Section 8.4
Volume I

QUALITY ASSURANCE PROGRAM FOR THE USE OF SELF-CONSOLIDATING CONCRETE (SCC) IN THE FABRICATION OF PRECAST/PRESTRESSED CONCRETE PRODUCTS

8.4.1 PURPOSE

This procedure provides guidelines to the Florida Department of Transportation (Department) personnel and their designees that are involved in SCC related laboratory and field trial batches, review of the Quality Control (QC) Plans of precast/prestressed fabrication facilities (Plants), and inspection and testing of production concrete.

8.4.2 AUTHORITY

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

8.4.3 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

Materials Manual Volume II, Section 8.4 Self-Consolidating Concrete for Precast/Prestressed Concrete Products, Florida Department of Transportation

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

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

American Concrete Institute (ACI), Publication 237R-07, Self-Consolidating Concrete, Farmington Hills, Michigan, April 2007

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

8.4.4 SCOPE

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

8.4.5 PROPOSED QUALITY CONTROL PLANS

The DMRO reviews the Plant's proposed QC Plan related to SCC. The QC Plan should include information related to the SCC 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 QC inspection and testing program.

8.4.6 PROPOSED SCC MIX DESIGNS

8.4.6.1 Specified 346 Class Concrete

The proposed SCC mix designs require SMO approval. The DMRO reviews the proposed SCC mix designs and verifies that they meet the requirements of ***FDOT Specifications Section 346*** **and** ***Materials Manual Volume II***, ***Sections 8.4*** and ***9.2***. Ensure that the proposed concrete mix designs provide the required minimum target slump flow. Upon satisfactory results of the laboratory trial and field demonstration, the DMRO submits the proposed SCC mix design along with supporting data and recommendation to the SMO for review and approval.

8.4.6.2 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 trial batches.

8.4.7 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 design meets the requirements of the ***Specifications***, ***Materials Manual*** and QC Plan.

8.4.8 FIELD DEMONSTRATION OF SCC

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

The field demonstration includes the delivery and placement of at least 9 cubic yards of concrete. During the field demonstration, the plant performs the slump flow loss test and evaluates 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 concrete mix design. The

DMRO reviews and approves the Plant's proposed ***ASTM*** and ***AASHTO*** mix designs.

8.4.8.1 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 SCC for the first time, and shall meet the following requirements:

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

When the coarse aggregate index (CAI) 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 shall be rejected.

8.4.8.2 Static Segregation of the Field Demonstration Concrete:

The DMRO may exempt the mockup for a particular mix design. In this case, the assessment of static segregation shall be verified in accordance with ***AASHTO R 81*** and at least one of the following conditions shall be met:

1) The SCC is centrally batched at the Plant.
2) The target slump flow of the previously approved SCC mix design has been increased by less than or equal to 2.5 inches.
3) 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 manufacturer's technical representative. Mixes with adjustments falling outside the technical data sheet range shall be suspended when written recommendation from the admixture manufacturer'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 SCC 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.

8.4.9 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.

8.4.10 TRAINING

Department personnel involved in SCC mix design laboratory trials, field trials, and production batch verification shall be ***ACI Concrete Field Testing Technician Grade I*** and ***ACI Self-Consolidating Concrete Testing Technician*** certified.

8.4.11 FORMS

None needed.