

## **Section 9.3**

### **Volume II**

## **CONCRETE PAVEMENT PRODUCTION FACILITIES GUIDE**

### **9.3.1 PURPOSE**

This guide establishes policies governing the production of paving concrete produced by central mix plants, used by the Florida Department of Transportation, herein after called the Department. The guide also provides a concrete producer with information related to the methods and minimum requirements for a Producer Quality Control Plan (PQCP), as well as, the criteria by which the Department will review the PQCP for acceptance.

### **9.3.2 AUTHORITY**

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

### **9.3.3 SCOPE**

The principal user of this document is a concrete paving contractor who produces their own paving concrete.

### **9.3.4 REFERENCES**

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 334.044(2), 334.044(10)(a), and 334.048 Florida Statutes.

American Society for Testing and Materials (ASTM) Standard Test Methods and Specifications, Philadelphia, Pennsylvania.

American Association of State Highway and Transportation Officials (AASHTO), Part II Tests, Washington, D.C.

Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

Florida Department of Transportation Approved Products List (APL).

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

### 9.3.5 GENERAL INFORMATION

Concrete pavement production facilities that supply paving concrete to Department projects must have a PQCP accepted by the Department in accordance with the **Specifications Section 105 and Specifications Section 350**. A list of concrete pavement production facilities, herein after called plants, with accepted PQC Plans that meet the requirements of this guide, will be maintained by the Department.

Paving concrete produced in accordance with the **Specifications Section 350** and this guide shall be accepted with the proper certification and verification of the job site acceptance criteria.

Methods of sampling and testing materials shall be in accordance with the **Specifications**. References to the sampling and testing methods shall be construed to mean the most current issuance, including interims or addenda.

The Department will inspect the plants every three months or less during periods of continual use on Department projects, and before beginning work on any period of operation lasting less than three months.. The concrete producer may request a reduced scheduling frequency for the plant inspections from the District Materials and Research Engineer (DMRE). The reduced scheduling frequency shall be based on the plant coefficient of variation ( $C_v = \sigma/\mu$ :  $\sigma$ =standard deviation;  $\mu$ =mean), previous plant inspections, correction of any deficiencies noted, failing samples attributed to the plant, and a request from the producer. Upon meeting all criteria, the plant may be changed to a reduced inspection frequency. If approved by the DMRE, the inspection frequency shall be a minimum frequency of once every six (6) months or less. These inspections will assist in ensuring that the plant continues to produce a material that is in accordance with the accepted PQCP, **Specifications and other Contract Documents**.

### 9.3.6 CONCRETE PRODUCERS ROLES AND RESPONSIBILITIES

#### 9.3.6.1 Cementitious Materials

Acceptance of the cementitious materials at the plant shall be based upon the delivery ticket and mill certificate. As a check on current quality, samples may be obtained and tested by the Producer or the Department.

Each brand or type of cementitious material shall be stored in a separate and clearly labeled weatherproof facility. Provide suitable, safe, and convenient means of collecting cementitious material samples.

Measure the cementitious materials by mass within an accuracy of 1 percent of the required total amount. For concrete batches of 3 cubic yards or less, an accuracy of 2 percent is allowed. Weigh the cementitious materials separately from other materials. When weighing the cementitious materials in a cumulative weigh hopper, weigh the cement first.

### **9.3.6.2 Aggregates**

Aggregate used on Department projects must be accordance with **Florida Administrative Code Rule 14-103**. A list of approved sources will be maintained by the Department and made available from the State Materials Office (SMO).

As a minimum, suitable bins, stockpiles or silos shall be provided to store and identify aggregates without mixing, segregating, degradation or contaminating the different sources or grades. Department designated, approved source number and aggregate grade shall be included in the identification.

Aggregates shall be measured by mass within an accuracy of 1 percent of the required amount.

Concrete producer is responsible for handling of the aggregates, minimizing segregation and recovering the material from the stockpile for use in the mix so it will remain within Specification limits. Stockpiles shall be maintained in a well-drained condition to minimize free water content and not promote algae/fungal growth. Quantities of aggregate necessary for sampling and testing shall be obtained where feasible from the recovery side of the stockpile to ensure compliance with the **Specifications and other Contract Documents**.

#### **9.3.6.2.1 Wetting Coarse Aggregate Stockpiles, Storage Bins and Silos**

The coarse aggregate shall be continuously and uniformly sprinkled with water for a period of 24 hours immediately preceding introduction into the concrete. Any request for deviations from the 24-hour sprinkling requirement shall be addressed in the Producer's QC Plan.

### **9.3.6.3 Admixtures**

Concrete mixes shall use only admixtures approved by the Department. A certification from the admixture supplier that the admixture meets the requirements of **Specifications Section 924** is required. The certification will include a statement from the admixture's supplier or an accepted independent testing laboratory that the proposed admixture is compatible with all other admixtures to be included in the concrete design mix. The admixture dosage rate of the product to be used should be within the range of the admixture manufacturer's technical data sheet. Dosage rates outside of this range may only be used with written recommendation from the admixture Producer's technical representative.

Measure the admixtures by mass or volume. Use measuring equipment that has accuracy (under all operating conditions) within 3 percent of the quantity of admixture required for the batch. Measure each admixture separately, and add it to the mix in a manner and to a component of the mix that meets the admixture manufacturer's approval

Store the admixtures in accordance with the admixture manufacturer's recommendation.

#### **9.3.6.4 Scales, Meters, and other Weighing or Measuring Devices**

##### **9.3.6.4.1 General Requirements**

The accuracy of all scales, meters, and other weighing or measuring devices, excluding admixture dispensers, shall be checked prior to the production of concrete and, at a minimum, once every three months thereafter. A qualified representative of a scale company registered with the Bureau of Weights and Measures, Division of Standards of the Florida Department of Agriculture and Consumer Services, shall conduct the check for accuracy. The Department reserves the right to be present during all accuracy checks.

The date of inspection, signature of the company representative, observed deviations for each quantity checked and a statement that the device conforms to the **Contract Documents** shall be included in the report provided by the qualified company performing the check. A copy of the report corresponding with the current certificate of inspection shall be available at the plant where the device is located.

Affix a certificate of inspection bearing the date of the certification showing signature of the company representative to each weighing or measuring device.

##### **9.3.6.4.2 Scales**

Maintain scales to an accuracy of 0.5 percent of the maximum load normally handled.

##### **9.3.6.4.3 Water Measuring Devices**

The check for accuracy will be by weight or volume. Whichever method is used, construct the equipment so that the accuracy of measurement is not affected by variations in pressure in the water supply line. Use a meter or weighing device capable of being set to deliver the required quantity and to automatically cut off the flow when the required quantity has been discharged. Ensure that the measuring equipment has accuracy, under all operating conditions, within 1 percent of the quantity of water required as total mixing water for the batch. The total mixing water shall include: water added to the batch, ice added to the batch, water occurring as surface moisture on the aggregates, and water introduced in the form of admixtures.

Use of flow meters mounted in series is acceptable provided the accuracy of the flow meters is traceable to the National Institute of Standards and Technology.

### **9.3.6.5 Admixture Measuring Dispensers**

Annual certification of admixture measuring dispenser accuracy shall be completed by the admixture supplier. Calibrate the dispensing equipment for calcium nitrite quarterly.

### **9.3.6.6 Recorders**

Plants equipped with recording mechanisms must provide records that are clear, complete, and with permanent indications of the plant's performance. Recorder information may be supplemented by the batcher during the batching operation. The Department shall be allowed to review the recorder history at any time.

### **9.3.6.7 Batching Accuracy**

The failure to maintain batching operations of the plastic concrete within the tolerance for each component material requires immediate investigation and corrective action by the concrete producer. A failure to immediately investigate and implement corrective measures may be cause for suspension of the PQCP.

#### **9.3.6.7.1 Batch Adjustments for Materials**

Permissible adjustments to previously approved design mixes that may be made without a new design mix request are as follows:

- (1) Allowable variation of Coarse or Fine Aggregate: The variation for each aggregate can be  $\pm 75$  pounds per cubic yard of concrete.
- (2) 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.
- (3) Allowable variation of Cementitious Materials:  $\pm 6.5$  percent per cubic yard but not less than the specified minimum.

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

The DMRE 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.

### 9.3.6.7.2 Batch Adjustments for Moisture

Free moisture for the coarse and fine aggregates will be determined within two hours prior to each day's batching, unless moisture meters are used. Determine the free moisture content of aggregates at 4-hour intervals during continuous batching operations, and at any time a change in moisture content becomes apparent. Adjustment of batch proportions will be made using these values.

One or more of the following methods shall be used to determine aggregate free moisture:

- (1) Use moisture meter readings, speedy moisture tester or Chapman flask for fine aggregate moisture. The moisture meter readings may be used for coarse or fine aggregate moistures. The accuracy of the moisture meter shall be verified at least weekly by the moisture meter manufacturer's recommended method and by method (2) below. The Chapman flask and speedy moisture tester shall be verified at least weekly by method (2) below.
- (2) Calculate both coarse and fine aggregate free moisture based upon dry sample weights and adjusting for absorption per AASHTO T 255. The following minimum sample sizes shall be used in lieu of the sample sizes required in AASHTO T 255 Table 1.  
Fine Aggregate – 500 grams  
Coarse Aggregate – 1500 grams
- (3) Towel dry coarse aggregate to calculate free moisture on saturated surface dry aggregate. The accuracy of towel drying shall be verified weekly by method (2) above.
- (4) The comparison criteria between any of these methods shall be no more than 0.5%.

### 9.3.6.8 Substitution of Materials

Aggregate sources may be substituted within an approved base mix design provided that the aggregates are the same geological type, same size, and are from an approved source. The new aggregate source shall have a specific gravity (saturated surface dry) within 0.08 of the original aggregate source. Obtain the Department's approval for any material substitutions before beginning concrete placement. Provide a new base mix design for any cementitious material or admixture substitution. The Department may take up to five working days to review any material substitution request. A purchase order or delivery ticket for the new material used in the substitution

shall be submitted with the request to substitute material. Ensure that the substituted mix meets the theoretical yield requirements, does not exceed the maximum water to cementitious materials ratio, and the cement content equals or exceeds the approved base mix design.

The theoretical unit weight of the proposed mix design will be within 2.0 pounds per cubic yard of the originally approved theoretical mix design unit weight. When the Engineer determines that unsatisfactory results are obtained during production, the concrete producer shall return to the originally approved base mix design or obtain approval of a new mix design.

### 9.3.6.9 Equipment

Use equipment that has no detrimental effect on the plastic concrete for handling ingredients, mixing concrete, handling the mixed concrete, transporting and depositing the mixed concrete. Do not use equipment with aluminum surfaces in physical contact with the mixed product.

## 9.3.7 DESIGN MIXES

Design mixes shall meet the requirements of **Specifications Section 346**. The concrete producer shall submit design mix verification requests directly to the DMRO in the District where the design mix will be verified. If a design mix is to be verified at a location that is out-of-state, submit the design mix design to the DMRE closest to that location.

Ensure that preparation and testing of the trial mixes is performed by a laboratory that is inspected and meets the requirements of ASTM C1077. Personnel performing plastic or hardened concrete testing shall be qualified as described in this guide.

Make a separate submittal for each particular combination of component materials to be used at a trial mix concrete temperature of 68°F to 86°F, or for hot weather mixes at a minimum concrete temperature of 94°F. Use only design mixes approved by the SMO for Department use. Ensure that the 28-day strength (or strength at any other designated age) of all trial mixes meets the over design requirement, of 1200 psi, to ensure that concrete sampled and tested at the point of placement has a strength exceeding the specified minimum strength.

Include the following with the mix design submittal:

- (1) The Department approved source identification number for coarse and fine aggregates, specific gravity, along with the grade of coarse aggregate and target Fineness Modulus for fine aggregate. Identify

other component materials by manufacturer, brand name, and type or class. Provide specific gravity for all cementitious material except cement.

- (2) Test data from a single trial mix which demonstrates that the produced concrete using the proposed mix, designated ingredients and designated water to cementitious materials ratio will meet the plastic properties described in this guide. Apply an over design requirement, that is the minimum required strength plus 1,200 psi for specified concrete strengths of 5,000 psi or less.

As an option, strength test data for establishing the standard deviation of the plant to meet the specified strength of the mix within 1,000 psi may be submitted for approval. The strength test data shall represent either a group of at least 30 consecutive tests or a statistical average for two groups totaling 30 or more tests. The strength test data from the trial batch is required to meet an over design, which is the minimum required strength for the concrete plus 1.6 standard deviations.

- (4) The admixture producer's technical representative's written recommendation when the admixture dosage rate of the product to be used is outside the range of the admixture manufacturer's technical data sheet.
- (5) A copy of any changes to the Standard Specifications, to include but not limited to Technical Special Provisions and Supplemental Specifications. Include any supporting documentation demonstrating compliance with the changes.

#### **9.3.7.1 Concrete trial mixes temperature between 68°F to 86°F (standard temperature mixes):**

- (1) Ensure that preparation and testing of the trial mix is performed in accordance with ASTM C192. Perform water to cementitious ratio calculations in accordance with FM 5-501.
- (2) On completion of the mixing period, ensure that the trial mix concrete has a slump within  $\pm 0.50$  inch of the target value ( $\pm 1.0$  inch for mixes utilizing a High Range Water-Reducing admixture), and an air content less than or equal to 6.0 percent.

#### **9.3.7.2 Concrete trial mix temperature of 94°F (hot weather mixes):**

- (1) Ensure that preparation and testing of the trial mixes is performed in accordance with ASTM C192, with the following exceptions:
- (2) Initial mixing shall be done in accordance with ASTM C192, except concrete materials shall be brought to a temperature that will ensure the mix temperature is not less than 94°F at any time.
- (3) Hold the trial mix in the mixer for 90 minutes after completion of initial mixing. During the extended mixing period, turn the drum intermittently for 30 seconds every five minutes. Cover the drum with wet burlap or an impermeable cover material during the rest periods. At the end of the 90-minute period, remix the trial mix for a minimum of one minute and make a slump test to verify that the concrete is within the specified range for slump. Ensure that the mix temperature is not less than 94°F at any time.
- (4) On completion of the extended mixing period, ensure that the trial mix concrete has a slump within  $\pm 0.75$  inch of the target value ( $\pm 1.0$  inch for mixes utilizing a High Range Water-Reducing admixture), and an air content less than 6.0 percent. If below the target range, the producer may adjust the slump by a water addition. After the water addition, remix the concrete for a minimum of two minutes and perform slump and air content tests.
- (5) The total water used in initial mixing and the final slump adjustment constitutes the design mix water content. Perform water to cementitious ratio calculations in accordance with FM 5-501. Ensure that the total water to cementitious materials ratio does not exceed the maximum water to cementitious materials ratio of 0.50.

## **9.3.8 PLANT BATCHING REQUIREMENTS**

### **9.3.8.1 Bins**

Provide bins of adequate capacity for the required concrete production. Support the bins upon a rigid framework founded upon a stable foundation capable of holding them in a safe and secure position. Design each compartment to discharge efficiently and freely into the weigh hopper. Provide positive means of control so that as the quantity desired in the weigh hopper is approached, the material can be added slowly and the addition of further material can be stopped precisely. Use a discharging mechanism that prevents loss of material when it is closed. Construct aggregate storage bins sufficiently tight to prevent leakage of material, and divide them into at least one compartment for the fine aggregate and one compartment for each size of coarse aggregate to be used. Provide

compartment partitions that are sufficiently tight and high enough to prevent intermingling of the different materials. Construct leak-proof and moisture-proof cementitious bins, and provide them with vibrators or other means to aid the flow of cement from the bin.

### **9.3.8.2 Weigh Hoppers**

Provide weigh hoppers consisting of suitable containers freely suspended from scales. Ensure the elements do not adversely affect accuracy. Equip the hoppers with a discharge mechanism that prevents leakage or loss of material when closed. Vent hoppers to permit air to escape and equip them with vibrators or other equipment that ensures complete and efficient discharge of materials.

### **9.3.8.3 Scales**

Provide either beam type or spring less dial type scales, or electronic devices such as load cells. Where using beam type scales, provide suitable means to hold poises securely in position after they are set. Keep scales clean and in good operating condition. Provide the scale operator with an unobstructed view of all indicating devices and convenient access to all controls. Use graduated weigh beam or dials to permit reading to 0.1 percent of the capacity of the scales. Check scales up to at least the maximum load normally handled on each respective scale.

## **9.3.9 MIXERS**

### **9.3.9.1 General Requirements**

Provide mixers that are capable of combining the components of the concrete into a thoroughly mixed and uniform mass, free from balls or lumps, which are capable of discharging the concrete with a satisfactory degree of uniformity.

Inspect all mixers at least once each week for changes due to accumulation of hardened concrete or to wear of blades.

### **9.3.9.2 Design**

Use concrete plant central mixers of the non-tilting, tilting, vertical or horizontal shaft types.

Make available at the plant at all times a copy of the mixer manufacturer's design, showing dimensions and arrangement of blades. The concrete producer 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. Mixer drum Id 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.

### **9.3.9.3 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 mixer manufacturer.

### **9.3.9.4 Mixer Cleaning and Maintenance**

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**.

## **9.3.10 MIXING AND DELIVERING CONCRETE**

### **9.3.10.1 General Requirements**

Operate all plant mixers at speeds per the mixer manufacturer's design or recommendation. Do not allow the volume of mixed batch material to exceed the mixer manufacturer's rated mixing capacity.

Account for all water entering the drum as batch water.

**When necessary, during cold weather conditions, heat either the mix water, the aggregates or both prior to batching. Apply the heat uniformly in a manner which is not detrimental to the mix. Do not heat the aggregates directly by gas or oil flame or on sheet metal over fire. Do not heat the aggregates or water to a temperature of over 150° F. If either component is heated to over 100° F, mix them together prior**

**to the addition of the cement. The cement must not come in contact with the materials which are in excess of 100° F. Include in the PQCP measures to maintain free moisture in a well-drained condition when heating aggregates. 9.3.10.2 Central Mixing:**

After all materials are in the mixer, mix the concrete a minimum of two minutes, or the mixer manufacturer's recommended minimum mixing time. As an alternative uniformity results may be developed in accordance with ASTM C94 to determine the mixing time. Charging the Mixer:

Charge each batch into the drum so that some water enters both in advance of and after the cementitious material and aggregates. If using fly ash (other than ultra-fine fly ash) in the mix, charge it into the drum over approximately the same interval as the cement. The concrete producer may use other time intervals for the introduction of materials into the mix when he demonstrates, using test requirements specified in **ASTM C94**, that he can achieve uniformity of the concrete mix.

For concrete mixes containing specialty ingredients, charge the batch materials into the mixer in a sequence recommended by the mixer manufacturer of the specialty ingredients. Adjust the weight of mixing water for a concrete mix containing a corrosion inhibitor and/or accelerator admixture. Account for water in the corrosion inhibitor and/or accelerator as described in the admixture manufacturer's technical data sheet.

### **9.3.11 QUALITY CONTROL PROGRAM**

The PQCP of any concrete producer shall meet the requirements of **Specifications Sections 105**. The accepted PQCP shall be the minimum required control of concrete on all Department projects. The PQCP shall also address the following items:

- (1) Describe how the concrete producer will maintain the properties of concrete to the point of discharge at the project site.
- (2) Describe how the water to cementitious materials ratio and the plastic properties tests of concrete will be controlled to meet **Specification** requirements.
- (3) Describe personnel qualification, source of materials, and equipment used to produce concrete.

### **9.3.12 PERSONNEL**

Plants supplying concrete to Department projects shall have adequate qualified personnel. Concrete Batch Plant Operator, certified technicians and Concrete Production Facility Manager of Quality Control are required positions for a plant. At the discretion of the Department, certain functions of the above positions may be combined when it can be demonstrated that the plant's operation and quality of the concrete will not be detrimentally affected. Personnel shall be qualified through the Construction Training and Qualification Program (CTQP) or an equivalent ACI training program. Qualified technicians utilizing equipment with a valid calibration/verification will perform quality control sampling and testing. The qualification records of any personnel shall be made available upon request.

#### **9.3.12.1 Concrete Batch Plant Operator**

Personnel who have quality control functions or who sign concrete certification/delivery tickets must demonstrate, through examination, adequate concrete related knowledge. Batch Plant Operators shall be present during batching operations. The Batch Plant Operator shall be qualified as a Concrete Batch Plant Operator.

#### **9.3.12.2 Certified Technicians**

If personnel perform concrete plastic properties test, such as temperature making/curing concrete cylinders, and calculating the water to cementitious materials ratio, they shall be certified as ***ACI Concrete Field Testing Technician Grade I***.

If personnel perform tests on hardened properties of concrete, such as strength determination of cylinders or beams, they shall be certified as ***ACI Concrete Strength Testing Technician***.

#### **9.3.12.3 Concrete Production Facility Manager of Quality Control**

Personnel who perform the duties of managing the quality control of the plant shall have the duties, responsibilities, and be qualified as follows:

Duties and responsibilities:

- (1) Implement policies and procedures of the PQCP.
- (2) Maintain liaison with the Department on all activities related to quality control.
- (3) Supervise the activities of all quality control technicians, ensuring sufficient manpower in all areas related to quality control testing and inspection.

- (4) Review all quality control procedures to ensure compliance with the ***Specifications and other Contract Documents***.
- (5) Ensure all quality control records are properly prepared and reviewed.
- (6) Ensure that quality control activities are performed in accordance with documented instructions and procedures.
- (7) Develop and maintain a filing, storage, and retrieval system for quality control records.
- (8) Concrete Production Facility Manager of Quality Control must be on-site at the plant on a daily basis or always available on-site upon four hours notice.

Qualification:

- (1) Concrete Laboratory Technician Level I, Concrete Field Technician-Level I, and Batch Plant Operator. As alternatives to these qualifications, the Department will accept:
  - a. Prestressed Concrete Institute (PCI) Level III
  - b. Precast Concrete Pipe, Box Culverts, Drainage Structures or
  - c. Incidental Precast Concrete Plants Level II Quality Control Inspector Certifications
  - d. National Ready Mixed Concrete Association (NRMCA) Certified Concrete Technologist Level 2.
- (2) Three years of producer's quality control experience directly related to cement concrete production.
- (3) Demonstrated proficiency in implementing, supervising, and maintaining surveillance over a Producer' Quality Control Program.
- (4) Experience and certification in performance of required Quality Control tests and statistical evaluation of Quality Control test results.

#### **9.3.12.4 Concrete Mix Designer**

Personnel who have quality control functions of designing a concrete mix must demonstrate, through examination, adequate concrete related knowledge. Such examinations will deal with Specifications and concrete quality control procedures. The Concrete Mix Designer shall be qualified as a ***Concrete Laboratory Technician Level II***.

As an alternative to the CTQP Level II qualification the Department will accept any of the following qualifications:

- (1) PCI Quality Control Personnel, Level III Certification, for concrete mix designs of prestressed products.
- (2) National Ready Mix Concrete Association Level 2 Production Control Technician Certification.
- (3) Precast Concrete Pipe, Precast Box Culverts, Drainage Structures, and Incidental Precast Concrete Level II Quality Control Inspector meeting the requirements of ***Specifications Section 105***.
- (4) Registered Professional Engineer, State of Florida

### 9.3.13 RECORDS

All records shall be kept on file and made available at each plant upon request by the Department. The following updated information shall be available at each plant:

- (1) Accepted concrete producer PQCP.
- (2) Approved concrete design mixes.
- (3) Materials source/specification compliance (delivery tickets, certifications, miscellaneous test reports).
- (4) Quality control data (aggregate gradation, Total Minus 200, and concrete chloride test data).
- (5) Aggregate moisture control records including date and time of test. Verify the accuracy of the moisture test method at least weekly. Is the scale calibrated annually and does it cover the full weighing range?
- (6) Annual calibration records for water sources for concrete water adjustments.
- (7) Mixer manufacturer's design data.
- (8) Federal poster shall be posted so as to be visible to all employees.
- (9) A copy of the scale company's report corresponding with the current certificate of inspection, showing the date of inspection, signature of the scale company representative, and the observed scale deviations for the loads checked.

- (10) Certification documents for admixture weighing and measuring dispensers.
- (11) Weekly mixer inspection reports.
- (12) A daily record of all concrete batched for delivery to Department projects, including respective design mix numbers and quantities of batched concrete.
- (13) Recorder history, if the plant is equipped.

### 9.3.14 SAMPLING AND TESTING OF MATERIALS

#### 9.3.14.1 General

Sampling and testing of materials and concrete for quality control purposes is the responsibility of the concrete producer. The frequency of sampling must be designed to provide adequate data to operate within the PQCP for each design mix. Table 1 designates the minimum sampling and testing frequencies that will be performed in a well- controlled plant. The PQCP shall indicate an increased sampling rate when any PQCP limit is reached. All sampling and testing shall be conducted in accordance with the Department’s current Florida Sampling and Testing Methods, AASHTO, or ASTM sampling and testing methods. For both coarse and fine aggregate being used, the specific gravity (saturated surface dry) and absorption values shall be provided to the plant by the aggregate producer providing the coarse and fine aggregate.

TABLE 1	
Material and Required Tests	Minimum Sampling Frequency For Each Source and Grade
Coarse Aggregate Gradation (FM 1-T 027)*	1 every 90 days
Total Minus 200 (FM 1-T011)*	1 every 90 days
Fine Aggregate Gradation (FM 1-T 027)*	1 every 90 days
Total Minus 200 (FM 1-T011)*	1 every 90 days
Cementitious Materials	Delivery Ticket and Mill Certificate
Admixtures	Certification
Water**	As required in <b>Specification Section 923</b>

\*District Materials Research Office shall split a sample of both coarse and fine aggregate from each plant in their District on an annual basis.

Materials Certification and Delivery Tickets must be kept on file for five years from date of materials receipt at the plant.

\*\*When evidence shows the concrete producer has failed to sample water within the

TABLE 1	
Material and Required Tests	Minimum Sampling Frequency For Each Source and Grade

required frequency, an increased sampling frequency shall be implemented. Open bodies of water and recycled water shall be tested every 15 days during production. Well and other sources of water will be tested every 45 days during production, until approval to return to the normal sampling frequency is given by the DMRE for the District which has PQCP acceptance responsibility. Failure to comply with the sampling frequency shall be cause for suspension of the PQCP.

### 9.3.15 DELIVERY TICKET/CERTIFICATION

The following information is required information for each concrete delivery and must be furnished either with each load or in a cover letter submitted for each paving placement or at a minimum each paving production day. The original signature on the cover letter shall certify to the accuracy of the recorded information and compliance with the approved design mix. 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) Design mix number.
- (8) Time all materials are introduced into mixer.
- (9) Cubic yards in this load.
- (10) Cumulative total cubic yards batched for job on date of delivery.
- (11) Coarse and fine aggregate sources (Department assigned Pit No.).
- (12) Actual amount of coarse and fine aggregates batched in pounds.

- (13) Percent of free moisture in coarse and fine aggregates.
- (14) Cement producer and type.
- (15) Total amount of cement batched in pounds.
- (16) Producer, brand name and class (whichever might apply) of pozzolan or slag.
- (17) Total amount of pozzolan or slag batched in pounds.
- (18) Manufacturer and total amount of air entraining agent used.
- (19) Manufacturer, type and total amount of admixtures used.
- (20) Total amount of water batched at the plant in gallons or pounds before leaving for the job site. Unit of measure must be indicated.
- (21) Statement of compliance with ***the Contract Documents***.
- (22) Original signature of Batch Plant Operator and technician identification number.

### **9.3.16 TRAINING**

Training will be in accordance with Specifications Section 105 and the appropriate Materials Manual Volume II Sections.

### **9.3.17 FORMS**

Example Concrete Delivery Ticket – Appendix A

