

## Section 9.2 Volume II

### STRUCTURAL CONCRETE PRODUCTION FACILITIES GUIDE

SUBSECTION 9.2.10 is expanded by the following:

#### MIXERS

##### 9.2.10.1 General Requirements

Provide mixers that can combine the components of the concrete into a thoroughly mixed and uniform mass, free from balls or lumps, and which can discharge the concrete with a satisfactory degree of uniformity.

Inspect all mixers at least once each week.

##### 9.2.10.2 Design

Use inclined axis revolving drum type truck mixers, or concrete Plant central mixers of the non-tilting, tilting, vertical or horizontal shaft types.

Make always available at the Plant a copy of the mixer manufacturer's design, showing dimensions and arrangement of blades. The concrete Plant may use mixers that have been altered from such design in respect to blade design and arrangement, or to drum volume, when authorized by the mixer manufacturer and approved by the DMRE. For initial design changes, provide uniformity test data, based on **ASTM C94** testing.

The metal rating plates must be attached to each mixer to specify its mixing speed, agitating speed, rated capacity and unit serial number. The unit serial number represents the entire mixing system. The metal rating plate may be located on the inside of the driver's door. Mixer drum identification numbers or part numbers may or may not compare with the serial number on the rating plate. Should a drum be replaced, documentation from the mixer manufacturer must identify any deviations from the rating plate.

##### 9.2.10.3 Truck Mixers Description

Use truck mixers with a drum that is actuated by a power source independent of the truck engine or by a suitable power take-off. Either system must provide control of the rotation of the drum within the limits

specified on the mixer manufacturer's rating plate, regardless of the speed of the truck. Use truck mixers that are equipped with a hatch in the periphery of the drum shell which permits access to the inside of the drum for inspection, cleaning and repair of the blades.

Use truck mixers equipped with revolution counters and mounting, by which the number of revolutions of the drum may be readily verified.

Ensure that the water supply system mounted on truck mixers is equipped with a volumetric water gauge or a water meter in operating condition. Annually calibrate water measuring devices on truck mixers or other water sources used for concrete water adjustments.

Ensure truck mixers equipped with a volumetric water gauge are parked in a level condition during on-site water adjustments and for calibration. Ensure that the water measuring equipment has an accuracy of within 3 percent of the indicated quantity.

Truck mixers meeting these requirements shall be issued a mixer identification card by the DMRE upon request from the Plant. Failure to present the identification card upon request shall be cause for rejection of the delivered concrete. The Contractor shall remove the identification cards when a truck mixer is discovered to be in noncompliance and the deficiency cannot be repaired immediately. When the identification card is removed for noncompliance, the Contractor shall note the deficiency on the identification card and forward the identification card to the DMRE in the District with QC Plan acceptance authority.

The concrete Plant shall inspect all truck mixers at least once each week for changes due to accumulation of hardened concrete or to wear of blades or chutes. The blades or chutes shall be repaired or replaced as necessary to meet these requirements. Any appreciable accumulation of hardened concrete shall be removed before any mixer may be used.

Copies of the most recent water measuring equipment calibration shall be kept in the truck cab and made available upon request.

#### **9.2.10.4 Automated Slump Monitoring System**

Proposed automated slump monitoring system include the following items:

- (1) Slump is measured by the ready-mixed concrete truck.
- (2) Slump is adjusted and controlled by the ready-mixed concrete truck.
- (3) All water additions and slump adjustments are recorded.

The Plant's QC Plan shall include:

- (1) Automated slump monitoring system information.
- (2) Provisions for training on the proposed automated slump monitoring systems. As a minimum, the Plant shall provide training on the automated slump monitoring system for drivers, QC personnel, and verification inspection personnel.
- (3) Calibration procedures.

Calibration of the automated slump monitoring system shall be done on an annual basis, or when a truck is rejected in accordance with **FDOT Specifications Section 346**. All system records including calibration records shall be made available at the Plant to the Department upon request.

Mix concrete at speeds and number of revolutions as recommended by the mixer manufacturer, when water is added enroute to the project site. Automatic introduction of water will be disabled when entering the project site or when the maximum water to cementitious materials ratio for the mix design is reached. If the system adds water in transit, the concrete shall be re-mixed at mixing speed upon arrival to the project for an additional 30 revolutions. Water shall not be added during the discharge of the batch.

#### 9.2.10.5 Central Mixers

Use stationary type mixers equipped with a timing device which will automatically lock the discharge lever when the drum is charged and release it at the end of the mixing period. In the event of failure of the timing device, the Department may allow operations to continue during the day that failure was noticed for the first time. Do not extend such operations beyond the end of that working day. Operate the mixer at the speed recommended by the central mixer manufacturer.

#### 9.2.10.6 Mixer Cleaning and Maintenance

Repair or replace mixer blades of revolving drum type mixers when the radial height of the blade at the point of maximum drum diameter is less than 90 percent of the design radial height. Repair or adjust mixers of other designs per mixer manufacturer's instructions. Resolve questions of performance by performing mixer uniformity tests as described in **ASTM C94**.

### 9.2.10.7 Volumetric Mixers:

Submit a QC Plan in accordance with **Materials Manual Section 9.2.12** to the DMRO. The Volumetric Mixer shall have a metal rating plate plainly marked with the gross volume of mixed concrete.

Upon the satisfactory review of the Volumetric Mixer QC Plan and satisfactory initial inspection, the DMRE will accept the QC plan, issue an identification card that must be kept with the Volumetric Mixer, and include the Volumetric Mixer's identification number on the list of Department's Certified Volumetric Mixers. Upon the DMRE's acceptance of the Volumetric Mixer's QC Plan, the SMO will assign the identification number.

Volumetric Mixers must meet design standards and guidelines of the **Volumetric Mixer Manufacturers Bureau (VMMB)100-01**. Each Volumetric Mixer must produce a concrete mix meeting the consistency and uniformity requirements of **ASTM C685**. Any modification of the mix design requires DMRE approval based on the mixer calibration, and demonstration of the consistency and uniformity of concrete test data.

Perform weekly inspections of the Volumetric Mixer, when it is used. The inspection records shall be available to the Department for review.

During production for Department Projects, perform the required QC sampling and testing of plastic and hardened concrete, including the chloride tests. Provide the material certifications for concrete materials ingredients. Enter the required data in MAC.

SUBSECTION 9.2.13 is deleted and the following substituted:

### 9.2.13 PERSONNEL

Plants supplying concrete to the Department projects shall have adequate qualified personnel. Concrete Batch Plant Operator, qualified technicians, and Plant Manager of QC are required positions for a Plant. A qualified Volumetric Mixer operator is required when concrete is produced in a Volumetric Mixer.

The Plant QC personnel shall meet the Structural Concrete Production Facility QC Personnel requirements of **FDOT Specification Section 105**.

SUBSECTION 9.2.16 is expanded by the following:

## 9.2.16 DELIVERY TICKET/CERTIFICATION

The following information is required information for each concrete delivery and must be furnished with each load. The information contained within **FDOT Specifications Section 346** is required information on each delivery ticket/certification. The original signature on the delivery ticket shall certify to the accuracy of the recorded information and compliance with the approved mix design. A sample of a delivery ticket is provided in **Appendix "A"**. Use this form or a similar form containing the same information.

- (1) Serial number of delivery ticket.
- (2) The Plant number as assigned by the Department.
- (3) Date of batching.
- (4) Contractor's name.
- (5) FDOT Financial Project Number.
- (6) Truck number making the concrete delivery shall match the truck number on the delivery ticket.
- (7) Class of concrete.
- (8) Mix design number.
- (9) Time all materials are introduced into mixer.
- (10) Cubic yards in this load.
- (11) Cumulative total cubic yards batched for job on date of delivery.
- (12) Maximum allowable water addition at the job site. Unit of measure must be indicated.
- (13) Number of revolutions at mixing speed before leaving for job site.
- (14) Amount of mixing time for central mixer.
- (15) Coarse and fine aggregate sources (Department assigned Source No.).
- (16) Actual amount of coarse and fine aggregates batched in pounds.

- (17) Percent of free moisture in coarse and fine aggregates.
- (18) Cement producer's name and type of cement.
- (19) Total amount of cement batched in pounds.
- (20) Producer's name, brand name and class (whichever might apply) of supplementary cementitious material used.
- (21) Total amount of each supplementary cementitious material batched in pounds.
- (22) Admixture manufacturer, type and total amount of each admixture used.
- (23) Total amount of water batched and added after the truck leaves the Plant in gallons or pounds before leaving for the job site. Unit of measure must be indicated.
- (24) Statement of compliance with the **Contract Documents**.
- (25) Original signature of Batch Plant Operator and technician identification number.

Notes:

- Items 12 and 13 do not apply to non-agitating concrete transporting vehicles.
- Items 1, 2, 4, 6, and 9 through 13 do not apply to precast operations with onsite Plants.

### 9.2.16.1 Volumetric Mixer Delivery Ticket

The Volumetric Mixer delivery ticket shall meet the requirements of **FDOT Specifications Section 350**, and **Materials Manual Section 9.3**. The signature of the Volumetric Mixer operator is required on delivery tickets, in lieu of the signature of the batch plant operator.