, 500 feet or less if the tolerances in dimensions and in alignment specified in 710-5 are met.

713-4 Application.

713-4.1 General: Remove existing traffic stripes and markings, such that scars or traces of removed markings will not conflict with new stripes and markings by a method approved by the Engineer.

Before applying traffic stripes and markings, remove any material by a method approved by the Engineer that would adversely affect the bond of the traffic stripes.

Apply a primer, sealer or surface preparation adhesive of the type recommended by the manufacturer. Ensure the tape stripes and markings adheres to the pavement surface.

Offset longitudinal lines at least 2 inches from construction joints on portland cement concrete pavement.

Apply traffic stripes or markings only to dry surfaces, and when the ambient air and surface temperature is at least 55ºF and rising.

Apply striping to the same tolerances in dimensions and in alignment specified in 710-5. When applying traffic stripes and marking over existing markings, ensure that not more than 2 inches on either end and not more than 1 inch on either side of the existing line is visible.

Apply traffic stripes and markings to the pavement by means approved by the Engineer. The stripes and markings shall be installed immediately following the paving operation. Conduct field testing in accordance with FM 5-541.Take test readings representative

of the striping performance. Remove and replace pavement stripes and markings not meeting the requirements of this Section at no additional cost to the Department.

Apply all final pavement markings prior to opening the road to traffic.

713-4.2 Thickness: Apply traffic stripes or markings such that, the stripes or markings will have a thickness as designated on the Qualified Products List for the particular product used.

Measure, record and certify on a Department approved form and submit to the Engineer, the thickness of white and yellow pavement markings in accordance with FM 5-541.

713-4.3 Retroreflectivity:

713-4.3.1 General: Black portions of contrast tapes and black masking tapes must have a reflectance of less than 5 mcd/lx m^2. Measure, record and certify on Department approved form and submit to the Engineer, the retroreflectivity of white and yellow pavement markings in accordance with Florida Method FM 5-541.

713-4.3.2 Standard Markings: Apply white and yellow traffic stripes and markings that will attain an initial retroreflectivity of not less than 300 mcd/lx·m^2 for white markings and not less than 250 mcd/lx·m^2 for yellow markings.

713-4.3.3 High Performance Markings: Apply white and yellow traffic stripes and markings that will attain an initial retroreflectivity of not less than 450 mcd/lx·m^2 for white markings and not less than 350 mcd/lx·m^2 for yellow markings.

713-4.4 Color: Use material meeting the requirements of 971-1.

713-5 Contractor's Responsibility for Notification.

Notify the Engineer prior to the placement of pavement stripes and marking material. Furnish the Engineer with the manufacturer's name and batch numbers of the material to be used. Ensure that the approved batch numbers appear on the material packages.

713-6 Protection of Newly Applied Stripes.

Do not allow traffic onto or permit vehicles to cross onto newly applied traffic stripes and markings until they are sufficiently bonded. Remove and replace any portion of the traffic stripes and markings damaged by passing traffic or from any other cause, at no additional cost to the Department.

713-7 Observation Period.

Pavement markings are subject to a 180 day observation period under normal traffic. The observation period shall begin with the satisfactory completion and acceptance of the work.

The pavement markings shall show no signs of failure due to blistering, excessive cracking, chipping, discoloration, poor adhesion to the pavement, loss of reflectivity or vehicular damage. The retroreflectivity shall meet the initial requirements of 713-4.3. The Department reserves the right to check the color and retroreflectivity any time prior to the end of the observation period.

Replace, at no additional expense to the Department, any pavement markings that do not perform satisfactorily under traffic during the 180 day observation period.

713-8 Corrections for Deficiencies.

Remove and reapply a 1.0 mile section centered around any deficiency, as determined by the Engineer, at no additional cost to the Department.

713-9 Submittals.

713-9.1 Submittal Instructions: Prepare a certification of quantities, using the Department's current approved form, for each project in the Contract. Submit the certification of quantities and daily worksheets to the Engineer. The Department will not pay for any disputed items until the Engineer approves the certification of quantities.

713-9.2 Contractor's Certification of Quantities: Request payment by submitting a certification of quantities 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 done or completed. Ensure the certification of quantities consists of the following:

(a) Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

(b) The basis for arriving at the amount of the progress certification, less payments previously made and less any amount previously retained or withheld. The basis will include a detailed breakdown provided on the certification of items of payment.

713-10 Method of Measurement.

The quantities to be paid for under this Section will be as follows:

(a) The length, in net miles, of 6 inch Solid Traffic Stripe, authorized and acceptably applied.

(b) The total traversed distance in gross miles of 10-30 or 3-9 skip line. The actual applied line is 25% of the traverse distance, for a 1:3 ratio. This equates to 1,320 feet of marking per mile of single line.

(c) The net length, in feet, of all other types of lines and stripes, authorized and acceptably applied.

(d) The area, in square feet, of Remove Existing Markings acceptably removed.

(e) The number of pavement messages, symbols and directional arrows, authorized and acceptably applied.

713-11 Basis of Payment.

Prices and payments will be full compensation for all work specified in this Section, including, all cleaning and preparing of surfaces, furnishing of all materials, application, curing and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

Payment will be made under:

Item No. 713-101- Permanent Tape (Standard).
Item No. 713-102- Permanent Tape (High Performance).

715 HIGHWAY LIGHTING SYSTEM.
(REV 12-2-10) (FA 1-4-11) (7-11)

ARTICLE 715-1 (Page 808) is deleted and the following substituted:

715-1 Description.

Install a highway lighting system in accordance with the details shown in the plans. Use pole assemblies as shown in the Design Standards when standard aluminum pole assemblies or standard high mast light assemblies are required by the Contract Documents. Include in the system the light poles, bases, luminaires, ballasts, pull boxes, cable, conduit, substations, expansion joints, protective devices, transformers and control devices; all as specified or required for the complete facility.

Obtain aluminum pole and high mast light pole assemblies from a fabrication facility that is listed on the Department's list of metal producers with an accepted quality control program, meeting the requirements of 105-3.

Provide metal lighting poles, excluding high mast lighting, with internal vibration damping devices in accordance with Design Standards, Index 17515 in all installations on bridges, walls and concrete median barriers.

SUBARTICLE 715-6.4 (Pages 809 – 810) is deleted.

ARTICLE 715-16 (Pages 812 and 813) is deleted and the following substituted:

715-16 Method of Measurement.

The quantities to be paid for will be as follows, completed and accepted:

(a) Conduit: The length, in feet, including elbows, sweeps, connecting hardware, trenching and backfill as indicated in the plans and the Design Standards, and the cost of restoring cut pavement, sidewalks, sod, and etc., to its original condition.

(b) 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 the Design Standards.

(c) Load Center: The Contract unit price will include the service pole, insulators, weatherheads, transformers, enclosures, panel boards, breakers, safety switches, H.O.A. switches, lighting protectors, fuses, photo electric assembly, meter base, and all external and internal conduit and conductors for the service as indicated in the plans and the Design Standards.

(d) Light Pole Foundation: The Contract unit price will include the foundation and anchor bolts with lock nuts and washers as indicated in the plans and the Design Standards.

(e) Luminaire: The Contract unit price will include the luminaire with lamp and necessary mounting hardware as indicated in the plans and the Design Standards.

(f) Pull Box: The Contract unit price will include the pull box and cover as indicated in the plans and the Design Standards.

(g) High Mast Parts: The Contract unit price will include the part specified with all mounting hardware as indicated in the Contract Documents and the Design Standards.

(h) Frangible Base for Light Pole: The Contract unit price will include the frangible base, attachments, bolts, and washers as indicated in the plans and the Design Standards.

(i) Photo Electric Control Assembly: The Contract unit price will include the photo electric control, transformers, conduit, and conductors as indicated in the plans and the Design Standards.

(j) Pre-Fab Pilaster: The Contract unit price will include the pilaster and all mounting hardware as indicated in the plans.

(k) High Mast Lighting Pole Complete: The Contract unit price will include the pole, luminaires with lamps, lowering system, breakers, anchor bolts with lock nuts and washers, and foundation as indicated in the plans and the Design Standards.

(l) Conductor: The length, in feet, as indicated in the plans and the Design Standards.

(m) 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.

(n) 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 luminaries.

901 COARSE AGGREGATE.
(REV 5-31-11) (FA 6-7-11) (1-12)

SECTION 901 (Pages 814 – 819) is deleted and the following substituted:

SECTION 901
COARSE AGGREGATE

901-1 General.

901-1.1 Composition: Coarse aggregate shall consist of naturally occurring materials such as gravel, or resulting from the crushing of parent rock, to include natural rock, slags, expanded clays and shales (lightweight aggregates) and other approved inert materials with similar characteristics, having hard, strong, durable particles, conforming to the specific requirements of this Section.

Coarse aggregate for use in pipe backfill under wet conditions, underdrain aggregate, or concrete meeting the requirements of Section 347 may consist of reclaimed Portland cement concrete meeting the requirements of 901-5. Coarse aggregate for use in bituminous mixtures may consist of reclaimed Portland cement concrete meeting the requirements of 901-5, except that the reclaimed concrete shall be from a concrete mix which was produced and placed in accordance with applicable Department Specifications.

Materials substantially retained on the No. 4 sieve, shall be classified as coarse aggregate.

Approval of mineral aggregate sources shall be in accordance with 6-2.3.

901-1.2 Deleterious Substances: All coarse aggregates shall be reasonably free of clay lumps, soft and friable particles, salt, alkali, organic matter, adherent coatings, and other

substances not defined which may possess undesirable characteristics. The weight of deleterious substances shall not exceed the following percentages:

Coal and lignite (AASHTO T 113).....1.00
Soft and friable particles (AASHTO T 112)*.....2.00
Clay lumps (AASHTO T 112)*.....2.00
Plant root matter (visual inspection in
AASHTO T 27)****.....0.005
Wood and wood matter (visual inspection in
AASHTO T 27)****.....0.005
Cinders and clinkers.....0.50
Free shell** 1.00
Total Material passing the No. 200 sieve (FM 1-T 011)
At Source with Los Angeles Abrasion less than or equal
to 30 .....2.50
At Source with Los Angeles Abrasion greater than
30.....1.75
At Point of Use.....3.75
Fine-Grained Organic Matter (AASHTO 194).....0.03
Chert (less than 2.40 specific gravity SSD)
(AASHTO T-113)*** 3.00

* The maximum percent by weight of soft and friable particles and clay lumps together shall not exceed 3.00.

** Aggregates to be used in asphalt concrete may contain up to 5% free shell. Free shell is defined as that portion of the coarse aggregate retained on the No. 4 sieve consisting of loose, whole, or broken shell, or the external skeletal remains of other marine life, having a ratio of the maximum length of the particle to the shell wall thickness exceeding five to one. Coral, molds, or casts of other shells, and crushed clam and oyster shell indigenous to the formation will not be considered as free shell.

*** This limitation applies only to coarse aggregates in which chert appears as an impurity. It is not applicable to aggregates which are predominantly chert.

**** Plant root matter, and wood and wood matter shall be considered deleterious when any piece exceeds two inches in length or 1/2 inch in width.

The weights of deleterious substances for reclaimed Portland cement concrete aggregate shall not exceed the following percentages:

Bituminous Concrete 1.00
Bricks 1.00
Wood and other organic substances (by weight)***** 0.1
Reinforcing Steel and Welded Wire Fabric 0.1
Plaster and gypsum board 0.1
Joint Fillers.....0.1

***** Supersedes requirement for other coarse aggregate

901-1.3 Physical Properties: Coarse aggregates shall meet the following physical property requirements, except as noted herein:

Los Angeles Abrasion (FM 1-T 096).....maximum loss 45%
Soundness (Sodium Sulfate) AASHTO T104 .....
.....maximum loss 12%*

Flat or elongated pieces** .....maximum 10%

* For source approval - Aggregates exceeding soundness loss limitations will be rejected unless performance history shows that the material will not be detrimental for Portland Cement Concrete or other intended usages.

** A flat or elongated particle is defined as one having a ratio between the maximum and the minimum dimensions of a circumscribing prism exceeding five to one.

901-1.4 Gradation: Coarse aggregates shall conform to the gradation requirements of Table 1, when the stone size is specified. However, Table 1 is waived for those aggregates intended for usage in bituminous mixtures, provided the material is graded on sieves specified in production requirements contained in 6-2.3, and meets uniformity and bituminous design requirements.

TABLE 1
Standard Sizes of Coarse Aggregate

Amounts Finer than Each Laboratory Sieve (Square Openings), weight percent								
Size No.	Nominal Size Square Openings	4 inches	3 1/2 inches	3 inches	2 1/2 inches	2 inches	1 1/2 inches	1 inch
1	3 1/2 to 1 1/2 inches	100	90 to 100	-	25 to 60	-	0 to 15	-
2	2 1/2 inches to 1 1/2 inches	-	-	100	90 to 100	35 to 70	0 to 15	-
24	2 1/2 inches to 3/4 inch	-	-	100	90 to 100	-	25 to 60	-
3	2 inches to 1 inch	-	-	-	100	90 to 100	35 to 70	0 to 15
357	2 inches to No. 4	-	-	-	100	95 to 100	-	35 to 70
4	1 1/2 inches to 3/4 inch	-	-	-	-	100	90 to 100	20 to 55
467	1 1/2 inches to No. 4	-	-	-	-	100	95 to 100	-
5	1 inch to 1/2 inch	-	-	-	-	-	100	90 to 100
56	1 inch to 3/8 inch	-	-	-	-	-	100	90 to 100
57	1 inch to No. 4	-	-	-	-	-	100	95 to 100
6	3/4 inch to 3/8 inch	-	-	-	-	-	-	100
67	3/4 inch to No. 4	-	-	-	-	-	-	100
68	3/4 inch to No. 8	-	-	-	-	-	-	-
7	1/2 inch to No. 4	-	-	-	-	-	-	-
78	1/2 inch to No. 8	-	-	-	-	-	-	-
8	3/8 inch to No. 8	-	-	-	-	-	-	-
89	3/8 inch to No. 16	-	-	-	-	-	-	-
9	No. 4 to No. 16	-	-	-	-	-	-	-

TABLE 1 Standard Sizes of Coarse Aggregate								
Amounts Finer than Each Laboratory Sieve (Square Openings), weight percent								
Size No.	Nominal Size Square Openings	4 inches	3 1/2 inches	3 inches	2 1/2 inches	2 inches	1 1/2 inches	1 inch
10	No. 4 to 0	-	-	-	-	-	-	-

TABLE 1 (Continued) Standard Sizes of Coarse Aggregate								
Amounts Finer than Each Laboratory Sieve (Square Openings), weight percent								
Size No.	Nominal Size Square Openings	3/4 inch	1/2 inch	3/8 inch	No. 4	No. 8	No. 16	No. 50
1	3 1/2 inches to 1 1/2 inches	0 to 5						
2	2 1/2 inches to 1 1/2 inches	0 to 5						
24	2 1/2 inches to 3/4 inch	0 to 10	0 to 5					
3	2 inches to 1 inch	-	0 to 5					
357	2 inches to No. 4	-	10 to 30	-	0 to 5			
4	1 1/2 inches to 3/4 inch	0 to 15	-	0 to 5				
467	1 1/2 inches to No. 4	35 to 70	-	10 to 30	0 to 5			
5	1 inch to 1/2 inch	20 to 55	0 to 10	0 to 5				
56	1 inch to 3/8 inch	40 to 85	10 to 40	0 to 15	0 to 5			
57	1 inch to No. 4	-	25 to 60	-	0 to 10	0 to 5		
6	3/4 inch to 3/8 inch	90 to 100	20 to 55	0 to 15	0 to 5			
67	3/4 inch to No. 4	90 to 100	-	20 to 55	0 to 10	0 to 5		
68	3/4 inch to No. 8	90 to 100	-	30 to 65	5 to 25	0 to 10	0 to 5	
7	1/2 inch to No. 4	100	90 to 100	40 to 70	0 to 15	0 to 5		
78	1/2 inch to No. 8	100	90 to 100	40 to 75	5 to 25	0 to 10	0 to 5	
8	3/8 inch to No. 8	-	100	85 to 100	10 to 30	0 to 10	0 to 5	
89	3/8 inch to No.	-	100	90 to 100	20 to 55	5 to 30	0 to 10	0 to 5

TABLE 1 (Continued) Standard Sizes of Coarse Aggregate								
Amounts Finer than Each Laboratory Sieve (Square Openings), weight percent								
Size No.	Nominal Size Square Openings	3/4 inch	1/2 inch	3/8 inch	No. 4	No. 8	No. 16	No. 50
	16							
9	No. 4 to No. 16	-	-	100	85 to 100	10 to 40	0 to 10	0 to 5
10	No. 4 to 0	-	-	100	85 to 100	-	-	-

The gradations in Table 1 represent the extreme limits for the various sizes indicated which will be used in determining the suitability for use of coarse aggregate from all sources of supply. For any grade from any one source, the gradation shall be held reasonably uniform and not subject to the extreme percentages of gradation specified above.

901-2 Natural Stones.

Course aggregate may be processed from gravels, granites, limestones, dolomite, sandstones, or other naturally occurring hard, sound, durable materials meeting the requirements of this Section.

901-2.1 Gravels: Gravel shall be composed of naturally occurring quartz, free from deleterious coatings of any kind. The minimum dry-rodded weight AASHTO T 19 shall be 95 lb/ft^3.

Crushed gravel shall consist of a minimum of 85%, by weight, of the material retained on the No. 4 sieve, having at least three fractured faces.

901-2.2 Granites: Coarse aggregate produced from the crushing of granites shall be sound and durable. For granites to be used in bituminous mixtures and surface treatments, the Los Angeles Abrasion requirement of 901-1.3 is modified to permit a maximum loss up to 50 (FM 1-T 096). Maximum amount of mica schist permitted is 5% (FM 5-584).

901-2.3 Limestones, Dolomite and Sandstone: Coarse aggregates may be produced from limestone, dolomite, sandstones, and other naturally occurring hard, durable materials meeting the requirements of this Section.

Pre-Cenozoic limestones and dolomite shall not be used as crushed stone aggregates either coarse or fine for Asphalt Concrete Friction Courses, or any other asphalt concrete mixture or surface treatment serving as the final wearing course. This specifically includes materials from the Ketone Dolomite (Cambrian) Newala Limestone (Mississippian), and Northern Alabama and Georgia.

As an exception to the above up to 20% fine aggregate from these materials may be used in asphalt concrete mixtures other than Friction Courses which serve as the final wearing course.

901-2.4 Cemented Coquina Rock: For Cemented Coquina Rock to be used in bituminous mixtures, the Los Angeles Abrasion requirement of 901-1.3 is modified to permit a maximum loss up to 50 (FM 1-T 096) provided that the amount of material finer than No. 200 generated during the Los Angeles Abrasion test is less than 18%.

901-3 Manufactured Stones.

901-3.1 Slags: Coarse aggregate may be produced from molten nonmetallic by-products consisting essentially of silicates and aluminosilicates of calcium and other bases, such as air-cooled blast-furnace slag or phosphate slag, provided it is reasonably uniform in density and quality, and reasonably free from deleterious substances as specified in 901-1.2. In addition, it must meet the following specific requirements:

Sulphur content ..... not more than 1.5%
Dry rodded weight AASHTO T 19 ..... minimum 70 lb/ft^3
Glassy Particles ..... not more than 10%

Slag shall not be used as an aggregate for Portland cement concrete.

For Air-Cooled Blast Furnace Slag, the Los Angeles Abrasion requirement of 901-1.3 is modified to permit a maximum loss up to 50 (FM 1-T 096) provided that the amount of material finer than No. 200 sieve generated during the Los Angeles Abrasion test is less than 18%.

901-4 Lightweight Aggregates.

901-4.1 Lightweight Coarse Aggregate for Bituminous Construction: Lightweight coarse aggregate may be produced from naturally occurring materials such as pumice, scoria and tuff or from expanded clay, shale or slate fired in a rotary kiln. It shall be reasonably uniform in quality and density, and free of deleterious substances as specified in 901-1.2, except that the term cinders and clinkers shall apply to those particles clearly foreign to the extended aggregate in question.

In addition, it must meet the following specific requirements:

Material passing the No. 200 Sieve
..... maximum 3.00%, (FM 1-T 011)
Dry loose weight (AASHTO T 19)* ..... 33-55 lb/ft^3
Los Angeles Abrasion (FM 1-T 096) maximum 35%
Ferric Oxide (ASTM C 641) ..... maximum 1.5 mg

* Source shall maintain dry-loose unit weight within plus or minus 6% of Quality Control average. Point of use dry-loose unit weight shall be within plus or minus 10% of Source Quality Control average.

901-4.2 Lightweight Coarse Aggregate for Structural Concrete: The requirements of 901-4.1 are modified as follows:

Aggregates shall not be produced from pumice and scoria.

Los Angeles Abrasion (FM 1-T 096, Section 12) shall be 45%, maximum.

Gradation shall meet the requirements of AASHTO M 195 for 3/4 inch, 1/2 inch and 3/8 inch.

901-5 Reclaimed Portland Cement Concrete.

The reclaimed Portland cement concrete shall be crushed and processed to provide a clean, hard, durable aggregate having a uniform gradation free from adherent coatings.

The Contractor's (Producer's) crushing operation shall produce an aggregate meeting the applicable gradation requirements. The physical property requirements of 901-1.3 for Soundness shall not apply and the maximum loss as determined by the Los Angeles Abrasion (FM 1-T 096) is changed to 50.

The sources of reclaimed Portland cement concrete will be treated as a mine and subject to the requirements of Section 6 and Section 105. These sources shall qualify as facilities generating clean debris, defined in Rule 62-701.200(15), Florida Administrative Code, as

uncontaminated concrete exempt from solid waste regulation in accordance with Rule 62-701.220(2)(f), FAC.

If the Department determines that the concrete has been contaminated with petroleum products or lead-based paint, the concrete shall not be considered clean debris and the source shall be required to be permitted and to perform testing in accordance with Rule 62-701, FAC, subject to any ensuing enforcement action by the Florida Department of Environmental Protection.

Concrete shall be asbestos free.

Operators of demolition recycling facilities shall demonstrate that they are in compliance with 40 Code of Federal Regulations (CFR) 61.141 and 61.145. Notification requirements from each owner or operator of a demolition or renovation activity supplying reclaimed concrete shall be available at the recycling facility.

901-6 Exceptions, Additions and Restrictions.

Pertinent specification modifications, based on material usage, will be found in other Sections of the specifications.

914 STABILIZATION MATERIALS.
(REV 5-17-11) (FA 6-7-11) (1-12)

SECTION 914 (Page 827) is deleted and the following substituted:

SECTION 914
STABILIZATION MATERIALS

914-1 General.

This Section governs materials to be used in subgrade stabilization. Meet the following requirements:

Plasticity Index (AASHTO T 90)	Maximum 10
Liquid Limit (AASHTO T 89)	Maximum 40
Passing a 3-1/2 inch screen (AASHTO T 27)	Minimum 97%
LBR	No Requirement

914-2 Materials for Stabilizing (Limerock Bearing Ratio).

914-2.1 Commercial Materials: Materials may be either limerock, shell rock, cemented coquina or shell base sources approved in accordance with 6-2.3.

914-2.2 Local Materials: Local materials used for stabilizing may be soils or recyclable materials such as crushed concrete, roof tiles and asphalt coated base or reclaimed pavement provided the following limits for Organic Content are met.

Average Organic Content* (FM 1-T 267)	Maximum 2.5%
Individual Organic Content Sample (FM 1-T 267)	Maximum 4%
*Note: A minimum of three samples per source.	

If the Organic Content exceeds the allowable values and RAP or RAP-blended material is used as stabilizing material, the Engineer may allow FM 5-563 (with the exception of gradation analysis) in lieu of FM 1-T 267 after mixing. The maximum allowable test result is 4.7%.

Materials that contain hazardous substances or contaminates shall not be used.

If toxic substances, elements or compounds are suspected to exist at concentrations exceeding limits defined by EPA, qualifying tests shall be performed. Test methods for these substances shall be those mandated by EPA and analyzed by a certified laboratory.

916 BITUMINOUS MATERIALS.
(REV 5-19-11) (FA 8-4-11) (1-12)

SECTION 916 (Pages 828 - 842) is deleted and the following substituted:

SECTION 916
BITUMINOUS MATERIALS

916-1 Superpave PG Asphalt Binder:

916-1.1 Requirements: Superpave Performance Graded (PG) asphalt binders, identified as PG 64-22, PG 67-22, and PG 76-22, shall meet the requirements of 916-1.2, AASHTO M 320 Table 1 and the following additional requirements:

1. The mass change per AASHTO T 240 shall be a maximum of 0.5% for all grades.

2. The intermediate test temperature at 10 rad/s. for the Dynamic Shear Rheometer test AASHTO T 315 shall be 25ºC for all grades.

3. An additional high temperature grade of PG 67 is added for which the high test temperature at 10 rad/sec for the Dynamic Shear Rheometer test AASHTO T 315 shall be 67ºC.

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

5. All PG asphalt binders having a high temperature designation higher than PG 67 shall be produced with a styrene-butadiene-styrene (SBS) or styrene-butadiene (SB) elastomeric polymer modifier and resultant binder shall meet all requirements of this Specification; in addition the phase angle at 76ºC (AASHTO T 315) shall be a maximum of 75 degrees.

6. The maximum viscosity AASHTO T 202 shall be 2400 poises for PG 64-22 and 3600 poises for PG 67-22.

All hot mix asphalt (except hot mix asphalt containing 20% RAP or greater) shall contain Superpave PG asphalt binder grade PG 67-22 unless otherwise specified in the plans and/or Specifications for the hot mix asphalt product.

For all PG binder used in all hot mix asphalt, silicone may be added to the PG binder at the rate of 25 cubic centimeters of silicone mixed to each 5,000 gallons of PG binder. If a disbursing fluid is used in conjunction with the silicone, the resultant mixture containing the full 25 cubic centimeters of silicone shall be added in accordance with the manufacturer's

recommendation. The blending of the silicone with the PG binder shall be done by the supplier prior to the shipment.

All PG binder and asphalt rubber binder for Friction Course mixes and for other hot mix asphalt products containing RAP shall contain 0.5% heat stable anti-strip additive by weight of PG binder unless specifications for the hot mix asphalt product requires testing by FM 1-T 283 and the test results indicate it is not required, or the mixture contains hydrated lime. Where FM 1-T 283 indicates an anti-strip additive is required, it shall be from 0.25 to 0.75%. The anti-strip additive shall meet the requirements of 916-5. The anti-strip additive shall be introduced into the PG binder by the supplier during loading.

Where PG binder is used in mixes containing reclaimed asphalt pavement (RAP), the requirements of 334-2.3.4 must also be met.

916-1.2 Qualified Products List: The Superpave PG asphalt binders supplied under this Specification shall be one of the products included on the Qualified Products List as specified in 6-1. Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6 and include a report of test results from an independent laboratory confirming the material meets the requirements of this section. Any marked variation from the original test values for a material below the established limits or evidence of inadequate quality control or field performance of a material will be considered to be sufficient evidence that the properties of the material have changed, and the material will be removed from the Qualified Products List.

For each binder grade, the supplier may be required to submit to the State Materials Office a split sample of material representative of test results submitted with the Product Evaluation Application. In addition, for modified binders, the original PG binder grade, the modifier product designation, and amount added shall be indicated on the Product Evaluation Application and in the Quality Control Program below. Suppliers shall not ship any PG binder until notified that the product is on the Qualified Products List and an approved Quality Control Program meeting the requirements of 916-1.3 has been implemented.

916-1.3 Quality Control Program: The supplier of Superpave PG asphalt binder shall at a minimum have a Quality Control Program meeting the requirements of this Specification which is based on AASHTO R 26. The Quality Control Program shall be submitted in electronic format to the State Materials Office for approval.

The requirements for the Quality Control program apply to the supply location of PG binders for the use on Florida Department of Transportation projects. The supply location of PG binder may represent refinery production, terminal distribution, blending, processing, and/or modification location. Rack blending (blending from two tank sources) will be permitted to meet the requirements for a PG asphalt binder product. Any special handling requirements such as rack blending and manufacture of polymer modified asphalt shall be described in the Quality Control program. The requirements of these Specifications for a Quality Control Program do not apply to Recycle Agents at this time.

916-1.3.1 Identification of Personnel and Supply Locations: The supplier's primary and secondary representatives responsible for Quality Control shall be identified by name, title, address, telephone, fax and e-mail address. At least one of the representatives shall be located at the supply location. The supply locations shall be identified by name, address and telephone.

916-1.3.2 Specification Compliance and Quality Control Testing: Specification Compliance Testing shall consist of complete testing of each PG binder shipped in accordance with AASHTO M 320 and 916-1.1 of these Specifications. Results of Specification

Compliance Testing shall be available to the supplier within five working days of sampling. Specification Compliance Testing shall be conducted by a testing laboratory that participates at least annually in the AASHTO Materials Reference Laboratory (AMRL) Proficiency Sample Program for both Performance Graded Asphalt Binder and Viscosity Graded Asphalt Cement. The primary testing lab and any other labs to be used for Specification Compliance Testing shall be identified in the suppliers Quality Control Program. The results from each AMRL Proficiency Sample for each testing laboratory shall be forwarded by the supplier for each supply location in electronic format to the State Materials Office. Acceptable performance in the AMRL Proficiency Sample Program shall be a minimum of 3 for each test. A rating of less than 3 shall require identification of appropriate action on the part of the supplier and be acceptable to the State Materials Engineer.

Quality Control testing as a minimum shall consist of testing a representative sample of each PG binder shipped by the supplier in accordance with either:

(1) AASHTO T 202 Standard Test Method for Viscosity of Asphalts by Vacuum Capillary Viscometer or

(2) AASHTO T 315 Test Method for Determining Rheological Properties of Asphalt Binder using a Dynamic Shear Rheometer (DSR).

Results of Quality Control Testing shall be available to the supplier within five hours of sampling. A Quality Control test result outside the specification limits will require immediate sampling and testing for Specification Compliance and appropriate action taken. The Quality Control testing and location where the test will be done shall be identified in the suppliers Quality Control Program.

916-1.3.3 Frequency of Sampling and Testing: Sampling of PG binders shall be done in accordance with AASHTO T 40. Initial Specification Compliance test results shall be required for each PG binder grade for each new LOT of material which will be further subjected to Quality Control Testing in accordance with 916-1.3.2. A new LOT will occur when the material in a tank changes and the Specification Compliance Test may no longer be representative of the material in the tank. This may be due to an incoming bulk shipment of material, change in refinery run, the manufacture of a product, or a blend of material in a tank. Additional testing is as follows:

(1) Any PG binder shipped to a Department project during any one calendar month shall be tested at least once during that month for Specification Compliance in accordance with 916-1.3.2.

(2) When being shipped to Department projects, samples shall be obtained by the supplier and tested for Quality Control testing in accordance with 916-1.3.2. A single one quart representative sample of each PG binder shall be obtained and tested by the supplier each calendar week; for each rack blended PG binder, additional representative samples shall be obtained daily. Each Quality Control sample and additional daily rack blended samples shall be adequately identified and retained not less than eight weeks at the supply location. Any PG binder not shipped to Department projects is not required to be sampled or tested.

(3) Split samples of any PG binder will be provided when requested by a representative of the Department. In this situation three representative one quart samples will be obtained by the supplier under the direction of the Department. One sample will be submitted to the State Materials Office, one will be tested by the supplier for Specification Compliance and one will be tested by the supplier for Quality Control. The method of obtaining the three representative one quart samples is to obtain a single gallon sample, which is then stirred and

poured into three one quart cans. When split samples are requested by the Department, the results from both parties will be made available within ten working days.

(4) For each rack blended PG binder, identify minimum daily Process Control Testing in the QC Plan.

916-1.3.4 Reporting: A monthly report by the supplier containing Specification Compliance and Quality Control Test results for each PG binder LOT shall be submitted by the supplier in electronic format using the form provided by the Department to the State Materials Office within seven days following the end of the calendar month. Test results for split samples shall also be included. Process Control Test results shall not be included. Copies of these monthly reports and supporting test reports shall be available at the supply location for a minimum of three years.

The report shall consist of the Specification compliance testing and Quality Control Testing of the following as applicable by these Specifications.

SUPERPAVE PG ASPHALT BINDER		
Test and Method	Conditions	Specification Minimum/Maximum Value
Original Binder		
Superpave PG Asphalt Binder Grade		Report
Qualified Products List Number		Report
Polymer Modifier Type	(PG 76-22 Only)	Report
Solubility, AASHTO T 44	in Trichloroethylene	Minimum 99.0%
Flash Point, AASHTO T 48	COC	Minimum 450ºF
Rotational Viscosity, AASHTO T 316	275ºF	Maximum 3 Pa-s
Absolute Viscosity, AASHTO T 202	140ºF	Max. 2400 P (PG 64-22) Max. 3600 P (PG 67-22)
Dynamic Shear Rheometer, AASHTO T 315	$G^*/\sin\delta$, Test Temperature @ 10 rad/sec, °C Phase Angle, δ, (PG 76-22 Only)	Minimum 1.00 kPa Maximum 75 degrees
Rolling Thin Film Oven Test Residue (AASHTO T 240)		
Rolling Thin Film Oven, AASHTO T 240	Mass Change%	Maximum 0.50
Dynamic Shear Rheometer, AASHTO T 315	$G^*/\sin\delta$, Test Temperature @ 10 rad/sec, °C	Minimum 2.20 kPa
Pressure Aging Vessel Residue (AASHTO R 28) at 100ºC		
Dynamic Shear Rheometer, AASHTO T 315	$G^*\sin\delta$, 10 rad/sec. @ 25°C	Maximum 5000 kPa
Creep Stiffness, AASHTO T 313	S (Stiffness), @ 60 sec. @ -12°C M-value, @ 60 sec. @ -12°C	Maximum 300 Mpa Minimum 0.300

916-1.3.5 Notification and Evaluation: In the event that a Specification Compliance test is outside specification requirements or a Quality Control test is outside limits established by the supplier as part of his Quality Control Program shipments of that product to Department projects will cease immediately and the Contractor and the State Materials Office will be notified and the product retested for Specification Compliance (resampling as appropriate). Where the retest for Specification Compliance meets all requirements, shipments of that product may resume. Where off-specification material has been shipped and the retest confirms the original test, the Contractor and State Materials Office will be informed of the steps taken to achieve specification compliance on the product shipped.

Where off-specification materials has been shipped, further shipment of that product to Department projects shall remain suspended until the cause of the problem is evaluated and corrected by the supplier to the satisfaction of the State Materials Engineer.

916-1.3.6 Certification and Verification: The supplier shall furnish certification on the bill of lading for each shipment of PG binder delivered to a Department project that includes: the quantity, the Superpave PG asphalt binder grade (including QPL number), PG binder LOT designation, the customer name, the delivery location, a statement that the binder is in conformance with 916-1 and the suppliers Quality Control Program, and the quantity of silicone and anti-strip agent addition, as applicable, including product designation (QPL number as applicable). Any special handling or temperature requirements shall be indicated on the certification and are solely the responsibility of the Contractor to follow.

The Department may sample and test PG binder from the suppliers storage tank, the delivery vehicle, and/or Contractors storage tank to verify and determine compliance with this and other specification requirements. Where these tests identify material outside specification requirements, the State Materials Engineer may require the supplier to cease shipment of that PG binder product. Further shipment of that PG binder product to Department projects may remain suspended until the cause of the problem is evaluated and corrected by the supplier as necessary to the satisfaction of the State Materials Engineer.

916-2 Recycling Agents.

916-2.1 Requirements: The asphalt recycling agent (RA) shall be an asphalt binder (PG asphalt binder) or an asphalt binder blended (as necessary) with a softening agent or flux oil, and shall meet the four Target Viscosity values of 550, 750, 1000, and 1500 poises and the following requirements:

RECYCLING AGENTS		
Test	Conditions	Recycling Agent Minimum/Maximum Value
Absolute Viscosity AASHTO T 202	140ºF	Target Viscosity ± 20%
Viscosity Ratio After AASHTO T 240	$\frac{\text{Visc. 140ºF after RTFOT}}{\text{Visc. 140ºF before RTFOT}}$	maximum 3
Flash Point AASHTO T 48	COC	minimum 400ºF
Solubility	in Trichloroethylene	minimum 99.0%

RECYCLING AGENTS		
Test	Conditions	Recycling Agent Minimum/Maximum Value
AASHTO T 44		

Rack blending of recycling agents (blending from two RA tank sources) will be permitted to meet a required target viscosity value.

For all recycling agents used in all hot mix asphalt, silicone mayl be added to the recycling agent at the rate of 25 cubic centimeters of silicone mixed to each 5,000 gallons of recycling agent. If a disbursing fluid is used in conjunction with the silicone, the resultant mixture containing the full 25 cubic centimeters of silicone shall be added in accordance with the manufacturer's recommendation. The blending of the silicone with the recycling agent shall be done by the supplier prior to the shipment.

All recycling agents for hot mix asphalt products containing RAP shall contain 0.5% heat stable anti-strip additive by weight of the recycle agent unless specifications for the hot mix asphalt product requires testing by FM 1-T 283 and the test results indicate it is not required, or the mixture contains hydrated lime. Where FM 1-T 283 indicates an anti-strip additive is required, it shall be from 0.50 to 0.75%. The anti-strip additive shall meet the requirements of 916-5. The anti-strip additive shall be introduced into the recycling agent by the supplier during loading.

Where a recycling agent is used in mixes containing reclaimed asphalt pavement (RAP), the requirements of 334-2.3.4 must also be met.

916-2.2 Sampling and Reporting: Sampling of recycling agents shall be done in accordance with AASHTO T-40. Initial Specification Compliance test results shall be required for each new LOT of material. A new LOT will occur when the material in a tank changes and the Specification Compliance Test may not be representative of the material in the tank. This may be due to an incoming bulk shipment of material, change in refinery run, the manufacture of a product, or a blend of material in a tank.

A monthly report by the supplier containing Specification Compliance Test results for each RA LOT shall be submitted by the supplier in electronic format using the form provided by the Department to the State Materials Office within seven days following the end of the calendar month. Copies of these monthly reports and supporting test reports shall be available at the supply location for a minimum of three years.

916-2.3 Certification and Verification: The supplier shall furnish certification on the bill of lading for each shipment of recycling agent delivered to a Department project that includes: the quantity, the RA target viscosity, the RA LOT designation, customer name, delivery location, a statement that the RA is in conformance with 916-2, and the quantity of silicone and anti-strip agent addition, as applicable, including product designation (QPL number as applicable).

The Department may sample and test recycling agents from the suppliers storage tank, the delivery vehicle, and/or Contractors storage tank to verify and determine compliance with this and other specification requirements. Where these tests identify material outside specification requirements, the State Materials Engineer may require the supplier to cease shipment of RA binder from that RA LOT(s). Further shipment of RA binder from that RA

LOT(s) to Department projects may remain suspended until the cause of the problem is evaluated and corrected by the supplier as necessary to the satisfaction of the State Materials Engineer.

916-3 Cut-Back Asphalts.

916-3.1 Requirements: Rapid-curing, cut-back asphalt shall conform with the requirements of AASHTO M 81, except that the penetration range shall be from 60-120 instead of 80-120.

For Grade RC-3000, in addition to the requirements shown in Table 1 of AASHTO M 81 the following values shall be added to the requirements for Distillation Test:

Distillate, Percentage by Volume of Total Distillate to 680ºF	Grade RC-3000 Maximum
to 320ºF	0
to 374ºF	10
to 437ºF	40

All other requirements for the distillation test (and for other properties included in the table) shall be as shown in Table 1 of AASHTO M 81.

Medium-curing, cut-back asphalt shall conform with the requirements of AASTHO M 82.

916-3.2 Sampling, Certification, and Verification: Sampling of cut-back asphalts shall be done in accordance with AASHTO T 40. For each tank of cut-back asphalt delivered to or prepared at the asphalt terminal, the asphalt supplier shall submit a sample to the State Materials Office for testing before use. A pretest number will then be assigned by the State Materials Office which shall be furnished with all cut-back asphalt delivered to the project. The pretest number shall be valid for three months from the date of issue.

The Department may sample and test pre-tested cut-back asphalt from the suppliers storage tank, the Contractor's transport tank and/or distributor to verify and determine compliance with this and other specification requirements. Where these tests identify material outside specification requirements, the State Materials Engineer may require the supplier to cease shipment of that pretested cut-back asphalt product. Further shipment of that pretested cut-back asphalt product to Department projects may remain suspended until the cause of the problem is evaluated and corrected by the supplier as necessary to the satisfaction of the State Materials Engineer.

916-4 Emulsified Asphalts.

916-4.1 Requirements: Anionic Emulsified Asphalt shall meet the requirements of AASHTO M 140 with the exception that the cement mix test will be waived when the asphalt is used in non-mix application, such as tack coats and primes. Cationic Emulsified Asphalt shall meet the requirements of AASHTO M 208. Additional emulsions permitted by specifications shall meet the following requirements:

HIGH FLOAT EMULSIONS		
Test	Conditions	Asphalt Emulsion Grade AE-60
		Minimum/Maximum

Tests on Emulsion:		
Saybolt Furol Viscosity	122ºF	75/400 seconds
Settlement	5 days (a)	maximum 5%
Storage Stability	24 hour (b)	maximum 1%
Sieve Test		maximum 0.10%
Demulsibility	50 mL $CaCl_2$ 0.10 N	minimum 75%
Residue by Distillation		minimum 65%
Oil Portion	500ºF. Dist.	maximum 1% by volume
Tests on Residue:		
Penetration (0.1 mm)	77ºF, 100 g, 5 seconds	minimum 40
Absolute Viscosity	140ºF	minimum 3,200 poise
Ductility	77ºF, 50 mm/minute	minimum 400 mm
Float Test	140ºF	minimum 1,200 seconds
Solubility	in Trichloroethylene	minimum 97.5%

Test	Conditions	Asphalt Emulsion Grade AE-90
		Minimum/Maximum
Tests on Emulsion:		
Saybolt Furol Viscosity	122ºF	75/400 seconds
Settlement	5 days (a)	maximum 5%
Storage Stability	24 hour (b)	maximum 1%
Sieve Test		maximum 0.10%
Demulsibility	50 mL $CaCl_2$ 0.10 N	minimum 75%
Residue by Distillation		minimum 65%
Oil Portion	500ºF. Dist.	maximum 2% by volume
Tests on Residue:		
Penetration (0.1 mm)	77ºF, 100 g, 5 seconds	minimum 70
Absolute Viscosity	140ºF	minimum 1,600 poise
Ductility	77ºF, 50 mm/minute	minimum 400 mm
Float Test	140ºF	minimum 1,200 seconds
Solubility	in Trichloroethylene	minimum 97.5%

Test	Conditions	Asphalt Emulsion Grade AE-150
		Minimum/Maximum
Tests on Emulsion:		
Saybolt Furol Viscosity	122ºF	75/400 seconds
Settlement	5 days (a)	maximum 5%
Storage Stability	24 hour(b)	maximum 1%
Sieve Test		maximum 0.10%
Demulsibility	50 mL $CaCl_2$ 0.10 N	minimum 75%

Residue by Distillation		minimum 65%
Oil Portion	500ºF. Dist.	maximum 3% by volume
Tests on Residue:		
Penetration (0.1 mm)	77ºF, 100 g, 5 seconds	minimum 125
Absolute Viscosity	140ºF	minimum 800 poise
Ductility	77ºF, 50 mm/minute	minimum 400 mm
Float Test	140ºF	minimum 1,200 seconds
Solubility	in Trichloroethylene	minimum 97.5%

Test	Conditions	Asphalt Emulsion Grade AE-200
		Minimum/Maximum
Tests on Emulsion:		
Saybolt Furol Viscosity	122ºF	minimum 45 seconds
Settlement	5 days (a)	maximum 5%
Storage Stability	24 hour (b)	maximum 1%
Sieve Test		maximum 0.10%
Demulsibility	50 mL $CaCl_2$ 0.10 N	minimum 75%
Residue by Distillation		minimum 62%
Oil Portion	500ºF. Dist.	maximum 8% by volume
Tests on Residue:		
Penetration (0.1 mm)	77ºF, 100 g, 5 seconds	minimum 150
Absolute Viscosity	140ºF	minimum 400 poise
Ductility	77ºF, 50 mm/minute	
Float Test	140ºF	minimum 1,200 seconds
Solubility	in Trichloroethylene	minimum 97.5%
(a) The test requirement for settlement may be waived when the emulsified asphalt is used in less than five days. (b) The 24-hour (one day) storage stability test may be used instead of the five day settlement test.		

SPECIAL MS-EMULSION		
Test	Conditions	Minimum/Maximum
Tests on Emulsion:		
Saybolt Furol Viscosity	77ºF	minimum 45 seconds
Storage Stability	24 hour	maximum 1%
Sieve Test	50 mL $CaCl_2$ 0.10 N	maximum 0.10%
Demulsibility		minimum 65%
Residue by Distillation		minimum 62%
Naphtha Content	500ºF. Dist.	maximum 8% by volume
Tests on Residue:		
Penetration (0.1 mm)	77ºF, 100 g, 5 seconds	minimum 50
Ductility	77ºF, 50 mm/minute	minimum 400 mm
Absolute Viscosity	140ºF	minimum 800 poise
Solubility	in Trichloroethylene	minimum 97.5%
Maximum application temperature shall be 170ºF.		

EMULSIFIED ASPHALT GRADE CRS-2H		
Test	Conditions	Minimum/Maximum
Tests on Emulsion:		
Saybolt Furol Viscosity	122ºF	100/400 seconds
Settlement	5 days (a)	maximum 5%
Storage Stability	24 hour (b)	maximum 1%
Demulsibility	35 mL 0.8% Sodium Dioctyl Sulfosuccinate (c)	minimum 40%
Particle Charge		positive
Sieve Test		maximum 0.1%
Residue		minimum 65%
Tests on Residue:		
Penetration (0.1 mm)	77ºF, 100 g, 5 seconds	80/140
Ductility	77ºF, 50 mm/minute	minimum 400 mm
Solubility	in Trichloroethylene	minimum 97.5%

(a) The test requirement for settlement may be waived when the emulsified asphalt is used in less than five days.
(b) The 24-hour (one day) storage stability test may be used instead of the five day settlement test.
(c) The demulsibility test shall be made within 30 days from date of shipment.

ASPHALT EMULSION PRIME (AEP)		
Test	Conditions	Minimum/Maximum
Tests on Emulsion:		
Saybolt Furol Viscosity	77ºF	20/150 seconds
Settlement	5 days (a)	maximum 5%
Storage Stability	24 hour (b)	maximum 1%
Sieve Test		maximum 0.1%
Residue		minimum 55%
Naphtha Content	500ºF. Dist	maximum 12% by volume
Tests on Residue:		
Penetration (0.1 mm)	77ºF, 100 g, 5 seconds	40/200
Ductility	77ºF, 50 mm/minute	minimum 400 mm
Solubility	in Trichloroethylene	minimum 97.5%

(a) The test requirement for settlement may be waived when the emulsified asphalt is used in less than five days.
(b) The 24-hour (one day) storage stability test may be used instead of the five day settlement test.

ASPHALT EMULSION GRADE RS-1h		
Test	Conditions	Minimum/Maximum
Tests on Emulsion:		
Saybolt Furol Viscosity	77ºF	20/100 seconds
Storage Stability	24 hour	maximum 1%
Demulsibility	35 mL 0.02N $CaCl_2$ (a)	minimum 60%
Sieve Test		maximum 0.10%
Residue by Distillation		minimum 55%
Naphtha Portion	500ºF. Dist (b)	maximum 3% by volume

Tests on Residue From Distillation Test:		
Penetration (0.1 mm)	77ºF, 100 g, 5 seconds	minimum 60
Viscosity	140ºF	minimum 1,600 poise
Ductility	77ºF, 50 mm/minute	minimum 400 mm
Solubility	in Trichloroethylene	minimum 97.5%

(a) The demulsibility test shall be made within 30 days from the date of shipment.
(b) When RS-1H has been modified to include naphtha, the 24-hour storage stability test will be waived.

EMULSION PRIME (RS TYPE)		
Test	Conditions	Minimum/Maximum
Tests on Emulsion:		
Saybolt Furol Viscosity	77ºF	minimum 75 seconds
Storage Stability	24 hour	maximum 1.0%
Sieve Test		maximum 0.1%
Naphtha Content		5/15% by volume
Residue		minimum 55%
Tests on Residue:*		
Penetration (0.1 mm)	77ºF, 100 g, 5 seconds	minimum 50
Viscosity	140ºF	minimum 800 poise
Solubility	in Trichloroethylene	minimum 97.5%

* Residue by distillation shall be in accordance with AASHTO T 59 except that the maximum temperature shall be 329 ± 10ºF [165 ± 5ºC] and the sample shall be maintained at this temperature for 20 minutes.

EPR-1 PRIME (e)		
Tests	Conditions	Minimum/Maximum
Tests on Emulsion:		
Saybolt Furol Viscosity	77ºF	6/24 seconds
Sieve Test (a)		maximum 0.1%
Residue by Distillation (b)		minimum 20%
Particle Charge Test (c)		positive
Test on Residue: (d)		
Flash Point	COC	minimum 410ºF
Viscosity	140ºF	600/1000 cSt

(a) Distilled water shall be used in place of 2% sodium oleate solution.
(b) Residue by distillation shall be in accordance with AASHTO T 59 with the exception that a 50 g sample is heated to 300ºF [149ºC] until foaming ceases, then cooling immediately and calculating results.
(c) Caution: this material has a positive particle charge, and therefore should not be mixed with materials having a negative particle charge.
(d) Residue by distillation shall be in accordance with AASHTO T 59 except that the maximum temperature shall be 329 plus or minus 10ºF [165 plus or minus 5ºC] and the sample shall be maintained at this temperature for 20 minutes.
(e) EPR-1 Prime shall not be diluted. In the event that EPR-1 Prime is not used in a 12 hour period, the material shall be thoroughly mixed by circulation or other suitable means prior to use.

EMULSIFIED ASPHALT GRADE CRS-1h		
Test	Conditions	Minimum/Maximum

Tests on Emulsion:		
Saybolt Furol Viscosity	77°F	20 – 100 seconds
Storage Stability	24 hour	maximum 1%
Demulsibility	35 ml 0.8% Sodium Dioctyl Sulfosuccinate (a)	minimum 60%
Sieve Test		maximum 0.10%
Residue by Distillation	500°F. Distillation	minimum 55%
Naphtha Portion	500°F. Distillation. (b)	maximum 3% by volume
Particle charge		positive
Tests on Residue From Distillation Test:		
Penetration (0.1mm)	77°F, 100 g, 5 seconds	minimum 45
Viscosity	140°F	minimum 1600 poise
Ductility	77°F	minimum 400 mm
Solubility	in Trichloroethylene	minimum 97.5%
(a) The demulsibility test shall be made within 30 days from the date of shipment. (b) When CRS-1 has been modified to include naphtha, the 24 hour storage stability will be waived.		

EMULSIFIED ASPHALT GRADE NTSS-1hm		
Test	Conditions	Minimum/Maximum
Tests on Emulsion:		
Saybolt Furol Viscosity	77°F	20 – 500 seconds
Storage Stability	24 hour	maximum 1%
Settlement	5 days	maximum 5%
Residue by Distillation		minimum 50%
Naphtha Content	500°F. Distillation	maximum 1% by volume
Sieve Test		maximum 0.30% (a)
Tests on Residue From Distillation Test:		
Penetration (0.1mm)	77°F, 100 g, 5 seconds	maximum 20
Softening Point ASTM D 36		minimum 149°F
Dynamic Shear Rheometer AASHTO T 315	G* sin&, 186.8°F @ 10 rad/sec	minimum 1.00 kPa
Solubility	in Trichloroethylene	minimum 97.5%
(a) Sieve test may be waived if no application problems are present in the field.		

916-4.2 Sampling, Certification, and Verification: For each tank of emulsified asphalt delivered to or prepared at the asphalt terminal, the asphalt supplier shall submit a sample to the State Materials Office for testing before use. A pretest number will then be assigned by the State Materials Office which shall be furnished with all emulsified asphalt delivered to the project. The pretest number shall be valid for three months from the date of issue.

The Department may sample and test pretested emulsified asphalt from the suppliers storage tank, the Contractors transport tank and/or distributor to verify and determine compliance with this and other specification requirements. Where these tests identify material outside specification requirements, the State Materials Engineer may require the supplier to cease shipment of that pretested emulsified asphalt product. Further shipment of that pretested emulsified asphalt product to Department projects may remain suspended until the cause of the

problem is evaluated and corrected by the supplier as necessary to the satisfaction of the State Materials Engineer.

916-5 Liquid Anti-strip Agents.

916-5.1 Requirements: Liquid anti-strip agents shall be tested in accordance with FM 5-508. Tensile strength ratios will be calculated for the following two conditions and expressed as percentages: 1) conditioned mixture without anti-strip to unconditioned mixture without anti-strip and 2) conditioned mixture with anti-strip to unconditioned mixture without anti-strip. A 20% gain in tensile strength ratio for condition 2 as compared to condition 1 shall be required.

916-5.2 Qualified Products List: Liquid anti-strip agents supplied under this Specification shall be one of the products included on the Qualified Products List (QPL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6 and include a report of test results from an independent laboratory confirming the material meets the requirements of this section. In lieu of submitting test results from an independent laboratory, the Department will evaluate the material. For each liquid anti-strip agent, the supplier will submit to the State Materials Office one pint of a representative sample of liquid anti-strip agent when submitting the QPL application to the Department's Product Evaluation Section.

Any marked variation from the original test values for a material below the established limits or evidence of inadequate quality control or field performance of a material will be considered sufficient evidence that the properties of the material have changed, and the material will be removed from the Qualified Products List.

916-5.3 Mix Design Verification: Inclusion of a liquid anti-strip agent on the QPL does not guarantee that the anti-strip will be approved for use in an asphalt mixture. Specifications may require subsequent moisture susceptibility testing per FM 1-T 283 for the particular mix design. Results from this testing may indicate the need for a larger dosage rate of anti-strip agent (up to 0.75% maximum) or a different anti-strip agent to meet the specification requirements.

919 GROUND TIRE RUBBER FOR USE IN ASPHALT RUBBER BINDER. (REV 6-22-09) (FA 6-25-09) (1-10)

ARTICLE 919-3 (Page 843) is deleted and the following substituted:

919-3 Physical Requirements.

The physical properties of the ground tire rubber shall be determined in accordance with FM 5-559, and shall meet the following requirements:

Specific Gravity ..... 1.06 to 1.20
Moisture Content .....Maximum 0.75%
Metal Contaminants .....Maximum 0.01%

Gradation - The gradation shall meet the limits shown in Table 919-1 for the type of rubber specified.

Table 919-1 Gradations of Ground Tire Rubber			
Sieve Size % Passing	Type A	Type B	Type C
No. 16	---	---	100
No. 30	---	100	70-100
No. 50	100	40-60	20-40
No. 100	50-80	---	---

921 PORTLAND CEMENT AND BLENDED CEMENT.
(REV 10-21-10) (FA 1-4-11) (7-11)

ARTICLE 921-1 (Page 845) is deleted and the following substituted:

921-1 General.

921-1.1 Type of Cement: Cement shall conform to the requirements of the following AASHTO designations except where a particular type of cement is specified on the plans or Specifications, and as specifically restricted in Section 346, cement may be Types I, II, II (MH), III, IV, V (AASHTO M-85), or IP, IP (MS), IS (AASHTO M-240). Different brands of cement, cement of the same brand from different facilities, or different types of cement shall be stored separately and shall not be mixed.

921-1.2 Alkali Content: Only Portland cement containing a maximum of 0.60% alkali, or less, calculated as Na_2O (% Na_2O plus 0.658% K_2O), may be used with no further testing. When tests performed in accordance with ASTM C-33 X1.3 on coarse and fine aggregate indicate the aggregate to be non-reactive to alkalis, cements exceeding 0.60% alkali is allowed.

921-1.3 Heat of Hydration: The cement heat of hydration for Type II (MH) shall be 80 cal/g or less at seven days in accordance with ASTM C-186.

923 WATER FOR CONCRETE.
(REV 5-20-10) (FA 6-9-10) (1-11)

SECTION 923 (Pages 848 - 849) is deleted and the following substituted:

SECTION 923
WATER FOR CONCRETE

923-1 General Requirements.

Water for use with cement shall be clear and free from oil, and injurious amounts of acid, alkali, chlorides, organic matter, and other deleterious substances. It shall not be salty or brackish. If it contains quantities of substances which discolor it or make it smell or taste unusual or objectionable or cause suspicion, it shall not be used unless approved by the Department. Water sources permitted include potable water supplies that are approved by a public health

department, open bodies of water, well water, reclaimed water, and recycled water. Reclaimed water shall be as defined in Chapter 62-610, F.A.C. Open bodies of water are defined as naturally occurring rivers, lakes, and ponds. Recycled water includes wash water from mixer washout operations (stored in a lined settling pond). All other sources of water not listed above shall be considered recycled and reclaimed water. Recycled and reclaimed may be used only to sprinkle the coarse aggregate stockpiles and for batching concrete meeting the requirements of Section 347.

923-2 Evaluation of Water for Concrete.

923-2.1 General: Water from potable water supplies approved by a public health department may be used without additional testing. The concrete producer shall provide test data of water samples from other sources. To determine chemical properties, use a laboratory accredited by the National Environmental Laboratory or Construction Materials Engineering Council Accreditation Program. To determine physical properties, use a laboratory accredited by the Construction Materials Engineering Council Accreditation Program or Cement and Concrete Reference Laboratory.

923-2.2 Initial Sampling and Testing Frequency: Open bodies of water and well water shall be initially sampled once prior to use. Recycled and reclaimed water shall be tested once per week for four weeks initially, and thereafter once per month for four months prior to its use, provided that the results of the test samples comply with all the applicable limits. Failing test results will result in restarting initial sampling and testing.

923-2.3 Production Sampling and Testing Frequency: Open bodies of water and recycled water shall be tested monthly. Well water and reclaimed water shall be tested once every three months. If the last eight consecutive well water and reclaimed water samples meet the requirements, then the sample frequency may be reduced to one sample every six months, as approved by the Department. If a well water or reclaimed water sample fails once the frequency has been reduced, then the sampling frequency shall revert back to once every three months.

923-3 Chemical Requirements.

923-3.1 Testing: All chemical analysis or tests shall be performed in accordance with the test methods listed in Tables 1 and 2 or Standard Methods for the Examination of Water and Wastewater.

923-3.2 Recycled and Reclaimed Water: Recycled and reclaimed water shall be tested before use and shall not exceed the limits in Table 1:

Table 1		
Chemical Test	Test Method	Maximum (%)
Equivalent Alkalis as (Na_2O + 0.658 K_2O)	ASTM D 6919	0.06
Total Solids	AASHTO T 26	5.00
Total Chlorides as Cl^-	ASTM D 512	0.031
Total Sulfates as SO_4	ASTM D 516	0.30

923-3.3 Open Bodies of Water and Well Water: Open bodies of water and well water shall be tested before use and shall not exceed the limits of Table 2:

Table 2

Chemical Test	Test Method	Maximum (%)
Acidity or Alkalinity Calculated in terms of Calcium Carbonate	AASHTO T 26	0.05
Total Organic Solids	AASHTO T 26	0.05
Total Inorganic Solids	AASHTO T 26	0.08
Total Chlorides as Cl^-	ASTM D 512	0.031
Total Sulfates as SO_4	ASTM D 516	0.30

923-4 Physical Requirements for Mortar.

Mortar shall be tested in accordance with ASTM C 109 with the following exception: the mortar shall not be tested for flow. The mortar, composed of the sampled water, shall have a compressive strength of not less than 90% when compared to a mortar prepared using distilled water and tested at seven days.

Water of a questionable quality, as determined by the Department, shall be subject to the acceptance criteria for time of set as required by ASTM C 1602, Table 1.

926 EPOXY COMPOUNDS.

(REV 1-4-10) (FA 1-14-10) (7-10)

ARTICLE 926-1 (Pages 854 – 855) is deleted and the following substituted:

926-1 Types of Compounds.

Epoxy resin compounds for application to portland cement concrete, bituminous cement concrete, metals and other type surfaces shall be two-component systems of the applicable of the following types as designated.

Type	Description
A	An epoxy resin, for bonding fresh concrete to hardened concrete.
B	An epoxy resin adhesive, for bonding hardened concrete to hardened concrete and constructing doweled splices in precast prestressed concrete piles.
E	A fluid epoxy for crack injection in the repair of old structures.
F	An epoxy for repairing spalled areas on concrete bridge structures with these subtypes:
F-1	A non sagging gel type for vertical surfaces.
F-2	A pourable type for repairs where forms are to be used.
G	An epoxy for rebuilding expansion joints and associated wearing surfaces.
H	An epoxy for structural bonding where asphalt overlays are to be in contact with the hardened compound.
I	An epoxy for filling small holes in concrete such as lifting bolt cut-outs on beams, etc.
J	An epoxy for installing rebar and anchor bolts into hardened concrete.
K	An epoxy for underwater sealing of the bottom of the jacket of an integral pile jacket system.
L	An epoxy for coating the interior of sewage disposal tanks.
M	A coal tar epoxy coating for steel sheet piles and H piles (water immersion).
N	An epoxy for preparing mortars and concrete for patching portland cement concrete pavement.
Q	An epoxy for use in post tensioning anchorage protection systems.

Type	Description
T	Hot applied coal tar epoxy tape.

SUBARTICLE 926-2.2 (Page 855) is deleted and the following substituted:

926-2.2 Qualified Products List: All epoxy materials shall be one of the products listed on the Department's Qualified Products List (QPL). Manufacturers seeking evaluation of their products shall submit product data sheets, performance test reports from an independent laboratory showing the product meets the requirements of this section, an infrared identification curve (2.5 to 15 μm) and a QPL application in accordance with Section 6. Information on the QPL application must identify the epoxy type.

Products may only be used for applications recommended by the manufacturer.

929 POZZOLANS AND SLAG.
(REV 12-17-10) (FA 1-3-11) (7-11)

ARTICLE 929-2 (Pages 861 – 862) is expanded by the following:

929-2 Fly Ash.

929-2.1 General: Sampling and testing of fly ash shall follow the requirements of ASTM C-311. Fly ash shall not include the residue resulting from the burning of municipal garbage or any other refuse with coal, or the burning of industrial or municipal garbage in incinerators.

929-2.2 Fly Ash (Class F): Fly ash derived from the combustion of ground or powdered coal shall meet the requirements of ASTM C-618 Class F fly ash.

929-2.2.1 Petroleum Coke Class F: Fly ash resulting from the combustion of coal and petroleum coke shall meet the physical and chemical requirements of ASTM C-618 Class F fly ash. When petroleum coke Class F fly ash is used in concrete, the test results shall verify improved or comparable strength, sulfate resistance, corrosion protective properties and other durability requirements of concrete, as compared to ASTM C-618 Class F fly ash concrete. The strength and durability tests of concrete shall be performed in accordance with ASTM C-39, ASTM C-157, ASTM C-1012, ASTM C-1202, ASTM G-109, FM 5-516 and FM 5-522.

929-2.2.2 Bark Ash Class F: Fly ash resulting from the combustion of timber bark ash and coal shall meet the physical and chemical requirements of ASTM C-618 Class F fly ash. When bark ash is used in concrete, the strength and durability of the bark ash concrete shall be improved or comparable to the strength and the durability properties of ASTM C-618 Class F fly ash concrete. The tests shall be performed as specified in 929-2.2.1.

929-2.3 Fly Ash (Class C): Fly ash derived from the combustion of ground or powdered coal shall meet the requirements of ASTM C-618 Class C fly ash. When Class C fly ash is used in concrete, the test results shall verify improved sulfate resistance and improved or comparable corrosion protective properties, as compared to ASTM C-618 Class F fly ash concrete. The durability tests of concrete shall be performed in accordance with FM 3-C-1012.

929-2.4 Exceptions: Fly ash shall not be used in conjunction with Type IP or Type IS cements.

929-2.5 Acceptance Testing of Fly Ash: Acceptance of fly ash from sources operating under an approved quality control plan shall be based on the monthly certified test report meeting the chemical and physical requirements of ASTM C-618. When the loss on ignition exceeds 5%, the Supplementary Optional Physical Requirements shall be mandatory except that the Effectiveness in Controlling Alkali-Silica Reaction will not be required. An approved laboratory shall perform the monthly quality control tests and a copy of their certified test reports shall be sent to the State Materials Office when the material is in use on Department projects. The certification shall indicate that the fly ash meets the requirements of this Specification. Also, the corresponding samples along with certified test reports shall be submitted to the Department, upon request.

SUBARTICLE 929-3.2 (Page 862) is deleted and the following substituted:

929-3.2 Acceptance Testing of Silica Fume: Acceptance of silica fume from sources operating under an approved quality control plan shall be based on certification that the material meets the requirements of ASTM C-1240 and this Specification.

SUBARTICLE 929-4.2 (Page 863) is deleted and the following substituted:

929-4.2 Acceptance Testing of Metakaolin: Acceptance of metakaolin from sources operating under an approved quality control plan shall be based on the monthly certified test report meeting the chemical and physical requirements of ASTM C-618 Class N, as modified herein. An approved laboratory shall perform the monthly quality control tests and a copy of their certified test reports shall be sent to the State Materials Office, when the material is in use on Department projects. Also, the corresponding samples along with certified test reports shall be submitted to the Department, upon request. The certification shall indicate that the metakaolin meets the requirements of this Specification.

SUBARTICLE 929-6.3 (Page 864) is deleted and the following substituted:

929-6.3 Acceptance Testing of Ultra Fine Fly Ash: Acceptance of fly ash from sources operating under an approved quality control plan shall be based on the monthly certified test report meeting the chemical and physical requirements of ASTM C-618. When the loss on ignition exceeds 2.0%, the Uniformity Requirements in the Supplementary Optional Physical Requirements shall be mandatory. An approved laboratory shall perform the monthly quality control tests and a copy of their certified test reports shall be sent to the State Materials Office when the material is in use on Department projects. The certification shall indicate that the fly ash meets the requirements of this Specification. Also, the corresponding samples along with certified test reports shall be submitted to the Department, upon request.

931 METAL ACCESSORY MATERIALS FOR CONCRETE PAVEMENT AND CONCRETE STRUCTURES.

(REV 7-11-11) (FA 8-10-11) (1-12)

SECTION 931 (Pages 875 – 877) is deleted and the following substituted:

SECTION 931
METAL ACCESSORY MATERIALS FOR CONCRETE PAVEMENT AND CONCRETE STRUCTURES

931-1 Reinforcement Steel (for Pavement and Structures).

931-1.1 Steel Bars: Unless otherwise shown in the plans, billet steel bars for concrete reinforcement shall conform to the requirements of ASTM A-615 Grade 60 except that the process of manufacture will not be restricted. For processes not included in ASTM A-615 the phosphorus content will be limited to 0.08%.

The following special requirements shall apply:

(1) Unless otherwise specified or shown on the plans all reinforcement bars No. 3 and larger shall be deformed bars.

(2) All billet-steel bars shall be of the grade called for on the plans.

(3) Twisted bars shall not be used.

(4) Wherever in the Specifications the word "purchaser" appears it shall be taken to mean the Department.

Acceptance of reinforcing steel shall be based on test samples taken randomly by the Department and manufacturer's certified mill analysis of test results meeting the specification limits of the ASTM or AASHTO designation for the particular size, grade and any additional requirements. Randomly taken test samples and certification of test values, representing each production LOT of reinforcing steel, shall be provided to the Engineer for each Contract prior to use. Randomly taken test samples shall be cut from bundled steel that is shipped to the jobsite.

931-1.2 Welded Wire Reinforcement: Welded wire reinforcement shall meet the requirements of AASHTO M-55.

Welded deformed wire reinforcement shall meet the requirements of AASHTO M-221.

Wherever the word "purchaser" is used it shall mean the Department.

931-2 Metal Materials for Joints in Concrete Pavement.

931-2.1 Sheet Metal Bottom Strips: The sheet metal strip for protecting the bottom and side edges of transverse expansion joints shall be composed of galvanized sheet metal of 0.0157 inch minimum thickness and shall conform to the requirements of ASTM A-653. The sheets shall be furnished in accordance with the dimensions shown on the plans. They may be in one continuous piece, or spliced. When splicing is used the metal shall be lapped not less than 3 inches and securely fastened, by welding or otherwise, in such manner as to leave the spelter undamaged and produce a smooth sliding surface in contact with the pavement slab. The splices shall be spaced not less than 10 feet apart and not less than 5 feet from either end. The complete sheet shall not vary from a straight line by more than 1 inch from end to end.

The Contractor shall provide the Engineer a certified mill analysis from the manufacturer of the sheet metal bottom strips including test results for thickness, dimension,

grade, length, size, and spacing. Each certified mill analysis shall cover only one type of metal material for joints.

931-2.2 Bars and Chairs for Longitudinal Joints: Transverse reinforcing steel across the joint shall be deformed steel bars conforming to the requirements of 931-1.1 except that the bars may be any Grade shown in ASTM A-615.

These bars, and the chairs to hold them in place, shall be of the type and spacing as indicated on the plans.

931-2.3 Dowel Bars: Dowel bars shall be plain steel bars conforming to the requirements of ASTM A-615 for any Grade of steel shown. They shall be of the length, size and spacing as shown on the plans.

The Contractor shall provide the Engineer a certified test report from the manufacturer of the dowel bars confirming that the requirements of this Section are met. The certified test report shall conform to the requirements of Section 6 and include metallurgical mill analysis, grade, length and size. Each certification shall cover only one LOT for dowel bars.

931-2.4 Chairs and Metal Expansion Caps: The chairs and metal expansion caps shall be of an approved type as shown on the plans.

Dowel bars for expansion joints shall have a metal cap on one end so placed to provide ample space for movement of the slab. Continuous sleeves covering one half of the length of the bar will not be permitted. Other fasteners may be approved. Dowel bars shall be coated with an approved material to break the bond.

931-3 Metal Dowel Bar Assemblies for Joints in Concrete Pavement.

931-3.1 Qualified Products List: The dowel bar assembly used shall be a product included on the Qualified Products List.

Manufacturers or distributors seeking approval of their material in accordance with this specification shall demonstrate the performance of their products in accordance with the requirements in 931-3.2 thru 931-3.6.

931-3.2 Rigidity: The dowel bars shall be supported by an approved welded assembly possessing sufficient rigidity to hold the dowel bars in position to such accuracy that error or deviation from its required position in any bar in the entire installation after the pavement has been finished shall be no greater than 1/2 inch.

The assembly shall have continuous parallel spacer bars and two continuous parallel bearing members of no less than 1/4 inch diameter wire. One spacer bar shall be located at or near each end of the dowel. Alternate ends of dowels shall be welded to a spacer bar in such a manner as to maintain the dowels parallel to each other and permit sliding movement in the joint.

The free ends of each dowel shall be retained securely in place by means of wire loops or metal tubes welded to the other spacer bar. An expansion cap shall be installed on one end of each bar if the dowels are being used in an expansion joint.

Suitable struts or ties shall be provided to hold the assembly in correct position during installation.

The assembly shall have an upright support welded to the spacer bar and continuous bearing member at the end of each dowel and a continuous bearing member.

If the upright support consists of a single vertical wire, the support shall be no less than 5/16 inch diameter wire. Otherwise, the support shall be no less than 1/4 inch in diameter.

931-3.3 Sand Plates: Sand plates, if required, shall be made from no less than 3/8 inch sheet steel. Each plate shall have no less than 0.1 ft^2 of bearing area. The plates shall be

furnished in sufficient number to provide uniform support for the complete assembly. They may be furnished separate from the assembly units or attached thereto by welding, suitable clips, or other approved means.

931-3.4 Welds: The welds of the assembly shall be made securely. A broken weld will be cause for rejection of the length of section of the assembly where it occurs.

931-3.5 Assembly Placement: When the dowel bar assembly is in place, it shall act as a rigid unit with each component part securely held in position relative to the other member of the assembly.

The entire assembly shall be held securely in place during placing, consolidating, and finishing the concrete by means of metal pins. Pins used on granular subbase or cold mixed bituminous stabilized subbase shall penetrate at least 12 inches below the dowel bar assembly. The pins shall be of no less than 1/4 inch diameter wire and shall be provided with a hook or arm welded to the pin in such a manner that it shall secure the assembly in place.

Nail securing systems may be used as an anchoring device on hot bituminous stabilized subbase. The nail shall be no less than 1/8 inch in diameter, no less than 2 inches in length and the nail head or attached washer shall be not less than 1/2 inch outside diameter. The nail shall be driven through both ends of a metal strap after it has been placed around one of the lower transverse bars on the dowel bar assembly.

At least eight pins or nails shall be used for each 12 foot section (a lane width) of assembly. Sand plates, if required, shall be drilled to receive the pins.

The Contractor shall provide the equipment and personnel necessary to verify dowel bar location after the concrete is placed and has received the initial screeding.

931-3.6 Materials: The wire for the welded assembly shall be in accordance with all applicable requirements of ASTM A-82.

Apply one coat of rust preventative compound meeting the requirements of 560-2.6. Apply the rust preventive in accordance with the manufacturer's recommendations.

932 NONMETALLIC ACCESSORY MATERIALS FOR CONCRETE PAVEMENT AND CONCRETE STRUCTURES – JOINT MATERIALS.

(REV 6-15-11) (FA 6-21-11) (1-12)

ARTICLE 932-1 (Pages 878 - 883) is deleted and the following substituted:

932-1 Joint Materials.

932-1.1 Preformed Joint Filler for Pavement and Structures: Preformed joint filler shall meet the requirements of AASHTO M-153 or AASHTO M-213, or cellulose fiber types meeting all the requirements of AASHTO M-213 (except for the asphalt content) is acceptable provided they contain minimums of 0.2% zinc borate as a preservative and 1.5% waterproofing wax. For AASHTO M-153, unless a particular type is specified, either Type I, Type II or Type III may be used.

Preformed joint fillers shall have a thickness equal to the width of the joint required, and shall be furnished in lengths equal to the widths of the slabs in which they are to be installed, except that strips which are of a length not less than the distance between longitudinal joints, or between longitudinal joint and edge, may be used if laced or clipped together in a manner approved by the Engineer. The depth and shape of the joint filler shall conform to the

dimensions shown in the plans. For doweled joints, proper provision shall be made for the installation of the dowels.

932-1.1.1 Certification: The Contractor shall provide the Engineer a certification conforming to the requirements of Section 6 from the manufacturer, confirming that the preformed joint filler meets the requirements of this Section.

932-1.2 Joint Sealer for Pavement and Structures:

932-1.2.1 General: This Specification covers joint sealer intended for use in sealing joints in asphaltic concrete pavement and portland cement concrete pavement. These materials may also be used to seal joints in portland cement concrete bridges and other structures.

932-1.2.2 Material: The joint sealant shall be composed of a mixture of materials, typically but not limited to bituminous based, that will melt when heated for application and then solidify to form a resilient and adhesive compound capable of sealing joints in portland cement concrete and/or asphaltic concrete against the infiltration of moisture and foreign materials throughout normal pavement conditions and at ambient temperatures. The manufacturer shall have the option of formulating the material according to their Specifications. However, the requirements delineated in this Specification shall apply regardless of the type of formulation used. The material shall cure sufficiently to not flow from the joint or be picked up by vehicle tires after 3 hours at 77°F. The material shall be capable of a uniform application consistency suitable for filling joints without the inclusion of large air holes or discontinuities and without damage to the material.

Materials for pavement joints shall be tested according to ASTM D 5329.

932-1.2.2.1 Physical Requirements of Joint Sealants for Portland Cement Concrete Only:

Parameter	Limits
Pour Point	At least 20°F lower than the safe heating temperature as stated by the manufacturer.
Cone-Penetration, Non-immersed at 77°F, 150 g, 5 s	Less than or equal to 90 mm
Flow at 140°F, 5 h	Less than or equal to 5.0 mm
Bond, Non-immersed, 0°F for 5 cycles*	No cracking, separation, or opening that at any point is over 1/4 inch deep, in the sealant or between the sealant and the substrate.
*The depth of a crack, separation or opening shall be measured perpendicular to the side of the sealant showing the defect. At least two test samples in a group of three representing a given sample of sealant shall meet this requirement.	

932-1.2.2.2 Physical Requirements of Joint Sealants for Portland Cement Concrete and/or Asphaltic Concrete:

Parameters	Limits
Pour Point	At least 20° lower than the safe heating temperature as stated by the manufacturer.
Cone-Penetration, Non-immersed at 77°F, 150 g, 5 s	Less than or equal to 90 mm
Flow at 140°F, 5 h	Less than or equal to 3.0 mm

Bond, Non-immersed, -20°F for 3 cycles, 50% extension*	No cracking, separation, or opening that at any point is over 1/4 inch deep, in the sealant or between the sealant and the substrate.
Resilience at 77°F	Recovery greater than or equal to 60%
Asphaltic Concrete Compatibility at 140°F	No failure in adhesion, formation of an oily exudates at the interface between the sealant and the asphaltic concrete, or softening or other deleterious effects on the asphaltic concrete or sealant.
*The depth of a crack, separation or opening shall be measured perpendicular to the side of the sealant showing the defect. At least two test samples in a group of three representing a given sample of sealant shall meet this requirement.	

932-1.2.3 Qualified Products List: The joint sealant materials used shall be one of the products listed on the Department's Qualified Products List (QPL). Manufacturers seeking evaluation of their products shall submit product datasheets, performance test reports from an independent laboratory showing the product meets the requirements of this section, and a QPL application in accordance with Section 6. Information on the QPL application must identify the sealant type.

932-1.2.4 Shipment: The material shall be delivered in containers plainly marked with the manufacturer's name or trademark product name, LOT number and date of expiration.

932-1.2.5 Bond Breaker Rod: The bond breaker rod shall be a closed cell, expanded polyethylene foam rod of the size and dimensions shown on the plans. It shall be compatible with the joint sealant and no bond or reaction shall occur between the rod and the sealant.

All bond breaker rods installed shall be covered by a sealant at the end of each work day.

Bond breaker tape approved by the sealant manufacturer may be used in lieu of bond breaker rod when sealing random cracks.

932-1.3 Low Modulus Silicone Sealant Materials:

932-1.3.1 Low Modulus Silicone Sealants: Silicone sealant shall be furnished in a one part or pre-measured two part formulation meeting the requirements specified herein.

Acetic acid cure sealants are not acceptable. A primer as specified in 932-1.4 for bonding sealant to concrete shall be used if required by the manufacturer. When a manufacturer's product is tested and approved by the Department using a primer, primer will be required for project installation.

Do not use Low Modulus Silicone Sealants Types A, B or C for bridge expansion joints.

Silicones shall be identified in the following manner:

Type A - A low modulus, non-sag (non-self-leveling) silicone formulation, used in sealing horizontal and vertical joints in cement concrete pavements and bridges (i.e., concrete-concrete joints). Tooling is required.

Type B - A very low modulus, self-leveling silicone formulation, used in sealing horizontal joints (including joints on moderate slopes) in cement concrete pavements and bridges (i.e., concrete-concrete joints). Tooling is not normally required.

Type C - An ultra-low modulus, self-leveling silicone formulation, used in sealing horizontal joints (including joints on moderate slopes) in cement concrete pavements and bridges (i.e., concrete-concrete joints). It can also be used to seal the joints

between cement concrete pavements and asphalt concrete shoulders (including asphalt-asphalt joints). Tooling is not normally required.

Type D - An ultra-low modulus, self-leveling silicone formulation, cold-applied, rapid-cure, used to seal expansion joints that experience both thermal and/or vertical movements. The material must cure by chemical reaction and not by evaporation of solvent or fluxing of harder particles. Tooling shall not be required. Use according to Design Standards, Index No. 21110.

932-1.3.2 Physical Requirements:

Silicone Sealant Type	Test Method	Type A	Type B	Type C	Type D
Flow	ASTM D 5893	No Flow			
Slump (maximum)	ASTM D 2202	0.3 inches			
Extrusion rate (minimum)	ASTM C 1183, Procedure A	20 ml/min	20 ml/min	20 ml/min	20 ml/min
Tack-free time at 77 ± 3ºF and 45 to 55% Relative Humidity	ASTM C 679	90 minutes maximum	180 minutes, maximum	60 minutes, maximum	30 – 60 minutes
Specific gravity	ASTM D 792, Method A	1.1 to 1.515	1.10 to 1.40	1.26 to 1.34	1.26 to 1.34
Durometer hardness, Shore A (Cured seven days at 77 ± 3ºF and 50 ± 5% Relative Humidity)	ASTM D 2240	10-25			
Durometer hardness, Shore 00 (Cured 21 days at 77 ± 3ºF and 50 ± 5% Relative Humidity)	ASTM D 2240		40-80	20-80	
Tensile stress	ASTM D 412 (Die C)	45 psi	40 psi	15 psi	

Silicone Sealant Type	Test Method	Type A	Type B	Type C	Type D
(maximum) at 150% elongation					
Elongation (Cured seven days at 77 ± 3ºF and 50 ± 5% Relative Humidity)	ASTM D 412 (Die C)	800% minimum			600% minimum
Elongation (Cured 21 days at 77 ± 3ºF and 50 ± 5% Relative Humidity)	ASTM D 412 (Die C)		800% minimum	1400% minimum	
Ozone and Ultraviolet Resistance	ASTM C 793	No chalking, cracking or bond loss after 5,000 hours, minimum.			
Bond to concrete mortar briquets (primed if required) (Cured seven days at 77 ± 3ºF and 50 ± 5% Relative Humidity)	AASHTO T-132	50 psi minimum			
Bond to concrete briquets (Cured 21 days at 77 ± 3ºF and 50 ± 5% Relative Humidity)	AASHTO T-132		40 psi minimum	35 psi minimum (includes bond to asphalt)	
Movement Capability	ASTM C 719	No adhesive or cohesive failure and adhesion, 10 cycles at -50 to +100%			No adhesive or cohesive

Silicone Sealant Type	Test Method	Type A	Type B	Type C	Type D
					failure and adhesion, 10 cycles at +100/-50 % (joints 2” wide)

Portland Cement Mortar: Briquets shall be molded and cured 28 days minimum in accordance with AASHTO T-132. Cured briquets shall be dried at 230 plus or minus 5ºF, sawed in half and bonded together with a thin section of sealant. After cure of sealant, briquets shall be tested in accordance with AASHTO T-132.

932-1.3.3 Field Cure: Six-inch samples of the sealant shall be taken by the Engineer from the joint at the end of a two week curing period and tested for durometer hardness (by Florida Method ANSI/ASTM D 2240), except that the requirements of a 1 inch sample width shall not apply. A minimum hardness of 7.0 is required as evidence of adequate cure.

932-1.3.4 Qualified Products List: The low modulus silicone sealant used shall be one of the products listed on the Department’s Qualified Products List. Manufacturers seeking evaluation of their products shall submit product datasheets, performance test reports from an independent laboratory showing the product meets the requirements of this section, an infrared identification curve (2.5 to 15 μm) and a QPL application in accordance with Section 6. Information on the QPL application must identify the sealant type.

932-1.3.5 Shipment: The material shall be delivered in containers plainly marked with the manufacturer’s name or trademark product name, LOT number and date of expiration.

932-1.3.6 Primer: When required by the manufacturer’s product, a primer shall be used.

The manufacturer shall perform quality control tests on each LOT of sealant primer material furnished to each project and furnish a certified report that each LOT of primer material furnished to a project meets his Company’s Specifications for that product and the primer is suitable for its intended use.

Sealant primer material shall be delivered in containers plainly marked with the manufacturer’s name or trademark and product name, LOT number and date of expiration.

932-1.3.7 Backer Rod and Tape Bond Breakers: Backer rods and tape shall be compatible with the joint sealant and approved by the sealant manufacturer. No bond or reaction shall occur between the rod and the sealant.

932-1.3.8 Installation: Installation, material selection, joint dimensions, bond breaker suitability (by type and project) shall be in agreement with the requirements of Design Standards, Index Nos. 305 and 21110. Any modifications or exceptions to these requirements shall be shown in the plans.

For new construction projects or general use where the joints to be sealed have uniform width, a closed cell, expanded polyethylene foam backer rod bond breaker shall be required. For rehabilitation projects and similar joint seals where the joints to be sealed have

irregular width, an open cell, expanded polyethylene foam backer rod bond breaker with an impervious skin shall be required.

The backer rod shall be compatible with the joint sealant. No bond or reaction shall occur between the rod and the sealant.

Tape bond breaker approved by the sealant manufacturer may be used in lieu of backer rod bond breaker when sealing joints and/or random cracks, as required.

Type D Silicone sealant shall be placed when the ambient temperature is rising and is between 55°F and 85°F and the temperature is expected to rise for the next three hours minimum to provide to adequate joint opening and compression of the sealant during curing.

All installed bond breakers shall be covered by sealant at the end of each work day.

A tolerance in cross-sectional height at midpoint of minus 1/16 to plus 3/16 inch will be allowed to the nominal values shown for each joint width on the plan sheet. The Engineer shall check one joint for each 1,000 feet of roadway by cutting out specimens. If the cross section of the cut specimen is out of the allowable range, additional specimens shall be taken as follows:

One joint every 100 feet of pavement, not to exceed 500 feet.

If the average of the specimens is out of tolerance, the Contractor shall remove and replace the entire 500 feet section at no additional expense to the Department.

Installation tolerance shall be verified at 1,000 feet intervals.

932-1.4 Pre-cured Silicone Sealant:

932-1.4.1 General: Pre-cured silicone sealants are intended for sealing vertical joints on concrete surfaces. Type V1 sealant is intended for contraction joints or joints with movements less than 1/4 inch. Type V2 sealant is intended for expansion joints not exceeding 200% of the nominal joint opening. Type V2 sealant may be substituted for Type V1 sealant. The joint sealant must be listed on the Department's Qualified Products List (QPL).

932-1.4.2 Physical Requirements: Sealant material shall be a nominal 1/16 inch thick, available in standard widths from 1 inch to 6 inches, colored to match the finish surface coating of the concrete, and meet the following minimum testing requirements:

TEST PROPERTY DESCRIPTION	TEST METHOD	TYPE V1	TYPE V2
Minimum Movement, Cohesion/Adhesion	ASTM C 1523	100%	200%
Dry/Room Temperature Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Water Immersion Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Frozen Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Heat Loss of Adhesion/Cohesion	ASTM C 1523	None	None
Artificial Weathering Loss of Adhesion/Cohesion	ASTM C 1523	None	None

TEST PROPERTY DESCRIPTION	TEST METHOD	TYPE V1	TYPE V2
Tear Propagation	ASTM C 1523	NT or PT (No Tear or Partial/Knotty Tear)	NT or PT (No Tear or Partial/Knotty Tear)
Ultimate Elongation	ASTM D 412	250%	500%

932-1.4.3 Qualified Products List: Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6. Applications must include test results, an infrared identification curve (2.5 to 15 μm), and a product data sheet with the recommended adhesive and installation requirements.

932-1.5 Compression Seals and Adhesive Lubricant

932-1.5.1 Preformed Elastomeric Compression Seals: Preformed Elastomeric Compression Seals shall meet the requirements of ASTM D 2628 except that immersion oil IRM 903 may be substituted for Oil No. 3 in the Oil Swell test procedure.

932-1.5.2 Compression Seal Adhesive Lubricant: Compression Seal Adhesive Lubricant shall meet the requirements of ASTM D 4070. The material shall be fluid from 5° to 120°F (-15° to 49°C).

932-1.5.3 Certification: The manufacturer shall provide a certified test report for each lot of material furnished to each project along with a statement certifying that the material conforms to this specification and identifying the project number and manufacturer's lot number.

932-1.5.4 Verification Samples: Provide verification samples in accordance with Section 6.

936 WIRE ROPE FOR FENDER PILE CLUSTER.
(REV 8-9-11) (1-12)

SECTION 936 (Page 889) is deleted.

937 POST-INSTALLED ANCHOR SYSTEMS FOR STRUCTURAL APPLICATIONS IN CONCRETE ELEMENTS.
(REV 8-5-11) (FA 8-10-11) (1-12)

SECTION 937 (Pages 889 – 891) is deleted and the following substituted:

SECTION 937
POST-INSTALLED ANCHOR SYSTEMS FOR STRUCTURAL APPLICATIONS IN CONCRETE ELEMENTS.

937-1 General.

Post-installed anchor systems intended for structural applications in concrete elements consist of adhesive-bonded anchor systems.

937-2 Qualified Products List (QPL).

Manufacturers of post-installed anchor systems may apply for inclusion of individual products on the Qualified Products List. The application shall be made in accordance with Section 6 and shall include certified test reports from an independent testing laboratory which shows the material system meets all the requirements of this Section.

937-3 Certification.

The Contractor shall provide the Engineer with certification from the manufacturer of the anchor system, confirming that the requirements of this Section are met. The certification shall conform to the requirements of Section 6. Each certification shall cover only one LOT of anchoring materials.

937-4 Adhesive Bonding Material Systems.

937-4.1 General: Adhesive bonding material systems for structural applications shall consist of pre-packaged 2-part chemical components. The material systems shall be specifically intended for use in structural applications for bonding anchors and dowels to hardened concrete. Applications are limited to anchors and dowels installed in positions ranging from vertically downward to horizontal.

Do not use material from containers which are damaged or have been previously opened. Use only full packages of components. Combining of adhesive bonding components from bulk supplies is not permitted.

Material systems shall be pre-packaged to automatically proportion and mix the materials for use. Manual proportioning of the components will not be permitted.

937-4.2 Minimum Performance Requirements (FM 5-568): When tested in accordance with FM 5-568, the adhesive bonding material system, for general use, shall meet the following requirements:

Uniform Bond Stress		
	Type HV	Type HSHV
Confined Tension	2,290 psi	3,060 psi
Damp-Hole Installation	1,680 psi	1,830 psi
Elevated Temperature	2,290 psi	3,060 psi
Horizontal Orientation	2,060 psi	2,060 psi
Short Term Cure	1,710 psi	1,710 psi
Specified Bond Strength	1,080 psi	1,830 psi
Maximum Coefficient of Variation for Uniform Bond Stress: 20%.		

Long Term Load (Creep):

(1) The rate of displacement shall decrease during the 42 day application of load.

(2) At 42 days the total displacement due to creep (with load still applied) shall be less than 0.03 inch and during the last 14 days of the 42 day load duration, the total displacement due to creep shall be less than 0.003 inch.

(3) After removal of the 42 day load, the uniform bond Stress from a subsequent Confined Tension Test shall not be less than 1,826 psi.

937-4.3 Product Identification (Fingerprint) Properties (FM 5-569): References for comparison including Infrared Absorption, Density or Average Weight, Gel Time or Setting Time, and Bond Strength shall be determined in accordance with FM 5-569.

937-4.4 Packaging and Marking: The adhesive bonding material system shall be delivered to the project site in original unopened containers with the manufacturer's label identifying the product. Each package shall be clearly marked with the following information:

Manufacturer's name and address
Product Name
Date of Manufacture
Expiration Date
LOT Identification Number
Storage and Handling Requirements

Each package shall include the manufacturer's instructions for anchor and dowel installation. The instructions shall include the following information:

Diameters of drilled holes for applicable anchor and dowel sizes.
Cleaning procedure for drilled holes, including a description of permitted and prohibited equipment and techniques.
Allowable temperature ranges for storage, installation and curing.
Identification of acceptable mixing/dispensing nozzles.
Fabrication requirements for anchors and dowels.
Description of tools permitted or required for installation.
Method of identifying properly proportioned and mixed adhesive materials.
Time and temperature schedule for initial set and full-strength cure.
Special requirements for special installation conditions such as damp holes, or horizontal or near horizontal orientation of the anchor or dowel.

948 MISCELLANEOUS TYPES OF PIPE.
(REV 5/19/10) (FA 6-9-10) (1-11)

SUBARTICLE 948-1.7 (Page 901) is deleted and the following substituted

948-1.7 Polyvinyl Chloride (PVC) Pipe (12 to 36 Inches): Polyvinyl Chloride (PVC) Pipe for side drain, cross drain, storm drain and other specified applications shall conform to AASHTO M-278 for smooth wall PVC pipe or ASTM F-949 for PVC ribbed pipe. Mitered end sections are not to be constructed of polyvinyl chloride. Use only concrete or metal mitered end sections as indicated in the Design Standards.

All pipe produced and shipped to the job site shall meet the requirements of 105-3.2.

SUBARTICLE 948-2.3 (Pages 901 – 904) is deleted and the following substituted:

948-2.3 Corrugated High Density Polyethylene Pipe (12 to 60 inches):

948-2.3.1 General: Class I (50 year) corrugated Polyethylene Pipe used for side

drain, storm and cross drain or french drain shall meet the requirements of AASHTO M-294. Class II Corrugated Pipe shall meet the requirements of AASHTO M-294 and the additional requirements as specified herein. Corrugations may only be annular. Ensure that pipe resin conforms to ASTM D-3350 minimum cell classification 435400C except that cell class 435400E may be used if the combination of color and UV stabilizer provides the same or better UV protection than that of resin cell class 435400C. Mitered end sections are not to be constructed of polyethylene. Use only concrete or metal mitered end sections as indicated in the Design Standards.

All pipe produced and shipped to the job site shall meet the requirements of 105-3.2.

948-2.3.2 Additional Requirements for Class II (100 Year), Type S Polyethylene Pipe Meet the following requirements:

Table 1

Stress Crack Resistance of Pipes

Pipe Location	Test Method	Test Conditions	Requirement
Pipe Liner	FM 5-572, Procedure A	10% Igepal solution at 122°F and 600 psi applied stress, 5 replicates	Average failure time of the pipe liner shall be ≥18.0 hours, no single value shall be less than 13.0 hours.
Pipe Corrugation[1], (molded plaque)	ASTM F-2136	10% Igepal solution at 122°F and 600 psi applied stress, 5 replicates	Average failure time shall be ≥24.0 hours, no single value shall be less than 17.0 hours.
Junction	FM 5-572, Procedure B and FM 5-573	Full Test[2,3]: Test at 3 temperature/stress combinations: 176°F at 650 psi 176 °F at 450 psi 158°F at 650 psi; 5 replicates at each test condition	Determine failure time at 500 psi at 73.4°F ≥ 100 years (95% lower confidence) using 15 failure time values[4]. The tests for each condition can be terminated at duration equal to or greater than the following criteria: 110.0 hr at 176°F 650psi 430.0 hr at 176°F 450 psi 500.0 hr at 158°F 650 psi
		Single Test[5]: Test temperature 176°F and applied stress of 650 psi.; 5 replicates	The average failure time must be equal to or greater than 110.0 hr

Table 1			
Longitudinal Profiles[6]	FM 5-572, Procedure C, and FM 5-573	Full Test[2,3]: Test at 3 temperature/stress combinations: 176°F at 650 psi 176 °F at 450 psi 158 °F at 650 psi; 5 replicates at each test condition	Determine failure time at 500 psi at 73.4°F ≥ 100 years (95% lower confidence) using 15 failure time values[4]. The tests for each condition can be terminated at duration equal to or greater than the following criteria: 110.0 hr at 176°F 650psi 430.0 hr at 176°F 450 psi 500.0 hr at 158°F 650 psi
		Single Test[5]: Test temperature 176°F and applied stress of 650 psi.; 5 replicates	The average failure time must be equal to or greater than 110.0 hr
Oxidation Resistance of Pipes			
Pipe Location	Test Method	Test Conditions	Requirement
Liner and/or Crown[7]	OIT Test (ASTM D-3895)	2 replicates (to determine initial OIT value) on the as manufactured (not incubated) pipe.	25.0 minutes, minimum
Liner and/or Crown[7]	Incubation test FM 5-574 and OIT test (ASTM D-3895)	Three samples for incubation of 195 days at 176°F[8] and applied stress of 250 psi. One OIT test per each sample	Average of 3.0 minutes[9, 10] (no values shall be less than 2.0 minutes)
Liner and/or Crown[7]	MI test (ASTM D-1238 at 190°C/2.16 Kg)	2 replicates on the as manufactured (not incubated) pipe.	< 0.4 g/10 minutes
Liner and/or Crown[7]	Incubation test FM 5-574 and MI test (ASTM D-1238 at 190°C/2.16 Kg)	2 replicates on the three aged sampled after incubation of 195 days at 176°F[8] and applied stress of 250 psi	MI Retained Value[10, 11, 12] shall be greater than 80% and less than 120%.

Table 1
Note: FM = Florida Method of Test. 1 Required only when the resin used in the corrugation is different than that of the liner. 2 A higher test temperature (194º F) may be used if supporting test data acceptable to the State Materials Engineer is submitted and approved in writing. 3 Full test shall be performed on alternative pipe diameter of pipe based on wall profile design, raw material cell classification, and manufacturing process. Full test must be performed on maximum and minimum pipe diameters within a manufacturing process. 4 Computer program to predict the 100 year SCR with 95% lower confidence can be obtained from FDOT. 5 Single test for the junction and longitudinal profile may be used on alternating pipe sizes within a manufacturing process. Single point tests may not be used on maximum and minimum pipe sizes within a manufacturing process except by approval of the Engineer. Single point tests may be used for quality assurance testing purposes. 6 Longitudinal profiles include vent holes and molded lines. 7 OIT and MI tests on the crown are required when resin used in the corrugation is different than that of the liner. 8 The incubation temperature and duration can also be 136 days at 185ºF. 9 Within each replicate set of tests, the discrepancy range shall be within 6%. If an out-of range discrepancy occurs, repeat the three OIT tests. 10 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. 11 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. 12 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.

Manufacturer may use ground class II, but not class I, pipe for reworked plastic.

948-2.3.3 Certification: Furnish to the Engineer certification from the manufacturer for each pipe diameter manufacturers LOT to be incorporated into the project that the pipe meets the requirements of these Specifications.

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 running the test methods for class II HDPE pipe. Submit the test reports to the State Materials Office.

948-2.3.4 Verification Samples: Furnish verification samples as directed by the Engineer.

ARTICLE 948-4 (Pages 905 – 906) is deleted and the following substituted:

948-4 Pipe Liner.

948-4.1 Cured-In-Place Pipe Liner: Cured-in-place pipe liner shall be continuous, resin impregnated, flexible tubing that meets the requirements of ASTM D-5813 and ASTM F-1216.

948-4.2 Deformed Pipe Liner: Deformed pipe liner shall be manufactured in an out of round state, usually collapsed circumferentially and folded on the long axis. After installation in a host pipe, the liner is rounded by means of heat and pressure to fit the host pipe. Deformed pipe liner, when installed, shall extend from one structure to the next in one continuous length with no intermediate joints.

(1) Polyethylene: Deformed polyethylene pipe liner shall meet the requirements of ASTM F-714 with a minimum cell classification of 335420c.

(2) Polyvinyl Chloride: Deformed polyvinyl chloride pipe liner shall meet the requirements of ASTM F-1504.

948-4.3 Discrete Pipe Liner: Discrete pipe liner shall be round, flexible or semi-rigid liner, manufactured in lengths that may be joined in a manhole or access pit before insertion in a host pipe.

(1) High Density Polyethylene Solid Wall: Discrete high density polyethylene pipe liner shall meet the requirements of ASTM F-714 or AASHTO M-326 and shall have a minimum of cell classification of 345464c.

(2) High Density Polyethylene Profile Wall: Discrete high density polyethylene pipe liner shall meet the requirements of AASHTO M-294 and shall have a minimum cell classification of 435400c.

(3) Polyvinyl Chloride: Discrete polyvinyl chloride pipe liner shall meet the requirements of ASTM F-794, ASTM F-949, or AASHTO M-304 and shall have a minimum cell classification of 12454.

(4) Fiberglass: Discrete fiberglass pipe liner shall meet the requirements of ASTM D-3262.

948-4.4 Spiral Wound Pipe Liner: Spiral wound pipe liner shall consist of coils of profile strips that are wound into a host pipe helically, after which a cementious grout is injected into the annular space between the liner and the host pipe, forming a rigid composite structure.

(1) Polyvinyl Chloride: Polyvinyl chloride spiral wound pipe liner shall meet the requirements of ASTM F-1697 or ASTM F-1735 and shall have a minimum cell classification of 12454.

948-4.4.1 Machine Spiral Wound Pipe Liner: Machine spiral wound pipe liner shall consist of a continuous one piece profile strip wound directly into the deteriorated pipelines. The liner can be installed in close fit to the host pipe, or alternatively installed at a fixed diameter. Where the liner is installed at a fixed diameter, the annular space between the spiral wound liner pipe and the existing pipe is grouted.

(1) Polyvinyl Chloride: Polyvinyl chloride machine spiral wound pipe liner shall meet the requirements of ASTM F-1697 and shall have a minimum cell classification of 12454.

948-4.5 Paneled Pipe Liner: Paneled pipe liner consists of custom-cut flat or curved panels that are formed to the inside circumference of a host pipe.

(1) Polyvinyl Chloride: Polyvinyl chloride paneled pipe liner shall meet the requirements of ASTM F-1735 and shall have a minimum cell classification of 12454.

948-4.6 Point Pipe Liner: Point pipe liner may consist of any materials covered by this specification when used to repair and rehabilitate an isolated portion of an existing storm drain pipe. Materials which are restricted (as primary components) to point repair are; steel, which shall meet the requirements of AASHTO M-167M, ASTM A-167, or ASTM A-240; aluminum, which shall meet the requirements of AASHTO M-196, and rubber; which shall meet the requirements of ASTM C-923.

948-4.7 Coated Pipe Liner: Coated pipe liner consists of liquid, slurry, foam or gel that is spread or sprayed over the interior surface of an existing pipe to rehabilitate it. Materials that may be used for coating are hydrophilic urethane gel, epoxy resin, polyester resin, gunite, shotcrete, low density cellular concrete, and cementious grout.

955 TIMBER TREATMENT (INCLUDING TREATING MATERIALS). (REV 2-2-11) (FA 4-11-11) (1-12)

SUBARTICLE 955-2.2 (Page 912) is deleted and the following substituted:

955-2.2 Above Ground or Ground Contact and Fresh Water Immersion Use: The treating of SYP lumber and timber for above ground or ground contact and fresh water immersion applications, shall be done with Copper Azole-Type B (CA-B), Copper Azole-Type C (CA-C), Amine Copper Quat-Type D (ACQ-D), or CCA, with the following exceptions:

Treatment of the wood products of the pedestrian bridges, wood rails at buildings or rest areas, and fence posts shall be done either with Copper Azole-Type B (CA-B), Copper Azole-Type C (CA-C), or Amine Copper Quat-Type D (ACQ-D).

ARTICLE 955-4 (Page 912) is deleted and the following substituted:

955-4 Requirements for Preservative Materials.

Amine Copper Quat-Type D (ACQ-D), Chromated Copper Arsenate (CCA), Copper Azole-Type B (CA-B), Copper Azole-Type C (CA-C), Ammoniacal Copper Zinc Arsenate (ACZA) shall be in accordance with AWPA P5.

ARTICLE 955-5 (Pages 912 – 913) is deleted and the following substituted:

955-5 Requirements for Retainment.

955-5.1 Piling: A minimum of 2.50 lb/ft^3 of CCA oxides shall be retained in zone 1, outer 0.50 inch, and 1.5 lb/ft^3 in zone 2, outer 0.50 to 2 inches.

If ACZA is used, a minimum of 2.50 lb/ft^3 shall be retained in zone 1, outer 0.50 inch, and 1.5 lb/ft^3 in zone 2, outer 0.50 to 2 inches.

955-5.2 Structural Timber and Sheet Piles: When installation is not in a salt (or brackish) water environment, the minimum retention shall be 0.60 lb/ft^3 of CCA or ACQ-D or 0.31 lb/ft^3 of CA-B or CA-C, as determined by cores from the outer 0.60 inch. When installation is in a salt (or brackish) water environment, a minimum of 2.50 lb/ft^3 of CCA oxides shall be retained in the outer 0.60 inch.

All guardrail material (timber posts, blocks, wedges, etc.) shall retain a minimum of 0.40 lb/ft^3 of CCA or ACQ-D; 0.21 lb/ft^3 of CA-B; or 0.15 lb/ft^3 of CA-C in the outer 1 inch zone.

955-5.3 Posts: Round/sawn timber fence posts shall retain a minimum of 0.40 lb/ft^3 of ACQ-D or 0.21 lb/f^{3}of CA-B or 0.15 lb/ft^3 of CA-C in the outer 1 inch zone.

955-5.4 Determination of Retention: Retention shall be determined by assay performed and certified by the treating company in accordance with the applicable AWPA standards.

962 STRUCTURAL STEEL AND MISCELLANEOUS METAL ITEMS (OTHER THAN ALUMINUM).

(REV 2-23-10) (FA 5-4-10) (1-11)

SUBARTICLE 962-1.2 (Page 914) is deleted and the following substituted:

962-1.2 Testing: For structural steel subjected to tensile stress used for main load-carrying members or components (as defined in Section 460), meet the ASTM A 709 impact test requirements for non-fracture and fracture critical tension components as specified in the Contract Documents. Meet the requirements for Zone 1 (Minimum Service Temperature 0ºF).

If not specified elsewhere in the Contract Documents, provide structural steel in accordance with ASTM A 709 requirements for non-fracture and fracture critical tension components as directed by the Engineer.

SUBARTICLE 962-8.2 (Page 916) is deleted and the following substituted:

962-8.2 Steel Sheet Piling: Provide steel sheet piles conforming to the requirements of ASTM A-328, ASTM A-572 or ASTM A-690.

SUBARTICLE 962-8.4.2 (Page 917) is deleted and the following substituted:

962-8.4.2 Testing: Structural steel tubing subjected to tensile stresses used in main load carrying members or components (as defined in Section 460) shall meet the impact test requirements of ASTM A 709 for non-fracture and fracture critical tension components for Zone 1. Minimum Average energy shall be: 15 ft-lbf at 70°F (non-fracture critical); or 25 ft-lbf at 70°F (fracture critical).

971 TRAFFIC MARKING MATERIALS.

(REV 7-21-11) (FA 7-22-11) (1-12)

SECTION 971 (Pages 922 - 936) is deleted and the following substituted:

SECTION 971
TRAFFIC MARKING MATERIALS

971-1 General Requirements.

971-1.1 Packaging and Labeling: All traffic marking materials shall be shipped in strong containers plainly marked with the weight in pounds per gallon, the volume of traffic marking materials content in gallons, the color, user information, date of manufacture, batch and DOT code number. Each batch manufactured shall have a unique number. A true statement of the percentage composition of the pigment, the proportion of pigment to vehicle, and the name and address of the manufacturer, also shall be shown. The label shall warn the user of any special

handling or precautions of the material, as recommended by the manufacturer. Any package not so marked will not be accepted for use under these specifications.

Preformed thermoplastic materials and permanent tape products shall be marked with content, color, date of manufacture and batch number.

971-1.2 Storage: Any traffic marking materials which, although inspected and approved at the point of manufacture, hardens or livers in the containers so that it cannot be readily broken up with a paddle to a smooth, uniform painting consistency, will be rejected. All materials shall have a container storage life of one year from date of manufacture. Any traffic marking materials not acceptable for proper application will be rejected, even though it conforms to these Specifications in all other respects.

971-1.3 Mixing: All paints shall be delivered to the project completely mixed, and ready to be used without additional oil or thinner. Gasoline shall not be used for thinner under any circumstances.

971-1.4 Qualified Products List: All traffic marking materials shall be one of the products listed on the Qualified Products List. Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6 accompanied by a copy of the infrared identification curve (2.5 to 15 μm) for the vehicle component. Products may only be used for applications recommended by the manufacturer. A notation of the number of coats and the thickness of each coat at which the product passes testing may be placed on the QPL. When listed, this will be the minimum criteria for application of the traffic marking material.

971-1. 5 Samples: Field samples will be obtained in accordance with the Department's Sampling, Testing and Reporting Guide Schedule.

971-1. 6 Color: Materials for pavement markings shall meet the following performance requirements.

The initial daytime chromaticity for yellow materials shall fall within the box created by the following coordinates:

Initial Daytime Chromaticity Coordinates (Corner Points)

	1	2	3	4
X	0.530	0.510	0.455	0.472
Y	0.456	0.485	0.444	0.400

The in-service daytime chromaticity for yellow materials shall fall within the box created by the following coordinates:

In-Service Daytime Chromaticity Coordinates (Corner Points)

	1	2	3	4
X	0.530	0.510	0.435	0.449
Y	0.456	0.485	0.429	0.377

The nighttime chromaticity for yellow materials shall fall within the box created by the following coordinates:

Nighttime Chromaticity Coordinates (Corner Points)

	1	2	3	4
X	0.575	0.508	0.473	0.510
Y	0.425	0.415	0.453	0.490

971-1.7 Additional Requirements: Traffic stripe materials shall be characterized as non-hazardous as defined by Resource Conservation and Recovery Act (RCRA) 40 CFR 261 and the material shall not exude fumes which are hazardous, toxic or detrimental to persons or property. Provide supporting independent analytical data or product Material Safety Data Sheets (MSDS) identifying nonhazardous designations.

Additionally, traffic stripe materials shall contain no more that 5.0 ppm lead by weight when tested in accordance with the RCRA reference above. Provide supporting independent analytical data.

971-2 Glass Spheres.

971-2.1 General Requirements: Glass spheres shall be of a composition designed to be highly resistant to traffic wear and to the effects of weathering for the production of a reflective surface, creating night visibility of the pavement markings without altering day visibility of the marking. The general requirements of 971-1 apply to glass spheres.

971-2.2 Specific Properties: The large (Type 3 or larger) glass spheres used for drop on beads shall have an adhesion coating. Type 1 glass spheres used for drop on beads shall have a dual coating. Beads used in the intermix of materials are not required to be coated.

The following physical requirements apply:

Property	Test Method	Specification
Roundness*	ASTM D 1155	Min: 70 % by weight
Roundness**	ASTM D 1155	Min: 80% by weight
Refractive Index*	Becke Line Method (25+/-5C)	1.5 minimum
Refractive Index**	Becke Line Method (25+/-5C)	1.9 minimum
*Type 1, 3, 4 and 5 beads **High Index beads		

Sieve Size	Percent by Mass Passing Designated Sieve (ASTM D 1214)				
	Grading Designation				
	Type 1 (AASHTO)	Type 3 (FP 96)	Type 4 (FP 96)	Type 5 (FP 96)	High Index
No. 8				100	
No. 10			100	95 – 100	
No. 12		100	95 – 100	80 – 95	
No. 14		95 – 100	80 – 95	10 – 40	
No. 16	100	80 – 95	10 – 40	0 – 5	100
No. 18		10 – 40	0 – 5	0 – 2	
No. 20	95 - 100	0 – 5	0 – 2		95 - 100
No. 25		0 – 2			
No. 30	75 – 95				55 - 85
No. 40					15 - 45

Sieve Size	Percent by Mass Passing Designated Sieve (ASTM D 1214)				
	Grading Designation				
	Type 1 (AASHTO)	Type 3 (FP 96)	Type 4 (FP 96)	Type 5 (FP 96)	High Index
No. 50	15 – 35				0 - 5
No. 80					
No. 100	0 – 5				

Provide the Engineer Certified test reports from the manufacturer confirming that all glass spheres conform to the requirements of this Section.

971-2.3 Sampling:

971-2.3.1 Sampling: A random 50 lb sample of glass spheres shall be obtained for each 50,000 lb shipped. Upon arrival, the quantity of material will be reduced in a sample splitter to a size of approximately 1 quart by the Engineer, or one 50 lb unopened bag.

971-2.3.2 Containers: The spheres shall be furnished in new 50 lb moisture-proof bags. All containers shall meet ICC requirements for strength and type and be marked in accordance with AASHTO 247 Part 5.

971-3 Standard Waterborne Fast Dry Traffic Paint.

971-3.1 General: Standard waterborne fast dry traffic paints intended for use under this Specification shall include water reducible products that are single packaged and ready mixed. Upon curing, these materials shall produce an adherent, reflective pavement marking capable of resisting deformation by traffic. The material shall have the capability of being cleaned and flushed from the striping machines using regular tap water and any required rust inhibitors. The manufacturer shall have the option of formulating the material according to his own specifications. However, the requirements delineated in this Specification and Section 710 shall apply regardless of the type of formulation used. The material shall be free from all skins, dirt and foreign objects.

971-3.2 Composition:

Component	Test Method	Criteria
Total Solids, by weight	ASTM D 2369	minimum 75%
Pigments, by weight	ASTM D 3723	minimum 57%
Vehicle Solids % of Vehicle*		minimum 40%
TiO_2, Type II Rutile (white paint only)	ASTM D 476	minimum 1.5 lb/gal
Volatile Organic Content, (VOC)	ASTM D 3960	maximum 150 g/L
*Vehicle Solids % of Vehicle = $\frac{\%\text{ total solids - }\%\text{ pigment}}{100 - \%\text{ pigment}}$		

971-3.3 Physical Requirements: The material shall meet the following criteria:

Property	Test Method	Minimum	Maximum
Density	ASTM D 1475	13.5 ± 1.4 lb/gal	-
Viscosity at 77ºF	ASTM D 562	80 KU	100 KU
Fineness of Grind	ASTM D 1210	3 (HS)	
Dry Opacity at 5 mils WFT	ASTM D 2805	0.92	-
Bleed Ratio	ASTM D 969	0.95	-
Flexibility	ASTM D 522 Method B	Pass	-
Abrasion Resistance	971-3.3.2	Pass	-

971-3.3.1 Set To Bear Traffic Time: The material shall set to bear traffic in not more than two minutes.

971-3.3.2 Abrasion Resistance: Test four samples per LOT using a Taber Abrader. The paint shall be applied to specimen plates using a drawdown blade having a clearance of 26 mils. Air dry each sample for 30 minutes and bake at 220ºF for 18 hours. Clean with a soft brush and weigh each sample. Abrade samples for 1,000 cycles with 500 g weights and CS-10 wheels. Clean the samples with a soft brush and weigh again. The average weight loss for the four plates shall not exceed 50 mg per plate.

971-3.3.3 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than 300 mcd/lx·m^2 and 250 mcd/lx·m^2. The retroreflectance of the white and yellow pavement markings at the end of the six month service life shall not be less than 150 mcd/lx·m^2.

971-3.4 Packaging and Labeling: The traffic paint shall be placed in 55 gallon open-end steel drums with a re-usable multi-seal sponge gasket. No more than 50 gallons of material shall be placed in any drum to allow for expansion during transport and storage.

971-4 Fast Dry Solvent Traffic Paint.

971-4.1 General: Fast dry traffic paints intended for use under this Specification shall include products that are single packaged and ready mixed. Upon curing, these materials shall produce an adherent, reflective pavement marking capable of resisting deformation by traffic. The manufacturer shall have the option of formulating the material according to his own specifications. However, the requirements delineated in this Specification and Section 710 shall apply regardless of the type of formulation used. The material shall be free from all skins, dirt and foreign objects.

971-4.2 Composition:

Component	Test Method	Criteria
Total Solids, by weight	ASTM D 2369	75% minimum
Pigments, by weight	ASTM D 3723	57% minimum
Vehicle Solids, % on Vehicle*		40% minimum
TiO_2, Type II Rutile (white paint only)	ASTM D 476	1.5 lb/gal minimum
Volatile Organic Content, (VOC)	ASTM D 3960	150 g/L maximum

971-4.3 Physical Requirements: The material shall meet the following criteria:

Property	Test Method	Minimum	Maximum
Density	ASTM D 1475	13.5 ± 0.37 lb/gal	N/A
Viscosity at 77ºF	ASTM D 562	80 KU	100 KU
Fineness of Grind	ASTM D 1210	3 (HS)	
Dry Opacity at 5 mils WFT	ASTM D 2805	0.92	-
Bleed Ratio	ASTM D 969	0.95	-
Flexibility	ASTM D 522 Method B	Pass	-
Abrasion Resistance	971-4.3.2	Pass	-

971-4.3.1 Set To Bear Traffic Time: The material shall set to bear traffic in not more than two minutes.

971-4.3.2 Abrasion Resistance: Test four samples per LOT using a Taber Abrader. The paint shall be applied to specimen plates using a drawdown blade having a clearance of 26 mils. Air dry each sample for 30 minutes and bake at 220ºF for 18 hours. Clean with a soft brush and weigh each sample. Abrade samples for 1,000 cycles with 500 g and CS-10 wheels. Clean the samples with a soft brush and weigh again. The average weight loss for the four plates shall not exceed 50 mg per plate.

971-4.3.3 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than 300 mcd/lx·m^2 and 250 mcd/lx·m^2, respectively. The retroreflectance of the white and yellow pavement markings at the end of the six month service life shall not be less than 150 mcd/lx·m^2.

971-4.4 Application Properties: Application properties shall meet the requirements of Section 710.

971-4.5 Packaging and Labeling: The traffic paint shall be placed in 55 gallon open-end steel drums with a re-usable multi-seal sponge gasket. No more than 50 gallons of material shall be placed in any drum to allow for expansion during transport and storage.

971-5 Thermoplastic Materials for Traffic Stripes.

971-5.1 General: Upon cooling to normal pavement temperature, these materials shall produce an adherent, reflective pavement marking capable of resisting deformation by traffic. The manufacturer shall utilize alkyd based materials only and shall have the option of formulating the material according to his own specifications. However, the requirements delineated in this Specification and Section 711 shall apply regardless of the type of formulation used. The pigment, glass spheres, and filler shall be well dispersed in the resin. The material shall be free from all skins, dirt and foreign objects.

971-5.2 Composition:

Component	Test Method	White	Yellow
Binder		20.0% minimum	20.0% minimum
TiO_2, Type II Rutile	ASTM D 476	10.0% minimum	-
Glass Spheres	AASHTO T 250	40.0% minimum	40.0% minimum
Yellow Pigment		-	% minimum per manufacturer
Calcium Carbonate and Inert Filler (-200 mesh sieve)		30.0% maximum	37.5% maximum
Percentages are by weight.			

The alkyd/maleic binder must consist of a mixture of synthetic resins (at least one synthetic resin must be solid at room temperature) and high boiling point plasticizers. At least one-half of the binder composition must be 100% maleic-modified glycerol of rosin and be no less than 15% by weight of the entire material formulation.

971-5.3 Glass Spheres: The glass spheres in the intermix shall consist of 50% Type 1 and 50% Type 3. Glass spheres shall meet the requirements of 971-2.

971-5.4 Sharp Silica Sand: Sharp silica sand used for bike lane symbols and pedestrian crosswalk lines shall meet the following gradation requirements:

Sieve Size	% Passing
20	100
50	0 to 10

971-5.5 Physical Requirements: Laboratory samples shall be prepared in accordance with ASTM D 4960 and shall meet the following criteria:

Property	Test Method	Minimum	Maximum
Water Absorption	ASTM D 570	-	0.5%
Softening Point	ASTM D 36	195ºF	-
Low Temperature Stress Resistance	AASHTO T 250	Pass	-
Specific Gravity	Water displacement	1.9	2.3
Indentation Resistance	ASTM D 2240* Shore Durometer, A2	40	75
Impact Resistance	ASTM D 256, Method A	1.0 N·m	-
Flash Point	ASTM D 92	475ºF	-
*The durometer and panel shall be at 110ºF with a 4.4 lb load applied. Instrument measurement shall be taken after 15 seconds.			

971-5.5.1 Set To Bear Traffic Time: The thermoplastic shall set to bear traffic in not more than two minutes.

971-5.5.2 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than 450 mcd/lx·m^2 and not less than 350 mcd/lx·m^2, respectively. The retroreflectance of the white and yellow pavement markings at the end of the three year service life shall not be less than 150 mcd/lx·m^2.

971-5.5.3 Durability: Durability is the measured percent of thermoplastic material completely removed from the pavement. The thermoplastic material line loss must not exceed 5.0% at the end of the service life.

971-5.6 Application Properties: Application properties shall meet the requirements of Section 711.

971-5.7 Packing and Labeling: The thermoplastic material shall be packaged in suitable biodegradable or thermo-degradable containers which will not adhere to the product during shipment and storage. The container of thermoplastic material shall weigh approximately 50 lb. The label shall warn the user that the material shall be heated in the range as recommended by the manufacturer.

971-6 Preformed Thermoplastic Materials for Traffic Stripes.

971-6.1 General: Upon cooling to normal pavement temperature, these materials shall produce an adherent, reflective pavement marking capable of resisting deformation by traffic. The manufacturer shall have the option of formulating the material according to his own specifications. However, the requirements delineated in this Specification and Section 711 shall apply regardless of the type of formulation used. The pigment, glass spheres, and filler shall be well dispersed in the resin. The material shall be free from all skins, dirt and foreign objects.

971-6.2 Composition: The preformed thermoplastic shall consist of high quality materials, pigments and glass spheres or other reflective material uniformly distributed throughout their cross-sectional area, with a reflective layer of spheres or other reflective material embedded in the top surface.

971-6.3 Glass Spheres: Material shall contain no less than 30% glass spheres by weight.

971-6.4 Color: Materials shall meet the performance requirements specified in 971-1 and the following additional requirements. The initial luminance factor, Cap Y, shall not be less than 55.

971-6.5 Physical Requirements: Laboratory samples shall be prepared in accordance with ASTM D 4960 and shall meet the following criteria:

Property	Test Method	Minimum	Maximum
Softening Point	ASTM D 36	195ºF	-
Low Temperature Stress Resistance	AASHTO T 250	Pass	-
Indentation Resistance	ASTM D 2240* Shore Durometer, A2	40	75
Impact Resistance	ASTM D 256, Method A**	1.0 N·m	-
*The durometer and panel shall be at 110ºF with a 4.4 lb load applied. Instrument measurement shall be taken after 15 seconds. **The test specimen for ASTM D 256 shall be 1 in. x 1 in. x 6 in. and shall not be notched.			

971-6.5.1 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than 300 mcd/lx·m^2. The retroreflectance of the white pavement markings at the end of the three year service life shall not be less than 150 mcd/lx·m^2. All pedestrian crosswalks, bike lane symbols and messages in a proposed bike lane shall attain initial retroreflectivity of not less than 275 mcd/lx·m^2.

971-6.5.2 Skid Resistance: The surface of the stripes and markings shall provide a minimum skid resistance value of 35 BPN (British Pendulum Number) when tested according

to ASTM E 303. Bike lane symbols and pedestrian crosswalks shall provide a minimum skid resistance value of 55 BPN.

971-6.5.3 Durability: Durability is the measured percent of thermoplastic material completely removed from the pavement. The thermoplastic material line loss must not exceed 5.0% at the end of the service life.

971-6.6 Application Properties: Application properties shall meet the requirements of Section 711.

971-6.7 Packing and Labeling: The thermoplastic material shall be packaged in suitable biodegradable or thermo-degradable containers which will not adhere to the product during shipment and storage.

971-7 Permanent Tape Materials for Pavement Stripes and Markings.

971-7.1 General: The materials for pavement stripes and markings shall consist of white or yellow weather-resistant reflective film as specified herein. The markings are divided into two classes: Standard and High Performance. The classes are differentiated by their durability and retroreflectivity. The pigment, glass spheres, and filler shall be well dispersed in the resin. However, the requirements delineated in this Specification and Section 713 shall apply. The material shall be free from all skins, dirt and foreign objects.

971-7.2 Composition: The pavement stripes and markings shall consist of high-quality plastic materials, pigments, and glass spheres uniformly distributed throughout their cross-sectional area, with a reflective layer of spheres embedded in the top surface.

971-7.3 Skid Resistance: The surface of the stripes and markings shall provide a minimum skid resistance value of 35 BPN (British Pendulum Number) when tested according to ASTM E 303. Bike lane symbols and pedestrian crosswalks shall provide a minimum skid resistance value of 55 BPN.

971-7.4 Thickness: The Qualified Products List will list the specified thickness of each approved product.

971-7.5 Durability and Wear Resistance: When properly applied, the material shall provide neat, durable stripes and markings. The materials shall provide a cushioned resilient substrate that reduces sphere crushing and loss. The film shall be weather resistant and, through normal wear, shall show no significant tearing, rollback or other signs of poor adhesion. Durability is the measured percent of pavement marking material completely removed from the pavement. The pavement marking material line loss must not exceed 5.0% of surface area at the end of its service life.

971-7.6 Conformability and Resealing: The stripes and markings shall be capable of conforming to pavement contours, breaks and faults under traffic at pavement temperatures recommended by the manufacturer. The film shall be capable of use for patching worn areas of the same types of film in accordance with the manufacturer's recommendations.

971-7.7 Tensile Strength: The stripes and markings shall have a minimum tensile strength of 40 psi when tested according to ASTM D 638. A rectangular test specimen 6 by 1 by 0.05 minimum thickness shall be tested at a temperature range of 40 to 80ºF using a jaw speed of 0.25 inch/min.

971-7.8 Elongation: The stripes and markings shall have a minimum elongation of 25% when tested in accordance with ASTM D 638.

971-7.9 Plastic Pull test: The stripes and markings shall support a dead weight of 4 lb for not less than five minutes at a temperature range of 70 to 80ºF. Rectangular test specimen size shall be 6 by 1 by 0.05 inch minimum thickness.

971-7.10 Pigmentation: The pigment shall be selected and blended to provide a material which is white or yellow conforming to standard highway colors through the expected life of the stripes and markings.

971-7.11 Glass Spheres: The stripes and markings shall have glass retention qualities such that, when at room temperature a 2 by 6 inches specimen is bent over a 0.5 inch diameter mandrel axis, a microscopic examination of the area on the mandrel shall show no more than 10% of the spheres with entrapment by the material of less than 40%. The bead adhesion shall be such that spheres are not easily removed when the film surface is scratched firmly with a thumbnail.

971-7.12 Standard Markings: The preformed materials for pavement stripes and markings shall have a service life of three year. The materials shall attain an initial retroreflectance of not less than 300 mcd/lx·m^2 for white and contrast markings and not less than 250 mcd/lx·m^2, for yellow markings. The retroreflectance of the white, yellow and contrast pavement markings at the end of the three year service life shall not be less than 150 mcd/lx·m^2. All pedestrian crosswalks, bike lane symbols and messages in a proposed bike lane shall attain initial retroreflectivity of not less than 275 mcd/lx·m^2.

971-7.13 High Performance Markings: The preformed materials for pavement stripes and markings shall have a service life of five years. The materials shall attain an initial retroreflectance of not less than 450 mcd/lx·m^2 for white and contrast markings and not less than 350 mcd/lx·m^2 for yellow markings. The pavement stripes and markings shall retain a minimum retroreflectance for two years of not less than 300 mcd/lx·m^2 for white and contrast markings and not less than 250 mcd/lx·m^2 for yellow markings. The retroreflectance of the white, yellow and contrast pavement markings at the end of the five year service life shall not be less than 150 mcd/lx·m^2.

971-8 Two Reactive Component Materials For Traffic Stripes And Markings.

971-8.1 General: Two reactive component materials intended for use under this Specification shall include, but not be limited to, epoxies, polyesters and urethanes. Upon curing, these materials shall produce an adherent, reflective pavement marking capable of resisting deformation by traffic. The manufacturer shall have the option of formulating the material according to his own specifications. However, the criteria outlined in this Specification and Section 709 shall apply regardless of the type of formulation used. The material shall be free from all skins, dirt and foreign objects.

971-8.2 Composition:

Component	Test Method	Criteria
TiO_2, Type II Rutile (white material only)	ASTM D 476	minimum 10% by weight
Volatile Organic Content, (VOC)	ASTM D 3960	maximum 150 g/L

971-8.3 Physical Requirements: The material shall meet the following criteria:

Property	Test Method	Minimum	Maximum
Adhesion to Concrete	ASTM D 4541, ASTM D 7234 or ACI 503	Concrete Failure	-
Hardness	ASTM D 2240 (Shore D)	75	-
Abrasion Resistance	971-8.3.2	Pass	-

971-8.3.1 Set To Bear Traffic Time: The material shall set to bear traffic in not more than two minutes.

971-8.3.2 Abrasion Resistance: Test four samples per LOT using a Taber Abrader. The material shall be applied to specimen plates using a drawdown blade having a clearance of 26 mils. Air dry each sample for 30 minutes and bake at 220ºF for 18 hours. Clean with a soft brush and weigh each sample. Abrade samples for 1,000 cycles with 500 g weights and CS-10 wheels. Clean the samples with a soft brush and weigh again. The average weight loss for the four plates shall not exceed 50 mg per plate.

971-8.3.3 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than 450 mcd/lx·m^2 and not less than 350 mcd/lx·m^2, respectively. The retroreflectance of the white and yellow pavement markings at the end of the three year service life shall not be less than 150 mcd/lx·m^2.

971-8.4 Application Properties: Application properties shall meet the requirements of Section 709.

971-8.5 Packaging and Labeling: The two reactive component material shall be placed in 55 gallon open-end steel drums with a re-usable multi-seal sponge gasket. No more than 50 gallons of material shall be placed in any drum to allow for expansion during transport and storage. Other containers will be used for applicable products. Each container shall designate the color, generic type (e.g. epoxy), user information, manufacturer's name and address, batch number and date of manufacture. Each batch manufactured shall have a unique number. The label shall warn the user of hazards associated with handling or using the material.

971-9 Thermoplastic Material for Audible and Vibratory Traffic Stripes.

971-9.1 General: Upon cooling to normal pavement temperature, the thermoplastic material shall produce an adherent, reflective pavement marking capable of resisting deformation by traffic. The manufacturer shall utilize alkyd based materials only and shall have the option of formulating the material according to his own specifications. However, the requirements delineated in this Specification shall apply regardless of the type of formulation used. The pigment, reflective elements, and filler shall be well dispersed in the resin. The material shall be free from all skins, dirt and foreign objects.

971-9.2 Composition:

Component	Test Method	White	Yellow
Binder		20.0% minimum	20.0% minimum
TiO_2, Type II Rutile	ASTM D 476	10.0% minimum	-
Reflective Elements	AASHTO T 250	% minimum per manufacturer	% minimum per manufacturer
Yellow Pigment		-	% minimum per manufacturer

Component	Test Method	White	Yellow
Calcium Carbonate and Inert Filler (-200 mesh sieve)		% minimum per manufacturer	% minimum per manufacturer
Percentages are by weight.			

The alkyd/maleic binder must consist of a mixture of synthetic resins (at least one synthetic resin must be solid at room temperature) and high boiling point plasticizers. At least one-half of the binder composition must be 100% maleic-modified glycerol of rosin and be no less than 15% by weight of the entire material formulation.

971-9.3 Retroreflective Elements: The reflective elements in the intermix shall be determined by the manufacturer and identified for the QPL System.

971-9.4 Physical Requirements: Laboratory samples shall be prepared in accordance with ASTM D 4960 and shall meet the following criteria:

Property	Test Method	Minimum	Maximum
Water Absorption	ASTM D 570	-	0.5%
Softening Point	ASTM D 36	210ºF	-
Low Temperature Stress Resistance	AASHTO T 250	Pass	-
Specific Gravity	Water displacement	1.9	2.3
Indentation Resistance	ASTM D 2240* Shore Durometer, A2	65	-
Impact Resistance	ASTM D 256, Method A	1.0 N·m	-
Flash Point	ASTM D 92	475ºF	-
*The durometer and panel shall be at 80ºF, but not exceeding 90ºF with a 4.4 lb load applied. Instrument measurement shall be taken after 15 seconds.			

971-9.4.1 Set To Bear Traffic Time: When applied at the temperatures and thickness specified by Section 701, the baseline material shall set to bear traffic in not more than two minutes. The audible bump shall set to bear traffic in not more than 10 minutes at ambient air temperatures of 80ºF or less and in not more than 15 minutes for ambient air temperatures exceeding 80ºF.

971-9.4.2 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than 300 mcd/lx·m^2 and not less than 250 mcd/lx·m^2, respectively. The retroreflectance of the white and yellow pavement markings at the end of the three year service life shall not be less than 150 mcd/lx·m^2.

971-9.4.3 Durability: Durability is the measured percent of thermoplastic material completely removed from the pavement. The thermoplastic material line loss must not exceed 5.0% at the end of the three year service life. Durability shall also include flattening of the profile or raised portions of the line. The flattening of the profile or raised portion of the line shall not exceed 25% at the end of the three year service life.

971-9.5 Application Properties: Application properties shall meet the requirements of Section 701.

971-9.6 Packing and Labeling: The thermoplastic material shall be packaged in suitable biodegradable or thermo-degradable containers which will not adhere to the product during shipment and storage. The container of thermoplastic material shall weigh approximately 50 lb.

The label shall warn the user that the material shall be heated in the range as recommended by the manufacturer.

971-10 Thermoplastic Material for Wet Weather Pavement Markings.

971-10.1 General: Upon cooling to normal pavement temperature, the thermoplastic material shall produce an adherent, reflective pavement marking capable of resisting deformation by traffic. The manufacturer shall utilize alkyd based materials only and shall have the option of formulating the material according to their specifications. However, the requirements delineated in this specification shall apply regardless of the type of formulation used. The pigment, reflective elements, and filler shall be well dispersed in the resin. The material shall be free from all skins, dirt and foreign objects.

971-10.2 Composition:

Component	Test Method	White	Yellow
Binder		20.0% minimum	20.0% minimum
TiO_2, Type II Ructile	ASTM D 476	10.0% minimum	N/A
Reflective Elements (intermix)	AASHTO T 250	% minimum per manufacturer	% minimum per manufacturer
Yellow Pigment		N/A	% minimum per manufacturer
Calcium Carbonate and Inert Filler (-200 mesh sieve)		% minimum per manufacturer	% minimum per manufacturer
Percentages are by weight.			

971-10.3 Retroreflective Elements: The reflective elements in the intermix shall be determined by the manufacturer and identified for the QPL System.

971-10.4 Physical Requirements: Laboratory samples shall be prepared in accordance with ASTM D 4960 and shall meet the following criteria:

Property	Test Method	Minimum	Maximum
Water Absorption	ASTM D 570	-	0.5%
Softening Point	ASTM D 36	200ºF	-
Low Temperature Stress Resistance	AASHTO T 250	Pass	-
Specific Gravity	Water displacement	1.9	2.3
Indentation Resistance	ASTM D 2240* Shore Durometer, A2	40	-
Impact Resistance	ASTM D 256, Method A	1.0 N·m	-
Flash Point	ASTM D 92	475ºF	-
*The durometer and panel shall be at 90ºF with a 4.4 lb load applied. Instrument measurement shall be taken after 15 seconds.			

971-10.4.1 Set To Bear Traffic Time: When applied at the temperatures and thickness specified by Section 702, the baseline material shall set to bear traffic in not more than two minutes. When the audible bump is required, the bump shall set to bear traffic in not more than 10 minutes at ambient air temperatures of 80ºF or less and in not more than 15 minutes for ambient air temperatures exceeding 80ºF.

971-10.4.2 Retroreflectivity: The white and yellow pavement markings shall attain an initial dry retroreflectivity of not less than 300 mcd/lx·m^2 and not less than 250 mcd/lx·m^2, respectively, and also attain an initial wet recovery retroreflectivity of not less than 150 mcd/lx·m^2 and not less than 125 mcd/lx·m^2, respectively. The dry retroreflectance of the white and yellow pavement markings at the end of the three year service life shall not be less than 150 mcd/lx·m^2, and also the wet recovery retroreflectivity at the end of the service life shall not be less than 75 mcd/lx·m^2. The retroreflectivity will be determined in accordance with Florida Method FM-5-541 for dry and ASTM E 2177 (Bucket Method) for wet recovery.

971-10.4.3 Durability: Durability is the measured percent of thermoplastic material completely removed from the pavement. The thermoplastic material line loss must not exceed 5.0% at the end of the three year service life. When an audible bump is required, durability shall also include flattening of the profile or raised portions of the line. The flattening of the profile or raised portion of the line shall not exceed 25% at the end of the three year service life.

971-10.5 Application Properties: Application properties shall meet the requirements of Section 702.

971-10.6 Packing and Labeling: The thermoplastic material shall be packaged in suitable biodegradable or thermo-degradable containers which will not adhere to the product during shipment and storage. The container of thermoplastic material shall weigh approximately 50 lb. The label shall warn the user that the material shall be heated in the range as recommended by the manufacturer.

972 RECYCLED PLASTIC PRODUCTS.
(REV 7-8-10) (FA 7-20-10) (1-11)

ARTICLE 972-1 (Page 936) is deleted and the following substituted:

972-1 Description.

Recycled plastic products shall include certified test reports from an approved independent test laboratory that shows the material meets all specifications herein and the manufacturer shall certify the following:

a. The source of the recycled plastic waste, including the state (FL, GA, etc.) from which the recycled plastic was obtained, and type of waste (consumer or industrial).

b. The total percent of recycled plastic in the final product.

ARTICLE 972-3 (Page 937) is deleted and the following substituted:

972-3 Materials.

The materials used for recycled plastic products shall consist of a minimum of 70% by weight of recycled plastic. The products shall exhibit good workmanship and shall be free of burns, discoloration, contamination, and other objectionable marks or defects which affect appearance or serviceability. Only chemicals, including fillers and colorants, designed to inhibit photo degradation, biological/biochemical decomposition, insect infestation, or burning will be

permitted to enhance durability. The use of sufficient additives to inhibit photo degradation over the lifetime of the product is required.

ARTICLE 972-4 (Page 937-938) is deleted:

ARTICLE 972-5 (Page 938) is deleted:

ARTICLE 972-6 (Page 939) is deleted and the following substituted:

972-4 Sampling.

One additional product per 1,000, or a minimum of one per order shall be included in the order for Department testing.

973 STRUCTURAL PLASTICS.
(REV8-1-11) (FA 8-4-11) (1-12)

SECTION 973 (Pages 939 - 944) is deleted and the following substituted:

SECTION 973
STRUCTURAL PLASTICS

973-1 Description.

This work covers structural plastic components including fiberglass structurally reinforced composite lumber (SCL) and smaller dimensional fiberglass fiber reinforced composite lumber (FFRCL).

973-2 Product Acceptance.

Use only products listed on the Department's Qualified Products List (QPL). Manufacturers seeking evaluation of products must submit an application in accordance with Section 6 and include independently certified test reports that the material meets the requirements of this Section.

In accordance with Section 6, provide manufacturer's certification that the material meets the requirements of this section.

973-3 Materials.

Use polyethylene made from recycled post consumer or post industrial thermoplastics. Mix the plastic with appropriate colorants, UV inhibitors, hindered amine light stabilizers and antioxidants so that the resulting product meets the material property requirements specified in Tables 1 and 2. Structural plastic must not corrode, rot, warp, splinter or crack. The skin must be smooth and black in color unless otherwise specified in the Contract Documents. Skin is the

surface material exposed to the atmosphere. Core is the material that surrounds and bonds to the fiberglass reinforcing rods. The use of separate materials for skin and core is at the discretion of each manufacturer; however, if a single material is used, that material must meet the requirements for both skin and core.

Manufacture structural plastic as one continuous piece with no joints or splices to the dimensions and tolerances in accordance with Table 3. Interior voids shall not exceed ¾ inch in diameter. Structural plastic members shall be free of twist and curvature.

Reinforce 10" x 10" fiberglass structurally reinforced composite lumber with a minimum of four 1-1/2 inch fiberglass reinforcing rods placed in the corners of the section.

Reinforcing rods must be continuous and offer a minimum flexural strength of 70.0 ksi when tested in accordance with ASTM D 4476 and a minimum compressive strength of 40.0 ksi when tested in accordance with ASTM D 695. Steel reinforcing rods are not permitted.

Reject any sections of structural plastic containing cracks or splits. Also, inspect the ends of the reinforcing rods and reject any sections containing reinforcing rods with voids or cracks.

Add a minimum of 15% (by weight) chopped fiberglass reinforcement to the polyethylene used for fiberglass structurally reinforced composite lumber and a minimum of 15% (by weight) chopped fiberglass reinforcement for smaller dimensional fiberglass fiber reinforced composite lumber. The fiberglass reinforcement may be reduced when other means of controlling cracking are specified with test results which show long term cracking is nonexistent.

Fiberglass structurally reinforced composite lumber must meet the minimum structural properties listed in Table 4.

Smaller dimensional fiberglass fiber reinforced composite lumber must meet the minimum physical properties listed in Table 5.

Table 1
Plastic Material Properties- SCL

Density	ASTM D792	Skin	55-63 pcf
Density	ASTM D792	Core	48–63 pcf
Water Absorption	ASTM D570	Skin	2 hrs:<1.0% weight increase 24 hrs:<3.0% weight increase
Brittleness	ASTM D746	Skin	Brittleness temperature to be less than - 40 deg. C
Impact Resistance	ASTM D256 Method A (Izod)	Skin	Greater than 0.55 ft-lbs/in
Hardness	ASTM D2240	Skin	44-75 (Shore D)
Ultraviolet	ASTM D4329 UVA	Skin	500 hours<10% change in Shore D Durometer Hardness
Chemical Resistance	ASTM D756 or ASTM D543	Skin/Core Sea Water Gasoline No. 2 Diesel	<1.5% weight increase < 9.5% weight increase <6.0% weight increase
Tensile Properties	ASTM D638	Core	Minimum 2200 psi at break
Compressive Modulus	ASTM D695	Core	Minimum 40 ksi
Static Coefficient of Friction	ASTM D1894	Skin	Maximum 0.25, wet

Nail Withdrawal or Screw Withdrawal	ASTM D 6117	Skin/Core	Minimum 60 lb (nail) Minimum 400 lb (screw)

Table 2 Plastic Material Properties FFRCL		
Density	ASTM D 792	50-65 pcf
Impact Resistance	ASTM D256 Method A (Izod)	Greater than 2.0 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 Gasoline No. 2 Diesel	 <1.5% weight increase <7.5% weight increase <6.0% weight increase
Tensile Properties	ASTM D638	Minimum 3000 psi at break
Static Coeffecient of Friction	ASTM D2394	Minimum 0.25, wet or dry
Nail Withdrawal or Screw Withdrawal	ASTM D 6117	Minimum 250 lb (nail) Minimum 400 lb (screw)

Table 3 Dimensions and Tolerances		
Structural Plastic	Dimension	Tolerance
Length	Per order (80 ft Maximum)	0/+6 inch
Width – SCL Width – FFRCL	See Contract Plans	±1/2 inch ±1/4 inch
Height – SCL Width – FFRCL	See Contract Plans	±1/2 inch ±1/4 inch
Skin Thickness	3/16 inch minimum	n/a
Distance from outer surface to center rebar elements (SCL)	2 inches	±1/2 inch
Straightness (gap, bend or inside while lying on a flat surface)		<1 1/2 inches per 10 feet

Table 4 Structural Properties for SCL		
Member Size		10 inches x 10 inches
Modulus of Elasticity	ASTM D 6109	521 ksi
Stiffness, E.I.	ASTM D 6109	4.05E+08 lb-inch^2
Yield Stress in Bending	ASTM D 6109	5.3 ksi
Weight		30-37 lb/ft

Table 5 Properties for FFRCL

Modulus of Elasticity	ASTM D 6109	300,000 psi
Flexural Strength	ASTM D 6109	2,500 psi
Compressive Strength	ASTM D 6108	2,200 psi
Compressive Strength Perpendicular to grain	ASTM D 6108	700 psi

The values stated in these tables are the required minimums.

975 STRUCTURAL COATING MATERIALS.
(REV 7-20-10) (FA 11-9-10) (7-11)

SECTION 975 (Pages 944–950) is deleted and the following substituted:

SECTION 975
STRUCTURAL COATING MATERIALS

975-1 General Requirements.

975-1.1 General: Upon curing, all coatings and/or coating systems must produce an adherent coating that is visually uniform. The composition of the coating is left to the discretion of the manufacturer but the finished product shall meet all requirements of this Section. All coats of multi-coat systems shall be supplied by the same manufacturer. Multi-component coatings shall be prepackaged in the required ratios.

975-1.2 Environmental Requirements: Coating materials and their waste shall be characterized as non-hazardous as defined by Resource Conservation and Recovery Act (RCRA) Subarticle C rules, Table 1 of 40 CFR 261.24 Toxicity Characteristic.

Volatile Organic Compounds (VOC) shall be less than 3.5 lb/gal when tested in accordance with ASTM D 3960.

975-1.3 Qualified Products List: All polymeric coating materials except the materials in 975-4 shall be listed on the Department's Qualified Products List (QPL). Manufacturers seeking evaluation of their products shall submit (1) the product data sheets, (2) performance test reports from an independent laboratory showing the product meets the requirements of this section, (3) a Product MSDS or performance test reports showing percent weight compositional analysis including Chemical Abstract Number, ACGIH time weighted average and ceiling exposure limits for all components, lower and upper explosive limits, flash point, boiling point, amount of volatile organic compounds by weight, and specific gravity for each component of the coating system, and (4) a QPL application in accordance with Section 6.

975-1.4 Packaging and Labeling: Materials shall be shipped in containers legibly marked with application instructions, lot number, batch number, date of manufacture, shelf life, and Department QPL number. Each lot or batch manufactured must have a unique number.

975-2 Structural Steel Coating Systems.

975-2.1 General: Structural steel coatings shall meet the application requirements of Section 560.

975-2.2 Performance Requirements: Outdoor exposure testing will be performed by the Department. Prepare four composite and four flat-scribed test panels in accordance with AASHTO R-31 (Federal Standard 595B, Shade X6134 or X4062) and submit to the State Materials Office. Also submit 1-quart wet samples of each component of each coating incorporated in the system being evaluated. Panels will be exposed at the Department's outdoor test site in accordance with ASTM G7. All coatings, regardless of color, shall meet the requirements below.

Laboratory Testing		
Property	Test Method	Requirement
Slip Coefficient	AASHTO R-31	Min. Class B (primer only)
Salt Fog Resistance	AASHTO R-31	Blister Size = 10 Average Rust Creep at the Scribe ≤ 0.1 inches
Cyclic Weathering Resistance	AASHTO R-31	Blister Size = 10 Average Rust Creep at the Scribe ≤ 0.2 inches, Color Retention $\Delta E \leq 8$, Gloss loss less than 30 units
Abrasion Resistance	AASHTO R-31	Wear Index ≤ 2.7 mg/cycle
Adhesion	AASHTO R-31	Avg. system tensile strength ≥ 800 psi
Freeze Thaw Stability	AASHTO R-31	Avg. tensile strength ≥ 800 psi
Coatings Identification	Fourier Transform Infrared Spectroscopy	IR scan (2.5 to 15 um) for each base, catalyst, and mixed coating.
Impact Resistance	ASTM D 2794	Greater than 25 inch/lbs, 1/2" impact, intrusion
Flexibility	AASHTO R-31, ASTM D 522, 1 inch cylindrical mandrel	No cracking
Outdoor Testing		
Property	Test Method	Requirement
Rusting	ASTM D 610 ASTM D 1654 (scribed) ASTM D 1654 (un-scribed)	≥ 9 after 5 years ≥ 9 after 5 years ≥ 9 after 5 years
Blistering	ASTM D 714	10 after 5 years
Adhesion	ASTM D 4541;annex A4	≥ 800 psi (un-scribed area) after 5 years

Color Retention	ASTM D 2244	$\Delta E \leq 8$ after 2 years
Gloss	ASTM D 523	$\leq$ 30 gloss units after 2 years

975-2.3 Structural Steel Coating Systems for New Structures.

975-2.3.1 High Performance Coating Systems (Color Pigmented):

975-2.3.1.1 Prime Coat: Zinc dust pigment shall be a minimum of Type II in accordance with ASTM D 520. Inorganic zinc rich primers shall meet the requirements of the Society for Protective Coatings (SSPC) Paint 20, Type I, Level 2.

975-2.3.1.2 Intermediate Coat: Intermediate coatings, when required by the manufacturer, shall be a component of the full coating system.

975-2.3.1.3 Finish Coat: The finish coat shall provide the color and gloss required for the completed coating system. A finish coat may be comprised of a single pigmented coat or a pigmented coat with a clear coat. The clear coat shall contain a dissipating colorant. The dissipating colorant shall be visible for a minimum of 12 hours after application and shall completely dissipate within 96 hours after application.

975-2.3.2 Inorganic Zinc Coating System: Zinc dust pigment shall be a minimum of Type II in accordance with ASTM D 520. Inorganic zinc rich primers shall meet the requirements of SSPC Paint 20, Type I, Level 2. The performance requirements for gloss and color retention are not applicable.

975-2.3.3 Interior Box Girder Coating System:

975-2.3.3.1 Prime Coat: Inorganic zinc dust pigment shall be a minimum of Type II in accordance with ASTM D 520. Inorganic zinc rich primers shall meet the requirements of SSPC Paint 20, Type I, Level 2.

975-2.3.3.2 Finish Coat: The finish coat shall be one coat of white polyamide or cycloaliphatic amine epoxy coating. The performance requirements for gloss and color retention are not applicable.

975-2.4 Structural Steel Coating Systems for Existing Structures.

975-2.4.1 Prime Coat: Zinc dust pigment shall be a minimum of Type II in accordance with ASTM D 520. Organic zinc rich primers shall meet the requirements SSPC Paint 20, Type II, Level 2.

975-2.4.2 Intermediate Coat: Intermediate coatings, when required by the manufacturer, shall be a component of the full coating system.

975-2.4.3 Finish Coat: Finish coating shall provide the color and gloss required for the completed coating system. A finish coat may be comprised of a single pigmented coating or a pigmented coating with a clear coat. The clear coat shall contain a dissipating colorant. The dissipating colorant shall be visible for a minimum of 12 hours after application and shall completely dissipate within 96 hours after application.

975-3 Galvanized Steel Coating System.

Coatings applied over galvanized steel shall meet the outdoor exposure requirements of 975-2.2 with the exception that test panels shall be galvanized in accordance with ASTM A 123 prior to application of subsequent coatings.

Coatings applied over galvanized steel strain poles, mast arms, and monotube assemblies shall meet the requirements of Section 649 and 975-4.

975-4 Painting Strain Poles, Mast Arms and Monotube Assemblies.

Paint systems used on galvanized steel strain poles, galvanized steel mast arms and galvanized steel monotube assemblies shall meet the color requirements as specified in the Contract Documents and shall exhibit no loss of adhesion or loss of color greater than 8ΔEs for five years after final acceptance as specified in 5-11. A galvanized steel strain pole, mast arm or monotube assembly that exhibits a cumulative surface area of delamination in excess of 100 square inches will constitute an adhesion failure. Delamination shall be defined as any area of exposed metal surface subsequent to hand tool cleaning in accordance with SSPC-SP2. A change in the coating color in excess of 8ΔEs per the CIE L*a*b* 1976 will constitute a color retention failure. The Department will measure the CIE 1976 color chromaticity coordinates for the color of the top coat of the two sample coupons provided with a BYK-Gardner Handicolor colorimeter using D65 illuminant and 2 degree geometry settings. The Department-measured L*a*b* chromaticity coordinates shall define the initial color and will be used for resolution of color retention failures and the resolution of color retention disputes. All paint systems shall possess physical properties and handling characteristics that are compatible with the application requirements of Section 649. Materials shall be specifically intended for use over galvanized steel.

975-5 Elastomeric Coatings.

975-5.1 General: Use an elastomeric coating system to provide a waterproof barrier over post-tensioning anchorages or other areas designated in the plans. The components of the coating system shall be supplied by a single manufacturer and sold as a waterproof coating system. The surface preparation and application of the coating system shall be performed in strict accordance with the manufacturer's specifications.

975-5.2 Physical Properties: The use of an epoxy prime coat is dependent upon the requirements of the manufacturer's waterproofing system. The polyurethane chemistry may be either waterborne aromatic (moisture-curing) or aromatic (moisture-sensitive). The minimum thickness of the system shall not be less than 30 mils. The elastomeric coating shall meet the following requirements:

Property	Test Method	Requirement
Hardness, Shore A	ASTM D 2240	Between 60 and 90
Tensile Strength	ASTM D 412	≥750 psi
Elongation	ASTM D 412	≥400%
Tear Strength	ASTM C 957	>70 pli
Abrasion Resistance H-18 wheels 1,000 gm/wheel	ASTM C 957	≤350 mg loss / 1,000 revs.
Crack Bridging 1,000 Cycles	ASTM C 957	System Passes
Elongation Recovery	ASTM C 957	≥94%

975-5.3 System Modifications for Use on Bridge Substructure: Supply the elastomeric coating system with a 100% acrylic aliphatic polyurethane top coating.

975-6 Class 5 Applied Finish Coatings.

975-6.1 General: All coatings shall possess physical properties and handling characteristics compatible with the application requirements of Section 400.Unless otherwise specified, the color of the finish coat shall meet Federal Color Standard No. 595B, Table VIII, Shade No. 36622.

975-6.2 Coating Requirements: Use 4 inch by 8 inch (except as required below) fiber cement test panels with a mass of 7 to 9 pounds per square foot of surface area to perform the laboratory tests. Coating performance shall meet the following requirements:

Laboratory Testing		
Property	Test Method	Requirement
Resistance to Wind Driven Rain	ASTM D 6904	No visible water leaks, and if the rear face of the block is damp, the average gain in weight of the three 8 by 16 by 2 inch blocks must be less than 0.2 lb.
Freeze thaw resistance	AASHTO R-31	No disbondment
Water Vapor Transmission	ASTM D 1653; Method B, Condition C	WVT≥10 perms
Abrasion Resistance	ASTM D 968, 3,000 liters of sand	No loss of coating thickness ASTM D 6132
Salt Spray (fog) resistance	ASTM B 117, 2,000 hours	No disbondment
Fluorescent UV-Condensation Exposure	ASTM D 4587, 2000 hours, 4 hours UV, 4 hours condensation	No blistering (ASTM D 714), cracking (visual), or delamination (visual). chalking (ASTM D 4214Method D) rating no less than 8.
Fungal Resistance	ASTM D 3273	Rating of 10, ASTM D 3274

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

975-7 Anti-Graffiti Coating Materials.

975-7.1 General Requirements: Anti-graffiti coatings intended for use under this specification shall be of a composition capable of preventing the adhesion of graffiti and facilitating the removal of graffiti. All anti-graffiti coatings shall possess the physical and handling characteristics that are compatible with the requirements of Section 563.

Anti-graffiti coatings shall contain less than 5.0 lb/gal volatile organic compounds (VOC) as defined by 40 CFR Part 59, Subpart D, and evaluated as per ASTM D 3960.

The manufacturer will supply the following additional information:

a. Cleaning instructions and materials, as applicable. Surfaces must be cleanable with nonproprietary cleaners as defined in ASTM D 6578.

b. Sacrificial Coating Removal instructions, as applicable.
c. Recommended base coat, as applicable.
d. Identification of coating system and type, as applicable.
e. Clear coats must contain a UV degradable color for inspection purposes. UV degradable color must dissipate in a reasonable time period to allow inspection but not detract from visual impact of the structure.

975-7.2 Performance Requirements: For laboratory testing, use flat test panels prepared in accordance with AASHTO R-31. Outdoor exposure testing will be performed by the Department. Submit four 4 inch by 8 inch fiber cement test panels, with a mass of 7 to 9 pounds per square foot of surface area to the State Materials Office. Panels will be exposed at the Department's outdoor test site in accordance with ASTM G 7.

Laboratory Testing- Non-Sacrificial		
Property	Test Method	Requirement
Cyclic Weather Testing	AASHTO R-31	No blistering, cracking, checking, chalking, or delamination; color change less than 3 Delta E CIE LAB units; Retention of 60° Gloss ratio >= 0.80
Taber Abrasion	ASTM D 4060, CS17, 1,000 g of sand	60 g maximum weight loss
Impact Resistance	ASTM D 2794	Minimum of 30 inch-pounds, 1/2" impact, intrusion
Graffiti Resistance	ASTM D 6578, Use identified marking materials; initial and recleanability; and after exposure initial and recleanability	Cleanability Level 8, 9, or 10.
MEK Double Rub	ASTM D 4752; 50 rubs	No coating wear through (4 minimum rating)
Fluid Resistance	ASTM D 1308- spot; Paint Thinner, Gasoline	No blistering, discoloration, softening or adhesion loss.

Laboratory Testing- Sacrificial		
Property	Test Method	Requirement
Cyclic Weather Testing	AASHTO R-31, no salt fog, 95°F, 0%- 90% Relative Humidity, 500 hours, alternating RH every 100 hours	No melting or disbondment
Outside Testing- Sacrificial		
Property	Test Method	Requirement
Sacrificial Coating removability	Per Manufacturer's specifications: 6 months exposure at FDOT test site	Complete removal of material from substrate

981 TURF MATERIALS.
(REV 7-1-10) (FA 8-16-10) (1-11)

ARTICLE 981-1 (Page 951) is deleted and the following substituted:

981-1 General.

The types of seed and sod will be specified in the Contract Documents. All seed and sod shall meet the requirements of the Florida Department of Agriculture and Consumer Services and all applicable state laws, and shall be approved by the Engineer before installation.

All seed, sod and mulch shall be free of noxious weeds and exotic pest plants, plant parts or seed listed in the current Category I "List of Invasive Species" from the Florida Exotic Pest Plant Council (FLEPPC, www.fleppc.org). Any plant officially listed as being noxious or undesirable by any Federal Agency, any agency of the State of Florida or any local jurisdiction in which the project is being constructed shall not be used. Any such noxious or invasive plant or plant part found to be delivered in seed, sod or mulch will be removed by the Contractor at his expense and in accordance with the law.

All materials shall meet plant quarantine and certification entry requirements of Florida Department of Agriculture & Consumer Services, Division of Plant Industry Rules.

ARTICLE 981-4 (Page 952) is deleted and the following substituted:

981-4 Mulch.

The mulch material shall be compost meeting the requirements of Section 987, hardwood barks, shavings or chips; or inorganic mulch materials as approved by the Engineer; or hydraulically applied wood fiber mulch or bonded fiber matrix (BFM) for the establishment of turf material.

ARTICLE 981-5 (Page 952) is deleted:

987 PREPARED SOIL LAYER MATERIALS
(REV 1-15-10) (FA 2-17-10) (7-10)

ARTICLE 987-1 (Page 955) is deleted and the following substituted:

987-1 Description.

All material shall be suitable for plant growth. The organic matter content of the prepared soil layer after mixing shall be a minimum of 2.5%, a maximum of 10%, in accordance with FM 1-T-267 and have a pH value of 4.5 or greater and less than or equal to 8.5 as determined in accordance with FM 5-550. The organic matter content shall be created using any of the following materials.

990 TEMPORARY TRAFFIC CONTROL DEVICES AND MATERIALS. (REV 6-15-11) (FA 8-9-11) (1-12)

SECTION 990 (Pages 956 - 966) is deleted and the following substituted:

SECTION 990
TEMPORARY TRAFFIC CONTROL DEVICES MATERIALS

990-1 General.

This Section specifies the material requirements for Temporary Traffic Control Devices.

990-2 Retroreflective Sheeting for Temporary Traffic Control Devices.

990-2.1 Qualified Products List: Sheeting for use on Temporary Traffic Control Devices shall be one of the products listed on the Qualified Products List (QPL). Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6.

990-2.1.1 Sign Panels, Bands for Tubular Markers, Vertical Panels, Barricades and other Devices: Sign Panels, Bands for Tubular Markers, Vertical Panels, Barricades and other Devices shall meet the requirements of ASTM D 4956 for Type III or higher retroreflective sheeting materials identified in Section 994 except for mesh signs shall meet the color, daytime luminance and nonreflective property requirements of Section 994, Type VI.

990-2.1.2 Collars for Traffic Cones: Collars for Traffic Cones shall meet the requirements of ASTM D 4956 Type VI.

990-2.1.3 Drums: Drums shall meet the requirements of ASTM D 4956 for Type III or higher retroreflective sheeting materials identified in Section 994 including Supplementary requirements for Reboundable Sheeting.

990-3 Portable Devices (Arrow Boards, Changeable (Variable) Message Signs, Regulatory Signs and Radar Speed Display Units).

990-3.1 General: All portable devices shall meet the physical display and operational requirements of the MUTCD and be listed on the Approved Products List (APL). Manufacturers seeking approval of their portable devices shall provide a working sample to be evaluated by the Department that meets all requirements specified herein.

990-3.1.1 Electrical Systems:

990-3.1.1.1 Diesel Engine: The Diesel Engine shall meet the following:

(a) The power supply and electrical system shall be self-contained within the unit.

(b) The engine shall have an electrical starting system.

(c) The power source furnished shall be of sufficient size to provide the required maximum load energy plus 25%.

(d) The electrical system shall meet the National Electrical Code where applicable.

(e) A backup power system that will operate the unit for a minimum of three hours automatically when the motor driven generator fails to operate.

(f) The starting batteries and back-up power supply system batteries shall be automatically charged when the generator is operating.

(g) The engine shall be supplied with an ammeter and the generator shall be supplied with a voltmeter showing voltage to the sign assembly.

990-3.1.1.2. Solar Powered Unit: The Solar Powered Unit shall meet the following:

(a) The unit shall provide automatic recharging of power supply batteries to normal operating levels with meters showing charge.

(b) Solar array recovery time for Arrow Boards and Regulatory Signs shall be accomplished in a maximum of three hours.

(c) Arrow Boards and Changeable Variable Message Signs shall be designed to provide 180 days of continuous operation with minimum onsite maintenance.

990-3.1.1.3 Battery Life Test: Meet the following:

(a) The photovoltaic unit shall be designed to provide 21 days of continuous operation without sunlight with a minimum of onsite maintenance for arrow boards and changeable message signs, or 10 days of continuous operation without sunlight with a minimum of onsite maintenance for regulatory signs and radar speed display units.

(b) The battery shall be equipped with a battery controller to prevent overcharging and over-discharging. An external battery level indicator shall be provided.

(c) The battery, controller, and power panel shall be designed to be protected from the elements and vandalism.

(d) Automatic recharging of power supply batteries shall be provided with charge indicator meter.

(e) An AC/DC battery charger unit shall be provided.

990-3.1.2 Display Panel and Housing:

(a) The display housing assembly shall be weather-tight.

(b) All nuts, bolts, washers and other fasteners shall be of corrosion resistant material.

(c) The display assembly shall be equipped with an automatic dimming operational mode capable of a minimum of 50% dimming and a separate manual dimmer switch

(d) The display panel background and frame for the display assembly shall be painted flat black and shall meet Federal Specification TT-E-489.

(e) The display panel for arrow boards and changeable message signs, when raised in the upright position, shall have a minimum height of 7 feet from the bottom of the panel to the ground, in accordance with the MUTCD. The display panel for radar speed display units, when raised in the upright position, will have a minimum height of 5 feet from the bottom of the panel to the ground.

(f) The regulatory speed sign panel for regulatory signs and radar speed display units, when raised in the upright position, shall have a minimum height of 7 feet from the bottom of the regulatory sign panel to the ground.

(g) The unit shall have an accessible mechanism to easily raise and lower the display assembly. A locking device shall also be provided to ensure the display panel will remain in the raised or lowered position.

990-3.1.3 Controller: The Controller shall meet the following:

(a) Controller and control panel shall be housed in a weather, dust, and vandal resistant lockable cabinet.

(b) Controller and associated on-board circuitry shall meet the requirements of the Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise by Class A digital devices.

(c) For Changeable Variable Message Signs and Arrow Boards ensure that the sign control software provides an on-site graphical representation that visibly depicts the message displayed on the sign face.

(d) For Changeable Variable Message Signs, if remote communication is included, meet the following National Transportation Communications for ITS Protocol (NTCIP) requirements: Ensure that the sign controller software implements all mandatory objects as defined in the FDOT Standard Global MIB v01 in Appendix A, all mandatory objects as defined in the FDOT Standard DMS MIB v01 in Appendix B, and all mandatory objects as defined in the FDOT Specific DMS MIB v01 in Appendix C. Ensure that additional objects implemented by the software do not interfere with the standard operation of mandatory objects.

990-3.1.4 Support Chassis: The Support Chassis shall meet the following:

(a) The support chassis shall be self-contained and self-supporting without the use of additional equipment or tools.

(b) Both trailer and truck-mounted units are allowed for arrow boards. Trailer mounted units are required for changeable message signs, regulatory signs and radar speed display units.

(1) Trailer mounted unit:

(a) The sign, power supply unit and all support systems shall be mounted on a wheeled trailer.

(b) The trailer shall be equipped with Class-A lights, using a plug adaptor.

(c) The trailer shall be equipped with adjustable outrigger leveling pads, one on each of the four frame corners.

(d) The trailer shall be designed to be set up at the site with its own chassis and outriggers, without being hitched to a vehicle.

(e) The trailer shall be equipped with fenders over the tires and shall be made from heavy-duty material sufficient to allow a person to stand and operate or perform maintenance on the unit.

(f) The trailer shall meet all equipment specifications set forth in Chapter 316 of the Florida Statutes, and by such rule, regulation or code that may be adopted by the Department of Highway Safety and Motor Vehicles.

(g) The trailers should be delineated on a permanent basis by affixing retroreflective material, known as conspicuity material, in a continuous line on the face of the trailer as seen by oncoming road users.

(2) Truck mounted unit:

(a) The truck-mounted assembly shall be designed to fit on a 1/2 ton or greater duty truck.

(b) The unit shall be self-contained with its own power supply, controls, raising and lowering device and shall be capable of being operated by one person.

(c) The unit shall be secured in the vehicle for normal operation.

990-3.1.5 Other Requirements: Meet the following:

(a) The portable device assembly shall be designed to function in dry, wet, hot or cold weather (ambient temperature ranges from-30 to 165ºF. Other environmental requirements shall be as specified in Section A-615 of the Minimum Specifications for Traffic Control Signal Devices, which can be located at the following URL: http://www.dot.state.fl.us/trafficoperations/Traf_Sys/terl/apl4.shtm .

(b) The controller shall not be affected by mobile radio, or any other radio transmissions.

(c) An operator's manual shall be furnished with each unit.

(d) The manufacturer's name and FDOT approval number shall be affixed on the equipment.

990-3.2 Portable Arrow Board:

990-3.2.1 Arrow Board Matrix:

(a) The minimum legibility distance for various traffic conditions are based on the decision-sight distance concept. The minimum legibility distance is the distance at which a driver can comprehend the arrow board message on a sunny day or a clear night. The arrow board size that is needed to meet the legibility distance is listed as follows:

Type	Minimum Size	Minimum Number of Elements	Minimum Legibility Distance
B	30 by 60 inches	13	3/4 mile
C	48 by 96 inches	15	1 mile

Type B arrow boards may be used on low to intermediate speed (0 to 50 mph) facilities or for maintenance or moving operations on any speed facility. Type C arrow boards shall be used for all other operations on high-speed (50 mph and greater) facilities and may be substituted for Type B arrow boards on any speed facility.

(b) Devices shall meet all arrow board displays identified in the MUTCD.

(c) The element lens should be 5 3/4 inches in diameter. Smaller element lens diameters are permissible only if they provide an equivalent or greater brightness indication and meet the legibility criteria in Section (a) of this Specification.

(d) The color of the light emitted shall be in accordance with the MUTCD.

(e) There shall be a 360-degree hood for close-up glare reduction.

(f) For solar powered arrow boards the bulbs shall provide a 350-candle power intensity for day use and an automatic reduction or dimming capacity for night use. The dimmed night operation shall provide adequate indication without excessive glare.

(g) The flashing rate of the element shall not be less than 25 nor more than 40 flashes per minute as required in the MUTCD.

(h) The minimum element "on time" shall be 50% for the flashing arrow and 25% for the sequential chevron.

990-3.3 Changeable Variable Message Sign:

990-3.3.1 Message Matrix:

(a) Message matrix panel shall be a maximum height of 7 feet by a maximum width of 10 feet.

(b) The message matrix panel shall contain three separate lines. Each line shall consist of eight characters, equally spaced a minimum of 3 inches. Each character shall contain 35 pixels in a five by seven horizontal to vertical grid arrangement.

(c) Each message line of the 7 foot by 10 foot PCMS shall provide for characters 13 inches in width by 18 inches in height minimum and variable graphic and symbol sizes to a minimum of 18 inches in height.

(d) For flip disk matrix signs, the disk elements shall be coated on the display side with a highly reflective florescent yellow Mylar material, and on the back with a flat black to blend in with the flat black background.

(e) Similar components shall be interchangeable.

990-3.3.2 Operation and Performance:

(a) The message shall be displayed in upper case except when lower case is project specific and is allowed by the MUTCD.

(b) The message matrix panel shall be visible from 1/2 mile and legible from a distance of 650 feet under both day and night conditions. Under variable light level conditions the sign shall automatically adjust its light source to meet the 650 feet visibility requirement. The message panel shall have adjustable display rates, so that the entire message can be read at least twice at the posted speed.

(c) The control panel shall have the capability to store a minimum 50 pre-programmed messages.

(d) The controller in the control panel shall be able to remember messages during non-powered conditions.

(e) The controller shall allow the operator to generate additional messages on site via the keyboard.

(f) For a PCMS using Flip-Disk technology, the controller shall have the capability to provide a stipulated default message upon loss of controller function.

(g) All messages shall be flashed or sequenced. In the sequence mode, the controller shall have the capability to sequence three line messages during one cycle.

990-3.4 Portable Regulatory Signs:

990-3.4.1 Sign Panel Assembly: The sign panel assembly shall consist of a 24 by 30 inches “SPEED LIMIT XX” sign panel and a “WHEN FLASHING” sign panel, intended to notify oncoming traffic the speed limit where workers are present. The sign panel assembly shall meet the following minimum physical requirements:

(a) all nuts, bolts, washers, and other fasteners shall be of corrosion resistant material.

(b) the sign panel shall fold down and be pinned in place for towing. Maximum travel height shall be 80 inches.

(c) construct the sign panel and light housing to allow the unit to be operated in the displayed position at speeds of 30 mph. Design the sign panel assembly to withstand transport speeds of 65 mph.

(d) construct the sign panel such that, when in the raised position, the sign panel will have a height of seven feet from the bottom of the lowest panel to the ground, in accordance with the MUTCD.

(e) provide the unit with a mechanism to raise and lower the sign panel. Provide the unit with a device to lock the sign panel in the raised and lowered position.

990-3.4.2 Flashing Lights: Provide a pair of hooded PAR 46 LED advance warning flashing lamps on each side of the top of the sign panel. These lamps shall be visible day or night at a distance of one mile with a flash rate of approximately 55 flashes per minute.

The lamp lens should be at least 5 3/4 inches in diameter. Smaller diameter lens are permissible if they provide an equivalent or greater brightness indication and meet the legibility criteria above.

The color of the light emitted shall be in accordance with the MUTCD. For solar powered units, the bulbs shall provide a 350 candlepower intensity for day use and an automatic reduction or dimming capacity for night use. The dimmed night operation shall provide adequate indication without excessive glare.

990-3.5 Radar Speed Display Unit:

990-3.5.1 Display Unit Panel and Housing: Meet the requirements of 990-3.1.2 and the following physical requirements as a minimum:

(a) Provide capability to mount a 24 by 30 inches regulatory sign with interchangeable numbers showing the posted speed limit above the message display.

(b) Provide legend "YOUR SPEED" either above or below the message display.

990-3.5.2 Message Display: The message Display shall meet the following physical requirements as a minimum:

(a) Provide a bright LED, two digit speed display on a flat black background with bright yellow LEDs.

(b) Each digit shall contain either a seven-segment layout or matrix-style design. Each digit shall measure a minimum 18 inches in height.

(c) Speed display shall be visible from a distance of at least 1/2 mile and legible from a distance of at least 650 feet under both day and night conditions.

(d) Display shall adjust for day and night operation automatically with a photocell.

990-3.5.3 Radar: The radar unit shall not be affected by normal radio transmissions and meet the following physical requirements as a minimum:

(1) Approach-Only sensor.

(2) Equipped with a low power K-Band transmitter.

(3) Part 90 FCC acceptance, 3 amps, 10.8 to 16.6 vdc. Fuse and reverse polarity protected.

(4) Range of 1,000 feet for mid-size vehicle, capable of accurately sensing speeds of 10 to 99 mph with over speed function that operates when a vehicle approaches over the posted speed limit.

990-3.5.4 Traffic Counter: The unit shall be fitted with a device, which counts the number of vehicles passing the Radar Speed Display Unit. The counter device shall be capable of:

(1) Digital readout of the number of vehicles passing the radar speed display unit.

(2) Digital readout of the number of vehicles exceeding the speed shown on the radar speed display unit.

990-4 Removable Tape.

990-4.1 Composition: Removable Tape shall be one of the products listed on the QPL. The pavement stripes and markings shall consist of high quality plastic materials, pigments, and glass spheres or other retroreflective materials uniformly distributed throughout their cross-sectional area, with a reflective layer of spheres or other retroreflective material embedded in the top surface. No foil type materials shall be allowed.

990-4.2 Skid Resistance: The surface of the stripes and markings shall provide a minimum skid resistance value of 35 BPN (British Pendulum Number) when tested according to ASTM E-303. Bike lane symbols and pedestrian crosswalks shall provide a minimum skid resistance value of 55 BPN.

990-4.3 Thickness: The Qualified Products List will list the specified thickness of each approved product.

990-4.4 Durability and Wear Resistance: When properly applied, the material shall provide neat, durable stripes and markings. The materials shall provide a cushioned resilient substrate that reduces sphere crushing and loss. The film shall be weather resistant and, through normal wear, shall show no significant tearing, rollback or other signs of poor adhesion. Durability is the measured percent of pavement marking material completely removed from the pavement. The pavement marking material line loss must not exceed 5.0% of surface area.

990-4.5 Conformability and Resealing: The stripes and markings shall be capable of conforming to pavement contours, breaks and faults under traffic at pavement temperatures recommended by the manufacturer. The film shall be capable of use for patching worn areas of the same types of film in accordance with the manufacturer's recommendations.

990-4.6 Tensile Strength: The stripes and markings shall have a minimum tensile strength of 40 psi when tested according to ASTM D 638. A rectangular test specimen 6 by 1 by 0.05 inch minimum thickness shall be tested at a temperature range of 40 to 80ºF using a jaw speed of 0.25 inch/minute.

990-4.7 Elongation: The stripes and markings shall have a minimum elongation of 25% when tested in accordance with ASTM D-638.

990-4.8 Plastic Pull test: The stripes and markings shall support a dead weight of 4 lb for not less than five minutes at a temperature range of 70 to 80ºF. Rectangular test specimen size shall be 6 by 1 by 0.05 inch minimum thickness.

990-4.9 Adhesive: Precoat removable tape with a pressure sensitive adhesive capable of being affixed to asphalt concrete and portland cement concrete pavement surfaces without the use of heat, solvents, and other additional adhesives or activators. Ensure that the adhesive does not require a protective liner when the removable tape is in rolled form for shipment. Ensure that the adhesive is capable of temporarily bonding to the roadway pavement at temperatures of 50ºF and the above without pick-up distortion by vehicular traffic.

990-4.10 Color: Meet the requirements of 971-1.6.

990-4.11 Removability: Ensure that the manufacturer shows documented reports that the removable tape is capable of being removed intact or in substantially large strips after being in place for a minimum of 90 days and under an average daily traffic count per lane of at least 5,000 vehicles per day.

990-5 Temporary Retroreflective Pavement Markers.

Temporary Retroreflective Pavement Markers (RPM's) shall meet the requirement of 970-1.2.1, be one of the products listed on the QPL and be certified as meeting the following:

(a) Composition: Use markers made of plastic, ceramic or other durable materials. Markers with studs or mechanical attachments will not be allowed.

(b) Dimensions: Marker minimum and maximum surface dimensions is based on an x and y axis where the y dimension is the axis parallel to the centerline and the x axis is 90 degrees to y. Class E markers shall be 4 inch (W) by 2 inch (H) by 1 inch (D).

The x and y dimension of Class D markers shall be a maximum of 5 inches. The x dimension shall be a minimum of 4 inches and the minimum y dimension will be 2.25 inches.

The maximum installed height of Class D markers shall be 1 inch. The maximum installed height of Class E markers shall be 2 inches. Use Class D markers having a minimum reflective face surface of 0.35 square inches. Use Class E markers having a minimum reflective surface area of 1 square inch.

The marker's reflective face shall be completely visible and above the pavement surface after installation, measured from a line even with the pavement perpendicular to the face of the marker.

(c) Optical Performance: Ensure that the specific intensity of each white reflecting surface at 0.2 degrees observation angle shall be at least the following when the incident light is parallel to the base of the marker:

Horizontal Entrance Angle	Specific Intensity
0 deg.	3
20 deg.	1.2

For yellow reflectors, the specific intensity shall be 60% of the value for white.

For red reflectors, the specific intensity shall be 25% of the value for white. Reflectivity of all RPM's shall not be less than 0.2 Specific Intensity (SI) any time after installation.

(d) Strength requirements: Markers shall support a load of 5,000 pounds. Three markers per lot or shipment will be randomly tested as follows:

Position the marker base down, between the flat, parallel 0.5 inch steel plates of a compression testing machine. Place on top of the marker, a flat piece of 60 (Shore A) durometer rubber, 6 inch by 6 inch by 0.37 inch, centered on the marker. Apply the compressive load through the rubber to the top of the marker at a rate of 0.1 inches per minute.

Either cracking or significant deformation of the marker at any load less than 5,000 pounds will constitute failure.

(e) Adhesion: Use bituminous adhesive materials for bonding the markers to the pavement that meet the requirements of Section 970 and are listed on the QPL.

(f) Removability: Ensure that the pavement marker is removable from asphalt pavement and portland cement concrete pavement intact or in substantially large pieces, either manually or by mechanical devices at temperatures above 40°F, and without the use of heat, grinding or blasting.

990-6 Temporary Glare Screen.

990-6.1 Design and Installation: Meet the following requirements:

(a) Glare screen units shall be manufactured in lengths such that when installed the joint between any one modular unit will not span barrier sections. Color shall be green, similar to Federal Color Standard 595-34227.

(b) Blades, rails and/or posts shall be manufactured from polyethylene, fiberglass, plastic, polyester or polystyrene, and be ultraviolet stabilized and inert to all normal atmospheric conditions and temperature ranges found in Florida.

(c) For paddle type designs, the blade width shall not be more than 9 inches. Blades or screen for individual or modular systems shall be 24 to 30 inches high and capable of being locked down at an angle and spacing to provide a cut-off angle not less than 20 degrees.

(d) For glare screen mounted on temporary barrier wall, a strip (6 by 12 inches) of reflective sheeting as specified in 994-2 shall be placed on a panel, centered in each barrier section (at a spacing not to exceed 15 feet) and positioned in such a manner as to permit total right angle observation by parallel traffic. When glare screen is utilized on temporary concrete barriers, warning lights will not be required.

(e) Prior to approval an impact test shall be performed by the manufacturer to verify the safety performance of the proposed system. The minimum impact strength of the posts, blades, rail and the barrier attachment design shall be sufficient to prevent the unit from separating from the barrier when impacted by a 3 inches outside diameter steel pipe traveling at 30 mph and impacting mid-height on the glare screen assembly.

(f) All hardware shall be galvanized in accordance with ASTM A-123 or stainless steel in accordance with AISI 302/305.

Alternative designs for temporary glare screen may be submitted as a Cost Savings Initiative Proposal in accordance with 4-3.9.

990-6.2 Qualified Products List: Manufactured glare screen systems may be modular or individual units listed on the QPL.

990-7 Temporary Traffic Control Signals.

990-7.1 General: Temporary Traffic Control Signals shall be one of the products listed on the APL. Meet the physical display and operational requirements of conventional traffic signal described in the MUTCD for portable traffic signals. The standard includes but is not limited to the following:

(a) Use signal heads having three 12 inch vehicular signal indications (Red, Yellow and Green). Ensure there are two signal heads for each direction of traffic.

(b) The traffic signal heads on this device will be approved by the Department.

(c) Department approved lighting sources will be installed in each section in accordance with the manufacturer's permanent directional marking(s), that is, an "Up Arrow", the word "UP" or "TOP," for correct indexing and orientation within a signal housing.

(d) The masts supporting the traffic signal heads will be manufactured with the lowest point of the vehicular signal head as follows:

(1) Eight feet above finished grade at the point of their installation for "pedestal" type application or

(2) Seventeen to 19 feet above pavement grade at the center of roadway for "overhead" type application.

(e) The yellow clearance interval will be programmed three seconds or more. Under no condition can the yellow clearance interval be manually controlled. It must be timed internally by the controller as per Department specifications.

(f) The green interval must display a minimum of five seconds before being advanced to the yellow clearance interval.

(g) The controller will allow for a variable all red clearance interval from 0 to 999 seconds.

(h) Portable traffic control signals will be either manually controlled or traffic actuated. Indicator lights for monitoring the signal operation of each approach will be supplied and visible from within the work zone area.

(i) When the portable traffic control signals are radio actuated the following will apply:

(1) The transmitter will be FCC Type accepted and not exceed 1 watt output per FCC, Part 90.17. The manufacturer must comply with all "Specific limitations" noted in FCC Part 90.17.

(2) The Controller will force the traffic signal to display red toward the traffic approach in case of radio failure or interference.

(j) The trailer and supports will be painted construction/maintenance orange enamel in accordance with the MUTCD color.

(k) The device will meet NEMA environmental standard. The test report certified by an independent laboratory will be provided.

(l) Ensure the certification number is engraved or labeled permanently on equipment.

(m) Ensure the device has an external, visible, water resistant label with the following information: "Certification of this device by the Florida Department of Transportation allows for its use in Construction Zones Only."

990-8 Work Zone Signs.

Provide steel flanged U-channel or Square Tube steel meeting the mechanical requirements of ASTM A 499, Grade 60. For each U-channel or Square Tube, punch or drill 3/8 inch diameter holes on 1 inch centers through the center of the post, starting approximately 1 inch from the top and extending the full length of the post. Ensure that the weight per foot of a particular manufacturer's post size does not vary more than plus or minus 3.5% of its specified weight per foot. Taper the bottom end of the post for easier installation. Machine straighten the U-channel to a tolerance of 0.4% of the length. Use only non-corrosive metal, aluminum, or galvanized steel attachment hardware. Work zone sign systems shall be one of the products listed on the QPL.

990-9 Temporary Raised Rumble Strips:

990-9.1 General: Temporary Raised Rumble Strips shall be one of the products listed on the QPL. Meet the physical display and operational requirements in the MUTCD for Temporary Raised Rumble Strips. The Temporary Raised Rumble Strip may be either a removable polymer striping tape type or a molded engineered polymer material type as described below:

990-9.1.1 Removable Polymer Striping Tape:

Characteristic	Requirement
Composition:	Removable Polymer Striping Tape with pre-applied adhesive
Color:	White, Black or Orange
Cross-section:	0.25 in. to 0.50 in. (height) x 4 in. (wide)

990-9.1.2 Molded Engineered Polymer Material:

Characteristic	Requirement
Composition:	Molded Engineered Polymer Material
Weight	Internally ballasted to provide proper weight to maintain position in use without the use of adhesives or mechanical fasteners
Color:	White, Black or Orange
Shape	Beveled on the leading edge

Cross-section:	0.625 in. to 0.875 in. (height) x 12 in. (wide)

990-10 Automated Flagger Assistance Devices (AFAD):

990-10.1 General: AFAD's shall be one of the products listed on the APL. Meet the physical display and operational requirements in the MUTCD for the AFAD as well as the detailed requirements below.

990-10.1.1 Stop/Slow Automated Flagger Assistance Devices: Provide a Stop/Slow AFAD including a Stop/Slow sign that alternately displays the stop face and the slow face of a Stop/Slow paddle without the need for a flagger in the immediate vicinity of the AFAD or on the roadway.

Ensure that the Stop/Slow AFAD includes a gate arm that descends to a down position across the approach lane of traffic when the stop face is displayed and then ascends to an upright position when the slow face is displayed.

Ensure the Gate arm is fully retroreflectorized on both sides, with vertical alternating red and white stripes at 16-inch intervals measured horizontally in accordance with the MUTCD. When the arm is in the down position blocking the approach lane:

A. The minimum vertical aspect of the arm and sheeting shall be 2 inches; and,

B. The end of the arm shall reach at least to the center of the lane being controlled.

990-10.1.2 Red/Yellow Lens Automated Flagger Assistance Devices: Provide a Red/Yellow Lens AFAD that alternately displays a steadily illuminated circular red lens and a flashing circular yellow lens to control traffic without the need for a flagger in the immediate vicinity of the AFAD or on the roadway.

Ensure that the Red/Yellow Lens AFAD includes a gate arm that descends to a down position across the approach lane of traffic when the steady circular red lens is illuminated and then ascends to an upright position when the flashing circular yellow lens is illuminated.

Ensure that the gate arm is fully retroreflectorized on both sides, with vertical alternating red and white stripes at 16-inch intervals measured horizontally in accordance with the MUTCD. When the arm is in the down position blocking the approach lane:

A. The minimum vertical aspect of the arm and sheeting shall be 2 inches; and,

B. The end of the arm shall reach at least to the center of the lane being controlled.

Do not provide a change interval between the display of the steady circular red indication and the display of the flashing circular yellow indication. Provide a steady illuminated circular yellow indication, with at least a 5 second duration, between the transition from flashing circular yellow indication and the display of the steady circular red indication. The Engineer may approve a different duration, provided it falls within the range recommended by the MUTCD.

993 OBJECT MARKERS AND DELINEATORS.
(REV 7-8-10) (FA 7-16-10) (1-11)

SUBARTICLE 993-1.4 (Page 975) is deleted and the following substituted:

993-1.4 Posts: The marker posts shall be of steel or aluminum as shown in the Design Standards or plans. Steel posts shall be 2.5 lb/ft. flanged U-Channel . The U-channel posts shall meet the mechanical requirements of ASTM A 499, Grade 60. Provide U-channel posts that have been galvanized after fabrication in accordance with ASTM A 123 and have a smooth uniform finish free from defects affecting strength, durability and appearance. For each U-channel, punch or drill 3/8 inch diameter holes on 1 inch centers through the center of the post, starting approximately 1 inch from the top and extending the full length of the post. Punching or drilling operations shall be completed prior to galvanization. The weight per foot of a manufacturer's U-channel size shall not vary more than plus or minus 3.5% of its specified weight per foot. Machine-straighten the U-channel to a tolerance of 0.4% of the length. U-channel posts shall be listed on the QPL. Round aluminum posts shall meet the requirements of Index 11860.

Use attachment hardware (nuts, bolts, clamps, brackets, braces, etc.) of aluminum or galvanized steel.

SUBARTICLE 993-2-2 (Page 975) is deleted and the following substituted:

993-2.2 Flexible Post Delineators:

993-2.2.1 Dimensions: The post shall have a minimum width of 3 inches facing traffic and of such length to generally provide a height of 48 inches above the pavement surface.

993-2.2.2 Color: The post shall be opaque white. The yellowness index shall not exceed 12 when tested in accordance with ASTM D 1925 or ASTM E 313. The daylight 45 degree, 0 degree luminous directional reflectance shall be a minimum of 70 when tested in accordance with ASTM E 1347.

993- 2.2.3 Retroreflective Sheeting: The reflective sheeting shall be Types III, IV, V or VII and meet the requirements of Section 994. The reflective sheeting shall have a minimum width of 3 inches and have a minimum area of 30 square inches.

993-2.2.4 Impact Performance: Posts shall be tested and evaluated according to the National Testing Product Evaluation Program (NTPEP) Project Work Plan for Field Evaluation of Flexible Surface Mounted Delineator Posts. A temperature of 65°F or greater may be used in lieu of the NTPEP temperature requirements. Posts shall be capable of returning to a vertical position plus or minus 5 degrees with no delaminating, and one post may list no more than 10 degrees. No post shall split, crack, break, or separate from base.

SUBARTICLE 993-2.3.1 (Page 975) is deleted and the following substituted:

993-2.3.1 Posts: The posts shall meet the requirements of 993-1.4, except the steel delineator post shall be 1.1 lb/ft.

994 RETROREFLECTIVE AND NONREFLECTIVE SHEETING FOR TRAFFIC CONTROL DEVICES.

(REV 2-8-10) (FA 2-10-10) (7-10)

SECTION 994 (Pages 977 – 980) is deleted and the following substituted:

SECTION 994
RETROREFLECTIVE AND NONREFLECTIVE SHEETING FOR TRAFFIC CONTROL DEVICES

994-1 Description.

994-1.1 General: This Section specifies the requirements for retroreflective and nonreflective sheeting materials, transparent and opaque process inks for retroreflective sheeting materials and film overlays for traffic control devices.

994-1.2 Classification: Retroreflective sheeting material Types III, IV, V, and VI shall be classified in accordance with ASTM D-4956. In addition, a special classification, Type VII (Special) is added for super high intensity retroreflective sheeting. This special classification shall include materials classified as Type VIII and above in accordance with ASTM D-4956.

994-1.3 Qualified Products List: All sheeting, process inks and film overlay materials shall be listed on the Qualified Products List (QPL). Manufacturers seeking evaluation of their products shall submit product data sheets, performance test reports from an independent laboratory showing the product meets the requirements of this section, and a QPL application in accordance with Section 6. Information on the QPL application must include the product colors included in the application, classification, adhesive backing class, and liner type. Information on the QPL application for process inks and film overlay products must also include the compatible reflective sheeting material.

994-2 Materials.

Sheeting shall meet the requirements of Types III, IV, V, VI in ASTM D-4956 or Type VII (Special) and fluorescent pink listed below in accordance with their approved usage.

994-3 Performance Requirements.

994-3.1 General: Sheeting, process inks and film overlay materials shall be tested in accordance with, and meet all the performance requirements of ASTM D-4956, including Supplemental Requirement S2, Reboundable Sheeting Requirements, except as amended in this Section. Classification Type VII (Special) shall be tested in accordance with, and meet the performance requirements of ASTM D-4956 Type VIII, except as amended in this Section. For performance requirements that are color dependant, each color included in the QPL application must be tested and meet the requirements identified in ASTM D-4956 or this Section as applicable. Process inks and film overlay materials shall be applied to reflective sheeting in accordance with Section 994-4 for testing.

994-3.2 Retroreflective Intensity: The retroreflective sheeting shall meet the minimum initial requirements as stated for 0.2 degree and 0.5 degree observation angles in ASTM D-4956. Type VI fluorescent pink sheeting and Type VII (Special) sheeting shall meet the minimum retroreflectivity requirements listed below.

Type VII (Special) Sheeting										
Minimum Coefficient of Retroreflection (cd/foot-candle·ft^2)(cd/fc·ft^2)										
Observation/Entrance Angle (degree)	White	Yellow	Red	Orange	Blue	Green	Brown	Fluorescent Orange	Fluorescent Yellow	Fluorescent Yellow/Green
0.2/-4	380	304	95	250	19	38	19	180	220	360
0.5/-4	250	195	55	100	12	25	8	60	145	235
0.2/30	220	176	48	110	11	22	9	85	125	205
0.5/30	135	105	30	50	7	14	3	33	75	125

Type VI Sheeting	
Minimum Coefficient of Retroreflection (cd/foot-candle·ft^2)(cd/fc·ft^2)	
Observation/Entrance Angle	Fluorescent Pink
(degree)	
0.2/-4	160
0.5/-4	100
0.2/30	100
0.5/30	40

994-3.3 Color: The fluorescent pink initial color shall meet the following x, y chromaticity coordinates:

Fluorescent Pink	1	2	3	4
x	.450	.590	.644	.536
y	.270	.350	.290	.230

Fluorescent pink sheeting shall have a minimum luminance factor of 25.

994-3.4 Outdoor Weathering: Outdoor weathering exposure of sign sheeting materials shall be in accordance with, and meet the requirements of ASTM D-4956 for each product color and classification and conducted at an exposure location meeting the Tropical Summer Rain Climate Type (Miami, Florida or equivalent). Outdoor weathering is not required for Type VI fluorescent pink and fluorescent yellow.

994-4 Direct and Reverse Screen Processing.

The transparent and opaque process inks furnished for direct and reverse screen processing shall be of a type and quality formulated for retroreflective sheeting materials as listed on the QPL and applied in accordance with the manufacturer's instruction. Screen processing in accordance with the techniques and procedures recommended by the manufacturer shall produce a uniform legend of continuous stroke width of either transparent or opaque ink, with sharply defined edges and without blemishes on the sign background that will affect the intended sign use.

The retroreflective sheeting shall permit color processing with compatible transparent and opaque process inks as approved by the sheeting manufacturer and listed on the QPL.

994-5 In-Service Minimum Requirements.

The retroreflective sheeting and screen processed retroreflective sheeting shall have the minimum coefficient of retroreflection as shown in ASTM D-4956, Outdoor Weathering Photometric Requirements for All Climates except Type VI fluorescent pink and fluorescent yellow. In addition, Type VII (Special) classified sheeting materials shall have a minimum coefficient of retroreflection of 80% of the values listed in the above table. Only the observation angle of 0.2 degrees and an entrance angle of -4 degrees shall be used in measuring in-service minimums. The in-service life for opaque overlay films, black processing inks and opaque lettering shall equal the life of the reflective sheeting to which it is applied.

994-6 Packaging and Labeling.

Packaging and labeling shall meet the requirements of ASTM D-4956.

994-7 Samples.

Field samples will be obtained in accordance with the Department's Sampling, Testing and Reporting Guide Schedule or on a random basis at the discretion of the Engineer.

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