

## **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 (Products). This evaluation process requires monitoring the rate of major production defects that occur in Products, using these major defects 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

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 major defect rate of Products cast does 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), District Structures Design Office (DSDO), and State Structures Design Office (SDO)

### 8.3.5. GENERAL INFORMATION

Major defects may occur in Products during the production process. If major defects are identified, the requirements of **FDOT Specifications Section 6** will be followed. Since the Department seeks to place Products with the very best quality into service whenever possible, the number of Products with major defects must be kept to a minimum. To encourage Plants to establish and maintain efforts that minimize major defects, the Department compiles major defect rates on a semiannual basis for each Product group at each Plant and these major defect rates are used as the basis for establishing a major defect rate limit.

### 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 defect data for each category and group of Products. Ensure that the Plant's QC Plan addresses this requirement, as described in **FDOT Specifications Section 450**. Each DMRO will verify and compile the submitted major defect rate data for Plants within their jurisdiction. 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 1<sup>st</sup> to June 30<sup>th</sup> and from July 1<sup>st</sup> to December 31<sup>st</sup> 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 DSDO 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**.

Products are organized by Product groups that have similar casting, stressing and handling characteristics in the **Prestressed Concrete Product Defect Data Table**. A major defect rate limit will be established for each Product group based on this criteria.

The information gathered during a monitoring period for each Product group includes the following:

- 1) Total number of Products cast.
- 2) Number of major defects, by defect type, in the Products cast.

- 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 cast). For example: if 100 Products are cast and 20 products have major defects, then the defect rate is computed by dividing 20 by 100 which results in a major defect rate of 20 percent.

Within 14 days after each monitoring period expires, the DMRO must provide the **Prestressed Concrete Product Defect Data Table** for each Plant in their respective jurisdiction to the SMO. Only major defects, as defined in **FDOT Specifications Section 450** are to be included, with the following qualifications:

- 1) Only include major defects on Products that were cast during the indicated monitoring period. If major defects are discovered on a Product that was cast during the monitoring period but discovered after the monitoring period ended, provide the Product and major defect information to the SMO upon receipt of the information from the Plant.

The SMO will then include the provided information in the appropriate monitoring periods **Prestressed Concrete Product Defect Data Table** for the Plant. If the additional major defect results exceeded the major defect rate limit, the SMO will notify the DMRO for the appropriate action.

- 2) Do not include the bottom flange spalls of the skewed beams which are caused by the effects of beam camber.
- 3) Do not include major 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
- 4) Do not include uncorrected major defects that are revealed during inspection after delivery to the project site. 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.
- 5) Do not include a major defect that is caused by a design error, as determined by the Department, and not by Plant error. The PA should report the design error to the DSDO.

- 6) When an individual component (beam, pile or slab) has multiple major defects of the same type, they must be considered as one defect for reporting. For example: if an individual pile has 3 spalls, 1 chip and 2 cracks, these must be reported as 1 spall, 1 chip and 1 crack.

#### **8.3.6.2. SMO Responsibilities**

Prior to the end of the monitoring period, the SMO will provide the current ***Prestressed Concrete Product Defect Data Table*** to the DMROs for distribution to the Plants within their respective jurisdiction.

Upon the receipt of the data in accordance with 8.3.6.1 from each DMRO, the SMO enters the statewide major defect data into an electronic version of the ***Prestressed Concrete Product Defect Data Summary Table*** (Table 8-3-2) and sends it to the DMROs.

#### **8.3.7. MAJOR DEFECT RATE LIMITS**

The following are the established major 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 major defect rate limits and the Plant's efforts to maintain the major defect rate below the limit.

#### **8.3.8. ACTIONS RELATED TO THE DEFECT RATE LIMIT**

During weekly meetings with the Plant and DMRO prestressed concrete personnel, the DMRO prestressed concrete personnel will discuss the current major defect rates with the Plant's QC manager. The discussion shall include the Plant's action or QC Plan modification regarding the major defect rates reduction.

When a Plant exceeds the established major defect rate limit, the DMRO must take action to encourage the Plant to improve the 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, including the following three levels with their definition and corresponding action:

**Level 1:** Major defect rate limit exceeded during one monitoring period

**Definition:** The Plant's major defect rate has exceeded the limit for one monitoring period but did not exceed the limit during any of the previous three monitoring periods.

**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 major defects.

**Level 2:** Major defect rate limit exceeded for two consecutive monitoring periods

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

**Action Required:** The DMRO must issue a major 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 major defect rate to below the established major defect rate limit. In addition, the frequency of the QC and verification inspection and testing must be increased for the Product group and defect type that exceeded the major defect rate limit. 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 and verification inspection and testing will be reduced to normal when the DMRO is confident that the revised QC procedures will result in a major defect rate below the established major defect rate limit.

**Level 3:** Major defect rate limit exceeded for three consecutive monitoring periods

**Definition:** The Plant's major 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 major defect rates that can be sustained below the established major defect rate limit for an extended period of time. During the suspension period, the Plant will not be permitted to cast 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 and verification inspection and testing for a 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 major defect rate limit may be waived if the major defect rate limit for a single category of Product as specified in 8.3.7 has 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												
	<b>Group 1A Totals</b>													
	GP 1B	30"/36" Voided												
	GP 1C	Sheet Piles												
GP 1D	Cylinder Piles													
<b>Category (1) Products Cast Total</b>				<b>Category (1) Defects Total</b>										
(2) BEAMS	Group 2A	AASHTO II												
		AASHTO III												
		AASHTO IV												
	<b>Group 2A Totals</b>													
	Group 2B	AASHTO V												
		AASHTO VI												
	<b>Group 2B Totals</b>													
	Group 2C	72 Bulb-T												
		78 Bulb-T												
	<b>Group 2C Totals</b>													
	Group 2D	U Beams												
	Group 2E I Beams	36" FIB												
		45" FIB												
		54" FIB												
		63" FIB												
72" FIB														
78" FIB														
84" FIB														
96" FIB														
<b>Group 2E Totals</b>														
Group 2F	Other Beams***													
<b>Category (2) Products Cast Total</b>				<b>Category (2) Defects Total</b>										
(3) SLABS	Group 3A	PS Slab												
	Group 3B	PS + PT Slab												
<b>Category (3) Products Cast Total</b>				<b>Category (3) Defects Total</b>										
<b>Totals</b>	<b>Total Products Cast/Defective</b>													
<b>(4) SPECIFICATION VIOLATIONS****</b>														

\*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