

SECTION 8.3

Volume I

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 (Plant) quality control (QC) processes 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 the Plant's QC efforts; and taking action that will improve the Plant's QC efforts when they are below the satisfactory level.

8.3.2. AUTHORITY

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

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

8.3.4. SCOPE

This procedure is used by the District Materials and Research Offices (DMRO) 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 DMRO, State Materials Office (SMO), District Construction Offices (DCO), State Construction Office (SCO), State Structures Design Office (SDO) and District SDO.

8.3.5. GENERAL INFORMATION

Major defects may occur in prestressed concrete products during the production process. These defects are usually correctable and the Department can accept 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. To encourage Plants 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 Plant must stay below to achieve the level of product quality that is acceptable to the Department.

8.3.6. MONITORING MAJOR DEFECTS

8.3.6.1. Plant and DMRO Responsibilities

Plants are required to submit to the DMRO, the semiannual compilation of the major deficiency data for each category and group of products. Ensure that the Plant's QC plan addresses this requirement, as described in **Specifications Section 450**. Each DMRO 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 Plant believes a major defect is caused by a design error and not a Plant error, the Project Administrator (PA) and the DMRO prestressed concrete personnel must determine whether they agree with the Plant. If they disagree with the Plant, the Plant can appeal to the District Construction Engineer (DCE) and District Materials and Research Engineer (DMRE) who should consult with the District SDO and/or State SDO 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 DMRO representative determines that a defect is major and the Plant disagrees, then the determination may be appealed to the DCE and DMRE 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***.

Prestressed concrete products are organized by product groups that have similar casting, stressing and handling characteristics in the ***Prestressed Concrete Product Defect Data Table***; 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) and
- (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 DMRO must electronically forward the ***Prestressed Concrete Product Defect Data Table*** for each Plant in the district to the SMO. 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) Do not include defects caused by the degree of skew if the skew angle (the angle between the longitudinal axis and the skewed end face of the beam) is less than the following limit:
 - a. Type II, III and IV AASHTO Beams – 55 degrees
 - b. Type V and VI AASHTO Beams – 65 degrees
 - c. Florida-I Beams and Bulb-T Beams – 70 degrees

- (3) Do not include uncorrected major defects that are revealed during inspection after delivery to the project site, in the ***Prestressed Concrete Product Defect Data Table***. The PA must report the defect to the DMRO prestressed concrete personnel who should evaluate whether the Plant is in compliance with the QC plan. If the Plant is not in compliance with the QC plan, appropriate action must be taken by the DMRO prestressed concrete personnel.
- (4) Do not include a major defect that is caused by a design error, as determined by the Department and not by Plant error, in the ***Prestressed Concrete Product Defect Data Table***. The PA should report to the District SDO and/or State SDO.
- (5) When an individual component (beam, pile or slab) has multiple defects of the same type, they must be considered as one defect for 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.

8.3.6.2. SMO Responsibilities

Upon the receipt of the data in accordance with 8.3.6.1, from each DMRO, the SMO enters the statewide defect data into an electronic version of the Prestressed Concrete Product Defect Data Summary Table (Table 8-3-2) and forwards it to the DMROs for actions as specified in 8.3.8. This information will be used by the SMO 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 DMRO will ensure that the Plant's QC plan includes a statement to address the defect rate limits and the Plant's efforts to maintain the defect rate below the limit.

8.3.8. ACTIONS RELATED TO THE DEFECT RATE LIMIT

During monthly meetings with the Plant and DMRO prestressed concrete personnel, the DMRO prestressed concrete personnel will discuss the current defect rates with the Plant's QC Manager. The discussion shall include the Plant's action or QC plan modification regarding the defect rates reduction, especially for the products which defect rates are approaching their limits before the end of the semiannual monitoring period.

When a Plant exceeds the established defect rate limit, the DMRO must take action to encourage the Plant to improve QC procedures. If procedures are not improved; the DMRO must suspend the Plant's QC plan. Actions to be taken are related to the severity of the Plant's unsatisfactory QC and include the following three levels with their definition and corresponding action:

Level 1: Defect rate limit exceeded during one monitoring period

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

Action Required: The DMRO must send a notice to the Plant and may ask for an amendment to the QC plan describing the Plant's increased QC processes for detecting and eliminating defects.

Level 2: Defect rate limit exceeded for consecutive monitoring periods

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

Action Required: The DMRO must issue a defect rate warning letter notifying the Plant that they are out of compliance with their QC plan. This will require the Plant to immediately re-submit the QC plan which must address a method for reducing the defect rate to below the established defect rate limit. In addition, the frequency of the QC, 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 DMRE and will be commensurate with the seriousness of QC lapses. The increased frequency of the QC, verification, and independent assurance inspection will be reduced to normal when a revised QC plan has been approved and the DMRO is confident that the revised QC 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 Plant'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 DMRO must suspend the Plant's QC plan and notify the Plant that their QC plan has been suspended until the DMRE determines that improved QC 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 require approval of a revised QC plan along with increased rates of QC, verification and independent assurance for duration to be determined by the DMRE. If the Plant disagrees with the duration or imposition of the suspension, an appeal may be made to the Director, State Materials Office and suspension must not be imposed until the appeal process is complete. The DMRE may waive the suspension of the Plant's QC 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 time completion.

At the discretion of the DMRE, the actions required by the DMRO for a Plant exceeding the defect rate limit may be waived if the defect rate limit for a single category of product as specified in 8.3.7 is exceeded as the result of one major product defect in that category. This exception would also be permitted if the total number of products in a category, as specified in 8.3.7, is less than 20.

**TABLE 8-3-1
 PRESTRESSED CONCRETE PRODUCT DEFECT DATA TABLE**

NUMBER OF PRESTRESSED CONCRETE PRODUCTS WITH MAJOR DEFECTS FOR THE 6 MONTH PERIOD											THRU	Plant No		
Product Category	Category Group	Product Name	Total Product Produced	Number of Defective by Type*									Total Defective	% Defective
				1	2	3	4	5	6	7	8	9**		
(1) PILES	Group 1A	14" sq. Piles												
		18" sq. Piles												
		20" sq. Piles												
		24" sq. Piles												
		30" sq. Piles												
	Group 1A Totals													
	GP 1B	30"/36" Voided												
	GP 1C	Sheet Piles												
GP 1D	Cylinder Piles													
Category (1) Products Cast Total				Category (1) Defects Total										
(2) BEAMS	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 Beams												
		36" FIB												
		45" FIB												
		54" FIB												
		63" FIB												
72" FIB														
78" FIB														
84" FIB														
96" FIB														
Group 2E Totals														
Group 2F	Other Beams***													
Category (2) Products Cast Total				Category (2) Defects Total										
(3) SLABS	Group 3A	PS Slab												
	Group 3B	PS + PT Slab												
Category (3) Products Cast Total				Category (3) Defects Total										
Totals	Total Products Cast/Defective													
(4) SPECIFICATION VIOLATIONS****														

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

****(9 Other Defective)** Attach a Description of the Defective Type(s)

*****(Group 2F Other Beams)** Attach a Description of the Type(s) of Beam(s)

******(4 Specification Violations)** Attach a Description of the Specification Violation(s)

**TABLE 8-3-2
 PRESTRESSED CONCRETE PRODUCT DEFECT DATA SUMMARY TABLE**

PRESTRESSED CONCRETE PRODUCTS MAJOR DEFECT DATA SUMMARY TABLE - 6 Month Period														thru			
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																
	D																
CATEGORY TOTALS																	
2 BEAMS	A																
	B																
	C																
	D																
	E																
CATEGORY TOTALS																	
3 SLABS	A																
	B																
CATEGORY TOTALS																	

* 1A - Square Piles (inches square): 14, 18, 20, 24, and 30
 1B - Square Piles (inches square): 30 & 36 Voided
 1C - Sheet Piles: all sizes
 1D - Cylinder Piles

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

2E - Florida I Beams (FIB)
 2F - All Other Types of Beams
 3A - Prestressed Slabs
 3B - Prestressed and Post-tensioned Slab