SECTION 8.3

PRESTRESSED (PS) CONCRETE PRODUCERS' QUALITY CONTROL RELATED TO MAJOR PRODUCT DEFECTS

8.3.1 PURPOSE

The purpose of this procedure is to establish a standard method for evaluating the effectiveness of PS concrete producer quality control (QC) efforts for minimizing the incidence of major defects in PS concrete products. This evaluation process requires monitoring the rate of major production defects that occur in PS concrete products; using these rates as a basis for evaluating the effectiveness of PS concrete producer QC efforts; and taking action that will improve PS concrete producer QC efforts when they are below a satisfactory level of performance.

8.3.2 AUTHORITY

Sections 20.23(3)(a) and 334.048(3), Florida Statutes (F.S.)

8.3.3 REFERENCES

Florida Department of Transportation, Standard Specifications for Road and Bridge Construction, Section 450, Precast Prestressed Concrete Construction

8.3.4 SCOPE

Primary offices that are affected by this procedure include the District Materials Offices (DMO), State Materials Office (SMO), District Construction Offices (DCO) and State Construction Office (SCO), State Structures Design Office (SSDO) and District Structures Design Offices (DSDO).

8.3.5 GENERAL INFORMATION

Major defects may occur in PS concrete products during the production process. These defects are usually correctable and proper correction results in the Department's acceptance of the product; however, the Department does not consider the quality of a corrected product to be as good as the quality of a product that needs no correction. Since the Department seeks to place products with the very best quality into service whenever possible, the number of corrected or defective products must be kept to a minimum. In order to

encourage PS concrete producers to establish and maintain efforts that minimize defects, the Department compiles defect rates on a semiannual basis for each PS concrete product group in each plant and these rates are used as the basis for establishing a "Defect Rate Limit". A Defect Rate Limit is the defect rate that a producer must stay below in order to achieve the level of product quality that is acceptable to the Department.

8.3.6 MONITORING MAJOR DEFECTS

8.3.6.1 District Materials Offices

Each District will compile the results of the defect rate data for plants of which they are responsible for verification inspections and testing, and it must be summarized as shown on the attached sample spread sheet referred to as a ***PS Concrete Product Defect Data Table (Table 8-3-1)*** every 6 months, referred to as the monitoring period, starting July 1st each year.

If the producer is of the opinion that a major defect is caused by a design error and not a producer error then the Project Administrator and the person in charge of prestressed concrete for the DMO must determine whether or not they agree with the Producer. If they disagree with the producer and the producer is unwilling to accept the decision, it may be appealed to the District Construction Engineer and District Materials Engineer who should consult with the DSDO and/or SSDO before making a final decision. Until a final decision is made by the Department about the defect in question, it will not be reported in the ***PS Concrete Product Defect Data Table***.

If the DMO representative determines that a defect is major and the producer disagrees, then the determination may be appealed to the District Construction Engineer and District Materials Engineer for final determination. Until a final determination is made by the Department about the defect in question, it will not be reported in the ***PS Concrete Product Defect Data Table***.

The table shows that the PS concrete products are organized by product groups that have similar casting, stressing and handling characteristics and; therefore, have defect rates and a defect limit that are also characteristic of the group.

The information gathered for 6 months for each product group includes the following:

(1) Total number of products produced.

(2) Number of major defects, by defect type, in the products produced.
(3) Total number of major defects, which is the summation of all major defect types in (2).
(4) The defect rate, which is computed by dividing the value in (3) above (total number of major defects) by the value in (1) above (total number of products produced). For example: if 100 products are produced and these have a total number of major defects of 20 then the defect rate is computed by dividing 20 by 100 which results in 1/5 or 0.20 defects per product produced.

Within 14 days after each 6-month data gathering period expires, the DMO must electronically forward the ***Defect Data Table*** for each plant in the District to the SMO. Only major defects, as defined in ***Specification 450-12***, are to be entered into the ***PS Concrete Product Defect Data Table*** with the following qualifications:

(a) If a defect is caused by the degree of skew and the skew angle the angle between the line perpendicular to the longitudinal centerline of beam and the skewed beam end face) is less than the following limit then the defect must not be entered into the ***PS Concrete Product Defect Data Table***:

1. Type II, III and IV AASHTO Beams – 35 degrees
2. Type V and VI AASHTO Beams – 25 degrees
3. Bulb-T Beams – 20 degrees

(b) When an Individual component (beam, pile or slab) has multiple defects of the same type, they must be considered as one defect for the purpose of reporting in the ***PS Concrete Product Defect Data Table***. For example: if an individual pile has 3 spalls, 1 chip and 2 cracks, these must be reported in the ***PS Concrete Product Defect Data Table*** as 1 spall, 1 chip and 1 crack.

(c) Uncorrected major defects that are revealed during inspection after delivery to the project site, must not be reported in the ***PS Concrete Product Defect Data Table*** but instead must be reported to the person in charge of prestressed concrete for the DMO who should address this oversight by evaluating whether or not the producer is in compliance with the Quality Control Plan. If the Producer is not in compliance with the Quality Control Plan, appropriate action must be taken by the person in charge of prestressed concrete for the DMO.

(d) A major defect that is caused by a design error, as determined by the Department and not by producer error, must not be reported in the ***PS Concrete Product Defect Data Table*** but should be reported by the Project Administrator to the DSDO and/or SSDO.

8.3.6.2 State Materials Office

Upon the receipt of the data in accordance with ***Section 8.3.6.1***, from each District, the data will be entered into an electronic version of the ***Defect Data Summary Table (Table 8-3-2)*** by the SMO. This information will be used by the SMO to compute the Defect Rate Limit (DRL) for each product group. The SMO must determine if any producer has exceeded the DRL and if so, actions as specified in ***Section 8.3.8***, will be taken in order to improve QC procedures.

8.3.7 METHODOLOGY FOR ESTABLISHING DEFECT RATE LIMITS (DRL)

(A) Method A: Three or More Plants Reporting - Using the information from the ***PS Concrete Product Defect Data Summary Table***, compute the Average Defect Rate (ADR) for each product group. Next, compute the DRL by adding 50% of the ADR to the ADR or by multiplying the ADR by 1.5 (see example calculation below). In order to compute the DRL using only data from a specific product group for a given monitoring period, the ***Defect Data Summary Table*** must show at least 3 plants reporting defect rates for that product group. If the ***Defect Data Summary Table*** shows less than 3 plants reporting, use Method B until Method A conditions have been reestablished. A defect rate of zero may be used for computing the ADR when the "Total Produced" data column has a value of 1 or greater for the plant. The first DRL must be determined by using data from ***PS Concrete Product Defect Data Tables*** compiled from the first monitoring period starting on July 1, 2004, and ending on December 31, 2004. The first DRL will be used to evaluate producers for the period beginning January 1, 2005 and ending December 31, 2005. The second DRL must be computed by averaging the data for the two monitoring periods in 2005 and will become the new DRL if less than the first DRL. The new DRL will be used for 2006 evaluations. This procedure must be followed thereafter, which requires the averaging of data from a calendar year to compute a new DRL which must be used for evaluation in the following calendar year if smaller than the previous DRL.

(B) Method B: Less than Three Plants Reporting - When the ***Defect Data Summary Table*** shows less than 3 plants reporting defect rates for a given product group, then the following procedure will be used to compute the DRL for that group for each monitoring period. Compute the ADR for the entire product category that the product group is in: product categories are Piles (1), Beams (2), and Slabs (3). Next, compute the DRL by adding 75% of the category ADR to the category ADR or by multiplying the category ADR by 1.75. If a product category has a total of 2 or less producers reporting defect rates then a DRL cannot be computed for any product group in that category for that monitoring period. However, if the defect rates of the 2 or less producers are considered to be too high then they will be reported to the DMO for review of the Producer's QCP.

For both Method A and B, the Department intends to establish a minimum DRL which once achieved by the industry will not be reduced. The determination of the minimum DRL will be based on defect data compiled over a statistically meaningful period of time.

Example Calculation:

On a ***Defect Data Summary Table***, ***Product Group 1A (Piles)*** shows data for product production in 4 plants including defect rates as follows:

Plant 1 = 0.059, Plant 2 = 0.024, Plant 3 = 0.009, and Plant 4 = 0.017.

ADR = 1/4 x (0.059 + 0.024 + 0.009 + 0.017) = 0.027
DRL = 1.5 x 0.027 = 0.04

Comparing the defect rates of the plants to the DRL shows that Plant 1 has exceeded the DRL and; therefore, is subject to an action as specified in ***Section 8.3.8***.

8.3.8 ACTIONS RELATED TO THE DEFECT RATE LIMIT

When a PS concrete Producer exceeds the DRL, action must be taken by the appropriate Department office to encourage the PS concrete producer to improve QC procedures or, if procedures are not improved, to suspend or revoke the producer's qualification. Actions to be taken are related to the severity of the producer's unsatisfactory QC and include the following three levels with their definition and corresponding action:

(A) Level 1: Defect Rate Limit Being Approached

Definition: The producer's defect rate has steadily increased during the monitoring period and is approaching the limit before the end of the period.

Action Required: The DMO must send a notice to the producer and may ask for a plan to reduce the defect rate in the form of a Quality Control Plan (QCP) amendment.

(B) Level 2: Defect Rate Limit exceeded during one monitoring period

Definition: The producer's defect rate has exceeded the limit for one monitoring period but did not exceed the limit during the previous period.

Action Required: The DMO must issue a Defect Rate Warning letter notifying the producer that the plant is out of compliance with the plant's Quality Control Plan. This will require immediate resubmittal of the plan by the Producer which must address a method for reducing the defect rate to below the DRL. In addition, QC, Verification and Independent Assurance (IA) rates must be increased for a period not to exceed 6 months. The duration is at the discretion of the District Materials Engineer (DME) and will be commensurate with the seriousness of QC lapses. The increased QC, Verification and IA rates will be reduced to normal when a revised QCP has been approved and the DMO is confident that the revised QC procedures will result in a defect rate below the DRL.

(C) Level 3: Defect Rate Limit exceeded for consecutive monitoring periods

Definition: The producer's defect rate has exceeded the limit for consecutive monitoring periods or for any 2 periods out of 4 consecutive periods.

Action Required: The DMO must notify the producer that the plant's qualification has been revoked until such time as the DME determines that improved QC procedures will result in defect rates that can be sustained below the DRL for an extended period of time. During the revocation period, the plant will not be permitted to produce any products for the product group in question. Rescinding revocation will also require approval of a revised QCP along with increased rates of QC, Verification and IA for duration to be determined by the DME. If the Producer disagrees with the duration or imposition of the revocation, appeal may be made to the Director, State Materials Office and revocation must not be imposed until the appeal process is complete. The DME may waive revocation of the plant's qualification with approval of both the Director, Office of Construction and the Director, State Materials Office, when production of components for the group in question, and for a specific project, is critical for that project's on time completion.

TABLE 8-3-1

PS CONCRETE PRODUCT DEFECT DATA TABLE

NUMBER OF PS CONCRETE PRODUCTS WITH MAJOR DEFECTS FOR THE 6 MONTH PERIOD -- _____ TO _____ – PLANT NO. _____															
Product Category	Category Group	Product Name	Total Product Produced	Number of Defects by Type *									Total Defective	% Defective
				1	2	3	4	5	6	7	8	9***		
(1) P I L E S	Group 1A	14" sq. Piles												
		18" sq. Piles												
		20" sq. Piles												
		24" sq. Piles												
		30" sq. Piles												
	Group 1A Totals →													
	GP 1B	30" Voided												
	GP 1C	Sheet Piles												
(2) B E A M S	Group 2A	AASHTO II												
		AASHTO III												
		AASHTO IV												
	Group 2A Totals →													
	Group 2B	AASHTO V												
		AASHTO VI												
	Group 2B Totals→													
	Group 2C	72 Bulb-T												
		78 Bulb-T												
	Group 2C Totals →													
	Group 2D	U Beam												
	Group 2E	Other Beams												
(3) Slabs	Group 3A	PS Slab												
	Group 3B	PS + PT Slab												
(4)	Specification Violations**													

* Defect Types: 1 – Spalls, 2 – Chips, 3 – Honeycomb, 4 – Cracks, 5 – Dimensional Deviations, 6 – Bearings, 7 – Reinforcement Errors, 8 – Materials Defect, 9 – Other Defects

**Attach a Description of the Specification Violation

***Attach a Description of the Type Defect

TABLE 8-3-2

PS CONCRETE PRODUCT DEFECT DATA SUMMARY TABLE – 6 Month Period from _____ to _____																	
CATEGORY	GROUP *	DISTRICT 1 & 7			DISTRICT 2			DISTRICT 3			DISTRICT 4 & 6			DISTRICT 5		
		Total Produced	Total Defective	Defect Rate	Total Produced	Total Defective	Defect Rate	Total Produced	Total Defective	Defect Rate	Total Produced	Total Defective	Defect Rate	Total Produced	Total Defective	Defect Rate
1 PILES	A															
	B															
	C															
2 BEAMS	A															
	B															
	C															
	D															
	E															
3 SLABS	A															
	B															

*
1A – Square Piles (inches square): 14, 18, 20, 24 and 30
1B – Square Piles (inches square): 30 Voided
1C – Sheet Piles: all sizes

2A – AASHTO Beams: Type II, III and IV
2B – AASHTO Beams: Type V and VI
2C – Bulb-T Beams: 72" and 78"
2D – Florida U Beams (FUB)
2E – All Other Types of Beams

3A – Prestressed Slabs
3B – Prestressed and Post-tensioned Slab