



Florida Department of Transportation

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MEMORANDUM

DATE: November 10, 2016

TO: Specification Review Distribution List

FROM: Dan Hurtado, P.E., State Specifications Engineer

SUBJECT: Proposed Specification: **4500402 Precast Prestressed Concrete Construction.**

In accordance with Specification Development Procedures, we are sending you a copy of a proposed specification change.

This change was proposed by John Westphal of the State Construction Office to update the language.

Please share this proposal with others within your responsibility. Review comments are due within four weeks and should be sent to Mail Station 75 or online at <http://www2.dot.state.fl.us/ProgramManagement/Development/IndustryReview.aspx> . Comments received after **December 8, 2016**, may not be considered. Your input is encouraged.

DH/dt
Attachment

PRECAST PRESTRESSED CONCRETE CONSTRUCTION.

(REV ~~9-20-16~~11-1-16)

SUBARTICLE 450-4.2.1 is deleted and replaced by the following:

450-4.2.1 General: Identify all reinforcing steel, welded wire reinforcement and prestressing strand 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. A LOT of FRP reinforcing bars or prestressing strands is a shipment of material of the same size, fiber lot and resin batch from the same manufacturer.

Acceptance of reinforcing bars, 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 bars, 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~~6-4.

ARTICLE 450-12 is deleted and replaced by the following:

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. Do not ship products requiring repairs from the casting yard to the project site until such repairs are complete and the Engineer has determined the product to be acceptable. 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 to be a major, deficiency as defined herein, requiring an engineering evaluation and repairable for acceptance,~~ submit an Engineering Analysis Scope in accordance with 6-4 by the Contractor's Engineer of Record, who may not be an employee of the manufacturer, to determine the disposition of the defect and the required method of repair. The use of a previously approved repair method is acceptable only for minor defects of the same type of single deficiency exhibited in a product. ~~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.

If the Engineering Analysis Report (EAR) is approved by the Engineer, all Department costs associated with review of EAR, including the cost of any and all engineering evaluation and testing services performed by the Department may be deducted from payment to the Contractor not to exceed 15% of the product value based on unit bid prices.

The Engineer ~~will~~ may require a credit on any product with deficiencies that require ~~an~~ engineering ~~analysis~~ 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. Replace a rejected product with a product meeting the requirements of the Contract Documents, at no additional 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 deficiencies are considered to be major ~~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 spalls in the bearing areas and edge of the top flange, a minor spall is defined as a spall not larger than 2.0 square feet and no deeper than one inch plus the sum of the concrete cover and the diameter of the bar in the first layer of reinforcing. Repair minor spalls in accordance with 450-13.4.

Spalls located at the edges of the top flange are considered minor spalls as follows:

1. A spall on one edge of the top flange, without a coincident spall on the other edge of the top flange, is considered a minor spall if the total longitudinal length of the defect does not exceed 10 feet and any lateral dimensions of the spall measured perpendicular to the longitudinal axis of the beam are not greater than 25% of the width of the top flange.

2. Coincident spalls on opposite edges of the top flange are considered minor spalls if the total length of the defects within both spalls does not exceed 10

feet and any lateral dimensions of the spalls at a given location measured perpendicular to the longitudinal axis of the beam are not greater than 25% of the width of the top flange.

Spalls **are considered to be major when:**

1. Located in the bearing area that extend back into the concrete within the limits above the bearing plate ~~are considered major spalls.~~

2. A major spall is a spall that a ~~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 ~~will be considered to be major~~~~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. If the total surface length of all cracks within a single product, regardless of width, located between the end zones exceeds one-quarter of the product's length, ~~the cracks are considered to be major~~~~an engineering evaluation and disposition in accordance with 450-14 is required.~~ 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 ~~an engineering evaluation analysis and disposition~~ in accordance with ~~450-146-4~~.

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 All Types of Simple Span Pretensioned Concrete Beams:

End zones (within a distance of three times the depth of the product from the end):

1. Horizontal or diagonal cracks 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 the product's depth.

2. Vertical cracks extending through the top flange not to exceed one-half 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. Horizontal or diagonal cracks at either or both ends in the top flange and web of the product where no post-tensioning anchorage zone is present.

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.

Any Location: 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 Post-Tensioned Beams for Drop-In Spans:

Pier Sections: Horizontal or diagonal cracks at either or both ends in the top flange and web of the product.

Drop-In Sections: Same as simple span pretensioned concrete beams.

End Sections: At end of beam with post-tensioning anchorages: same as Pretensioned I-Beams Containing Longitudinal Post-tensioning Ducts. At end of beam adjacent to pier sections: same as for simple span pretensioned concrete beams.

450-12.5.3.6 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.

450-12.5.3.7: Pretensioned Concrete Poles:

Longitudinal cracks: The length of each crack must be less than twice the base width of the pole.

Transverse or diagonal cracks: Cracks perpendicular to or at an inclined angle to the longitudinal direction of the pole. The length of each crack must be less than two-thirds of the base width of the pole.

Edge cracks: Cracks exhibiting at the edge and extending across one or two adjacent planes of a square pole. The total length of each crack must be less than 2.0 inches.

ARTICLE 450-14 is deleted.

~~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. The plant may use the repair method that is previously approved in the Producer 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 Repair Proposal:~~

~~The repair proposal must be completed by the Contractor's Engineer of Record and shall consist of the following:~~

- ~~1. A cover letter prepared on the Contractor's letterhead addressed to the Engineer describing the product.~~
- ~~2. Information in a format acceptable to the Engineer describing the details of the non-compliance and the proposed repairs.~~
- ~~3. An engineering evaluation: A structural performance and durability evaluation which explains why the performance and durability of the repaired deficient product is acceptable as compared to that of an undamaged comparable product. The evaluation must be supported by one or more of the following types of information:
 - ~~a. Written evidence of a previously approved comparable deficiency and its repair.~~
 - ~~b. Documented research that demonstrates the proposed repair to be effective.~~
 - ~~c. If applicable, engineering calculations providing support for recommendations.~~~~
- ~~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 their signature and seal.~~

~~————— 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.~~

~~————— 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.~~

ARTICLES 450-15 through 450-18 are deleted and replaced by the following:

450-15-14 Repairs Before Approval.

~~For repairs requiring an engineering analysis, do not initiate repairs prior to approval of the EAR by the Engineer. 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, submit 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 APL 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.~~

450-16-15 Handling, Storage, Shipping and Erection.

450-16-15.1 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.

450-1615.2 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, submit 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~~15.3 Shipping: Do not ship precast prestressed concrete products to the project site prior to the completion of the 72 hour curing period and attainment of the required 28-day strength. The contractor is permitted to verify the shipping strength test, before 28 days, by testing compressive strength cylinders that are cured under the conditions similar to the product or by testing temperature match cured cylinders. The use of maturity method, ASTM C1074, pulse velocity method in accordance with ASTM C597, 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 Producer QC Plan. The QC Manager's stamp on each product indicates certification that the product was fabricated in conformance with the Producer 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~~15.4 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~~16 Measurement and Payment.

450-~~17~~16.1 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~~16.2 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~~16.3 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 in the Plans, subject to the provisions of 9-3.2.

450-~~17~~16.4 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~~17 Basis of Payment.

Price and payment will be full compensation for all work and materials specified in this Section, including reinforcement, pretensioning strand, 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. |