

**ORIGINATION FORM**  
**Proposed Revisions to the Specifications**

**Date:**

**Specification Section:**

**Originator:**

**Articles/Subarticles:**

**Telephone:**

**email:**

**Why does the existing language need to be changed?**

**Summary of the changes:**

**Are these changes applicable to all Department jobs?**    Yes            No  
**If not, what are the restrictions?**

**Will these changes result in an increase or decrease in project costs?**    Yes            No  
**If yes, what is the estimated change in costs?**

**With who have you discussed these changes?**

**What other offices will be impacted by these changes?**

**Will this revision necessitate changes to the following:**    BOE            PPM            SDG            CPAM

**Design Standards**                      **List Affected Index Nos.**

**Other manual?**

**Are all references to external publications current?**    Yes            No  
**If not, what references need to be updated (please include changes in the redline)?**

**Will this revision necessitate any of the following:**

**Design Bulletin**

**Construction Bulletin**

**Estimates Bulletin**

Contact the State Specifications Office for assistance in completing this form.

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ANANTH PRASAD, P.E.  
SECRETARY

**MEMORANDUM**

**DATE:** November 18, 2014

**TO:** Specification Review Distribution List

**FROM:** Daniel Scheer, P.E., State Specifications Engineer

**SUBJECT:** Proposed Specification: **4500100 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 Timothy Ruelke of the State Materials Office (SMO) to revise the language for consistency with changes proposed for Section 105. The Department is revising the Contractor Quality Control (QC) Plan requirements and deleting the narrative portion of the Contractor QC Plan. This change is being made in conjunction with the implementation of the Materials Acceptance and Certification system (MAC), which is replacing the current Laboratory Information Management (LIMS) application.

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/SpecificationsEstimates/Development/IndustryReview.aspx> . Comments received after **December 16, 2014**, may not be considered. Your input is encouraged.

DS/dt  
Attachment

**PRECAST PRESTRESSED CONCRETE CONSTRUCTION.**  
**(REV 10-29-14)**

ARTICLE 450-1 is deleted and the following substituted:

**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~~ *Production Facility Listing*. Producers seeking inclusion on the list shall meet the requirements of *Section 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~~ *Producer* 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.

ARTICLE 450-2 is deleted and the following substituted:

**450-2 Quality Control Program.**

**450-2.1 General:** Develop a *Producer* Quality Control Program as specified in *Section 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-Producer* Quality Control (QC) Plan (*QC Plan*).

**450-2.2 Plant:** Ensure each plant has an onsite QC Manager meeting the requirements of *Section* 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 *Producer* QC Plan.

Attach to each monthly request for payment, certification that the listed precast prestressed products have been produced under the *Producer* 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 *Producer* 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.

SUBARTICLE 450-6.1 is deleted and the following substituted:

**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 *Producer* 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.

SUBARTICLE 450-8.2.6 is deleted and the following substituted:

**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 *Producer* 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.

SUBARTICLE 450-10.1.1 is deleted and the following substituted:

**450-10.1.1 Cold Weather Concreting:** When the temperature of the surrounding air is expected to be below 40°F within 24 hours after placing concrete, the temperature of the plastic concrete as placed must be 55°F or greater. Maintain the temperature of the concrete after placement at or above 55°F for the first 24 hours or until detensioning, whichever occurs first. For piles and other members with a minimum section dimension of 12 inches or more, maintain the temperature of the concrete after placement at or above 50°F for the first 24 hours or until detensioning, whichever occurs first. 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 *Producer* 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.

SUBARTICLE 450-10.2 is deleted and the following substituted:

**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 *Producer* QC Plan.

SUBARTICLE 450-10.3.2 is deleted and the following substituted:

**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 *Producer* 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 36 and 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.

SUBARTICLE 450-10.6 is deleted and the following substituted:

**450-10.6 Curing:** Cure prestressed concrete as required for a minimum duration of 72 hours. If forms are loosened upon setting of concrete and/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.

SUBARTICLE 450-11.1 is deleted and the following substituted:

**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 C1074, the pulse velocity method in accordance with ASTM C597, 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~~ *Producer* QC Plan. Cure concrete cylinders used for detensioning strength tests in the same manner and location as the prestressed concrete products.

For I-girders, where side forms are loosened upon setting of concrete or removed before the 72 hour curing period is complete, the top flange dormant strands may be released after the concrete reaches a compressive strength of 2,000 psi.

SUBARTICLE 450-11.2 is deleted and the following substituted:

**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 *Producer*

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 *Producer* QC Plan or the construction submittal.

Transfer prestressing forces to the concrete by either single strand release or multiple strand release.

SUBARTICLE 450-11.3 is deleted and the following substituted:

**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 *Producer* 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.

SUBARTICLE 450-13.1 is deleted and the following substituted:

**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.~~ *Submit the alternative repair methods in writing to the Engineer for approval prior to performing repairs.* 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.

SUBARTICLE 450-14.1 is deleted and the following substituted:

**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 *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.

SUBARTICLE 450-16.3 is deleted and the following substituted:

**450-16.3 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 ~~plant's-Producer~~ QC Plan. The QC Manager's stamp on each product indicates certification that the product was fabricated in conformance with the ~~Contractor's-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.