Section 8.6
Volume I

QUALITY ASSURANCE PROGRAM FOR THE USE OF FLOWING CONCRETE IN THE FABRICATION OF PRECAST/PRESTRESSED CONCRETE PRODUCTS

8.6.1 PURPOSE

This procedure provides guidance to the Florida Department of Transportation (Department) personnel and their designees that are involved in the flowing concrete related laboratory and field trial batches, review of the quality control (QC) plans of the precast/prestressed fabrication facilities (Plants), and inspection and testing of production concrete.

8.6.2 AUTHORITY

Sections 20.23(4)(a) and 334.048(3), Florida Statutes

8.6.3 REFERENCES

Manual for Quality Control for Plants and Production of Structural Precast Concrete Products, Precast/Prestressed Concrete Institute (PCI) Manual MNL 116

Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction

Florida Department of Transportation (FDOT) Materials Manual Volume II, Section 8.6 Flowing Concrete for Precast/Prestressed Concrete Products

Florida Department of Transportation (FDOT) Florida Sampling and Testing Methods (FSTM)

American Society for Testing and Materials (ASTM) Standard Test Methods and Specifications

American Association of State Highway and Transportation Officials (AASHTO), Part I Specification, and Part II Tests

8.6.4 SCOPE

Primary offices affected by this procedure include the District Materials and Research Offices (DMRO) and State Materials Office (SMO).

8.6.5 PROPOSED QUALITY CONTROL PLANS

The DMRO reviews the Plant's proposed QC Plan related to flowing concrete. The QC Plan should include information related to the flowing concrete mix design approval process, batching, delivery, placement, and curing methods.

The QC Plan should also include guidance to the Plant personnel who are involved in the operation and the QC inspection and testing program.

8.6.6 PROPOSED FLOWING CONCRETE MIX DESIGNS

8.6.6.1 Specified 346 Class Concrete

Flowing concrete is allowed for the fabrication of precast prestressed concrete as a modification of the ***FDOT Specifications Section 346*** class of concrete. This type of replacement requires that the Plant propose to the DMRO the use of a flowing concrete mix and perform necessary trial batches.

The proposed ***FDOT Specifications Section 346*** classes of flowing concrete mixes require SMO approval. The DMRO reviews the proposed flowing concrete mix designs and verifies that they meet the requirements of ***Materials Manual Volume II***, ***Section 8.6*** and ***FDOT Specifications Section 346***. Ensure that the proposed concrete mixes provide the required target slump. Upon satisfactory results of the laboratory and field demonstration, the DMRO submits the proposed ***FDOT Specifications Section 346*** class mix along with supporting data and recommendation to the SMO for review and approval.

8.6.6.2 ASTM or AASHTO Class Concrete

For ASTM and AASHTO specification concrete, the DMRO will review and approve the proposed mix design upon satisfactory completion of the required laboratory and field trial batches.

8.6.7 LABORATORY TRIAL BATCH VERIFICATION

After the review of the proposed mix design, the DMRO representative will observe the trial batch to ensure that the mix ingredients, proportioning, and verification process meet the requirements of the ***Specifications***, ***Materials Manual*** and QC Plan.

8.6.8 FIELD DEMONSTRATION OF FLOWING CONCRETE

The field demonstration of the proposed mix design is a requirement of the flowing concrete approval process. The field demonstration requires either production of a mockup, or static segregation evaluation of the hardened flowing concrete, as described in this section.

The field demonstration includes the demonstration of delivery and placement of at least 9 cubic yards of concrete. During the field demonstration, the plant

performs the slump loss test and evaluation of the mockup product in accordance with ***FM 5-617*** or ***AASHTO R81*** as appropriate.

The DMRO must review the test results and ensure that they meet the requirements of the ***Specifications***. Upon review and satisfactory results, the DMRO recommends the approval of the proposed ***FDOT Specifications Section 346*** class concrete mix design.

8.6.8.1 Mockup Product of the Field Demonstration Concrete

The field demonstration shall include the manufacture and evaluation of a mockup in accordance with ***FM 5-617*** if the Plant is utilizing flowing concrete for the first time, and shall meet the following requirements:

1) The mockup shall be a partial or full-scale representation of the proposed Products.
2) The mockup shall contain reinforcing steel typical of those Products.
3) The mockup shall use the same mix design.
4) The Coarse Aggregate Index (C.A.I.) shall be determined by saw cutting the Product's entire cross-section.

If the Plant is introducing a new flowing concrete mix design, but has previously successfully utilized flowing concrete, then the reinforcing steel is optional.

When the coarse aggregate index (C.A.I.) performed in accordance with ***FM 5-617*** exceeds 15 percent, it is an indication of segregation of concrete during placement. The Plant should review and determine the cause of segregation and provide information on how the segregation problem may be prevented during the placement of production concrete. The DMRO should review if the Plant's corrective action is acceptable, otherwise, the proposed mix design will be rejected.

8.6.8.2 Static Segregation of the Field Demonstration Concrete

The mockup product is not required, and the assessment of static segregation shall be verified in accordance with ***AASHTO R 81*** when:

1) The DMRO/SMO determine that the mockup test is not required for a particular mix.
2) Permissible adjustments to previously approved mix design have been made as referenced below:
    a) Allowable variation of Coarse or Fine Aggregate: The variation for each aggregate can be ±75 pounds per cubic yard of concrete.
    b) Admixtures: Should be within the admixture manufacturer's technical data sheet range. Dosage rates outside of this range may be used with written recommendation from the admixture producer's technical representative. Mixes with adjustments falling outside the technical

data sheet range shall be suspended when written recommendation from the admixture producer's technical representative has not been obtained.

c) Allowable variation of total Cementitious Materials: ±6.5 percent per cubic yard but not less than the specified minimum for that class of concrete.

The adjusted mix must meet the theoretical yield requirements of the approved flowing concrete mix design.

The DMRO will be advised of any adjustments to the concrete mix design. Batch adjustments shall not be used for batch tolerances of aggregate and cementitious materials. The adjustments shall be noted on the concrete delivery tickets.

8.6.9 PRODUCTION BATCH VERIFICATION

During production, inspectors must closely observe the concrete mix delivery ticket, aggregate moisture, plastic properties test results, placement operation, and concrete curing. Any deviation from the requirements of the ***Specifications*** or QC Plan should be noted.

8.6.10 TRAINING

Department personnel involved in the verification of lab and field trials for flowing concrete must be ***ACI Concrete Field Testing Technician – Grade 1*** certified***.***

8.6.11 FORMS

None needed.