

SECTION 8.3

Volume I and Volume II

PRESTRESSED 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 prestressed concrete producer quality control efforts for minimizing the incidence of major defects in prestressed concrete products. This evaluation process requires monitoring the rate of major production defects that occur in prestressed concrete products; using these rates as a basis for evaluating the effectiveness of prestressed concrete producer quality control efforts; and taking action that will improve prestressed concrete producer quality control efforts when they are below a satisfactory level of performance.

8.3.2 AUTHORITY

Code of Federal Regulations (CFR), Federal-Aid Policy Guide (FAPG), Subchapter G – Engineering and Traffic Operations, Part 637 – Construction Inspection and Approval, Subpart B – Quality Assurance Procedures for Construction Sections
334.044(2), 334.044(10)(a), and 334.048 Florida Statutes

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

This procedure is used by the Prestressed Concrete Structures Plants (Plant) to monitor and ensure that the defect rate of products produced do not exceed the established limits. Primary offices that are affected by this procedure include the District Materials Offices, State Materials Office, District Construction Offices, State Construction Office, State Structures Design Office and District Structures Design Offices.

8.3.5 GENERAL INFORMATION

Major defects may occur in prestressed 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 prestressed concrete producers to establish and maintain efforts that minimize defects, the Department compiles defect rates on a semiannual basis for each prestressed concrete product group at 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

Plants are required to submit to the District Materials Office, the semiannual compilation of the major deficiency data for each category and group of products. Ensure that the Plant's quality control plan address this requirement, as described in **Specifications Section 450**. Each District Materials Office will verify and compile the submitted defect rate data for Plants which they are responsible for verification inspection and testing. The compiled data must be summarized as shown on the attached sample spreadsheet referred to as a **Prestressed Concrete Product Defect Data Table (Table 8-3-1)**, every 6 months, referred to as the monitoring periods, which are from January 1st to June 30th and from July 1st to December 31st of each year.

If the producer is of the opinion that a major defect is caused by a design error and not a producer error, the Project Administrator and the person in charge of prestressed concrete for the District Materials Office 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 and Research Engineer who should consult with the District Structures Design Office and/or State Structures Design Office 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 **Prestressed Concrete Product Defect Data Table**.

If the District Materials Office 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 and Research 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 ***Prestressed Concrete Product Defect Data Table***.

The table shows that prestressed 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 District Materials Office must electronically forward the ***Defect Data Table*** for each Plant in the district to the State Materials Office. Only major defects, as defined in ***Specification Section 450*** are to be entered into the ***Prestressed Concrete Product Defect Data Table*** with the following qualifications:

- (1) Do not include the bottom flange spalls of the skewed beams which are caused by the effects of beam camber.
- (2) If a defect is caused by the degree of skew and the skew angle (the angle between the longitudinal axis and the skewed end face of the beam) is less than the following limit, the defect must not be entered into the ***Prestressed Concrete Product Defect Data Table***:
 - a. Type II, III and IV AASHTO Beams – 55 degrees

- b. Type V and VI AASHTO Beams – 65 degrees
 - c. Bulb-T Beams – 70 degrees
- (3) 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 ***Prestressed 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 ***Prestressed Concrete Product Defect Data Table*** as 1 spall, 1 chip and 1 crack.
- (4) Uncorrected major defects that are revealed during inspection after delivery to the project site, must not be reported in the ***Prestressed Concrete Product Defect Data Table*** but must be reported to the person in charge of prestressed concrete for the District Materials Office 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 District Materials Office.
- (5) 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 ***Prestressed Concrete Product Defect Data Table*** but should be reported by the Project Administrator to the District Structures Design Office and/or State Structures Design Office.

8.3.6.2 State Materials Office

Upon the receipt of the data in accordance with 8.3.6.1, from each District, the State Materials Office enters the statewide defect data into an electronic version of the ***Defect Data Summary Table (Table 8-3-2)*** and forwards it to the District Materials Office for actions as specified in 8.3.8. This information will be used by the State Materials Office to establish and modify the defect rate limit for each product group.

8.3.7 DEFECT RATE LIMITS

The following are the established defect rate limit for each category of products:

- (A) Piles: 5 percent

(B) Slabs: 5 percent

(C) Beams: 15 percent

The Plant's quality control plan shall include a statement to address the above requirements and the Plant's efforts to maintain the defect rate of the products below the established limit.

8.3.8 ACTIONS RELATED TO THE DEFECT RATE LIMIT

During the monthly quality control and quality assurance personnel meetings, the Plant's quality control manager shall discuss the current defect rates of the manufactured products. The discussion shall include the Plant's action or quality control plan modification regarding the defect rates reduction, especially for the products that their defect rates are approaching to their limits before the end of the semiannual monitoring period.

When a prestressed concrete Producer exceeds the established defect rate limit, the District Materials Office must take action to encourage the prestressed concrete producer to improve quality control procedures. If procedures are not improved; the District Materials Office must suspend the producer's quality control plan. Actions to be taken are related to the severity of the producer's unsatisfactory quality control and include the following three levels with their definition and corresponding action:

Level 1: 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 District Materials Office must send a notice to the producer and may ask for a plan to reduce the defect rate in the form of amendment to the quality control plan.

Level 2: 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 District Materials Office 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 re-submittal of the plan by the producer which must address a method for reducing the defect rate to below the

established defect rate limit. In addition, the frequency of the quality control, verification, and independent assurance inspection and testing must be increased for a period not to exceed 6 months. The duration is at the discretion of the District Materials and Research Engineer and will be commensurate with the seriousness of quality control lapses. The increased frequency of the quality control, verification, and independent assurance will be reduced to normal when a revised quality control plan has been approved and the District Materials Office is confident that the revised quality control procedures will result in a defect rate below the established defect rate limit.

Level 3: Defect Rate Limit exceeded for three consecutive monitoring periods

Definition: The producer's defect rate has exceeded the limit for three consecutive monitoring periods or for any 3 periods out of 4 consecutive periods.

Action Required: The District Materials Office must notify the producer that the Plant's quality control plan has been suspended until such time as the District Materials and Research Engineer determines that improved quality control procedures will result in defect rates that can be sustained below the established defect rate limit for an extended period of time. During the suspension period, the Plant will not be permitted to produce any products for the product group in question. Rescinding the suspension will also require approval of a revised quality control plan along with increased rates of quality control, verification and independent assurance for duration to be determined by the District Materials and Research Engineer. If the producer disagrees with the duration or imposition of the suspension, appeal may be made to the Director, State Materials Office and suspension must not be imposed until the appeal process is complete. The District Materials and Research Engineer may waive the suspension of the Plant's quality control plan 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***		
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													
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	G R O U P *	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