QUALITY MANAGEMENT & ACCEPTANCE
PC CONCRETE PAVEMENT

GENERAL

This Instructional Memorandum is based on the concept of mutual benefit partnership between the Contracting Agency and the Contractor during progress of the work. Technical partnering shall be a part of this work and a formal partnership agreement may or may not be in effect.

The Contractor shall submit and comply with a Quality Control Program. The Contractor shall be responsible for the design of a Portland Cement Concrete Design Mixture (CDM) for use in pavement and shall be approved by the District Materials Engineer. The Contractor shall perform process control sampling, testing, and inspection during all phases of the concrete work at the rate specified in the contract documents, with monitor inspection by the agency personnel. Inspection of all other aspects of the concrete paving operation remains the responsibility of the Engineer.

The Contractor shall have an Iowa DOT PCC Level II Certified Technician responsible for all process control sampling and testing and execution of the Quality Control Plan as specified in the specification and this Instructional Memorandum. An Iowa DOT PCC Level I Concrete Field Testing Technician or Technician Grade I (in accordance with ACI CP-2) may perform the sampling and testing duties for which he or she is certified.

MIX DESIGN PROCEDURE

An Iowa DOT PCC Level III Certified Technician shall perform the mix design. The Engineer shall concur with the Contractor designee.

The CDM shall be developed using the Excel spreadsheet developed by the Office of Materials. ACI 211 procedure, PCA procedure, or alternative methods may also be used. Aggregate proportions are contained on Form #955QMC (IM 532, Appendix A). When a CDM is developed, the absolute volume method shall be used.

The Contractor shall submit the CDM with test data, including a list of all ingredients, the source of all materials, target gradation, and the proportions, including absolute volumes.

A CDM with a satisfactory record of performance strength may be submitted in lieu of a new CDM. The concrete used for paving per this IM shall be produced with the same material sources and batched and mixed with the same equipment used to produce the concrete represented by the performance strength documentation.

For each proposed aggregate proportion, the 28-day flexural strength shall be determined at the proposed cementitious content. The CDM shall be based on the 28-day strength and the average of a minimum of three tests per mixture.

QUALITY CONTROL PLAN

The Contractor shall submit a Quality Control Plan listing the type and frequency of inspection, sampling, and testing deemed necessary to measure and control the various properties of materials and construction governed by the specifications. As a minimum, the sampling and testing plan shall detail sampling location, sampling procedures, and the test frequency to be utilized. This Contractor Quality Control Plan shall be submitted to the PCC Engineer and will be retained for use on all QMC projects. A copy of the Quality Control Plan shall be available on the project at all times. Periodic updates may be required as necessary.

A Project Information Quality Control Plan shall be submitted for each project. The plan shall identify the personnel responsible for the contractor quality control. This should include the company official who will act as liaison with Iowa DOT personnel, as well as the certified technician who will direct the inspection program. The certified technician shall be responsible to an upper level company manager and not to those responsible for daily production. The project information plan shall also include the mix design and mix design properties.

A. Elements of the Quality Control Plan

The plan shall address all elements that affect the quality of the concrete, including but not limited to, the following:

1. Stockpile management

2. Mixing time and transportation, including time from batching to completion of delivery and batch placement rate (batches per hour)

3. Placement and consolidation

4. The frequency of sampling and testing, coordination of activities, corrective actions to be taken, and documentation

5. How the duties and responsibilities are to be accomplished and documented, and whether more than one certified technician would be provided

6. The criteria used by the technician to correct or reject noncompliant materials, including notification procedures

B. Personnel Requirements

1. Perform and utilize process control tests and other quality control practices to ensure that delivered materials and proportioning meets the requirements of the mix design(s).

2. Periodically inspect all equipment utilized in transporting, proportioning, mixing, placing, consolidating, finishing, and curing to ensure proper operation. Monitor placement, consolidation, finishing, and curing to ensure conformance with the mix design and other contract requirements.

The Project Information Quality Control Plan shall be submitted in writing to the Engineer for the project. The Contractor shall not start paving until receipt of the approval of the Project Information Quality Control Plan.

C. Elements of Project Information Quality Control Plan

1. Mix design(s)

2. Mix design properties, as specified in the Specifications

3. The Contractor shall furnish name(s) and credentials of the quality control staff to the Engineer prior to the beginning of construction.

4. Project-related information

DOCUMENTATION

The Contractor shall maintain records of all inspections and tests. The records shall indicate the nature and number of observations made, the number and type of deficiencies found, the quantities represented by the test, and any corrective action taken. The contractor documentation procedures will be subject to the approval of the Iowa DOT prior to the start of the work and prior to regular monitoring during the progress of the work. Use standard Iowa DOT forms. Batch tickets and gradation data shall be documented in accordance with Iowa DOT requirements. Copies shall be submitted to the engineer as work progresses.

A control chart and running tabulation of individual test results shall be prepared for the following tests. An Excel spreadsheet is available from the Office of Materials to plot the test results. These shall be available to the Engineer at any time and submitted to the Engineer weekly:

1. Gradation (% passing) for each of the following sieves: 1 1/2 in. (37.5 mm), 1 in. (25 mm), 3/4 in. (19 mm), 1/2 in. (12.5 mm), 3/8 in. (9.5 mm), #4 (4.75 mm), #8 (2.36 mm), #16 (1.18 mm), #30 (600 µm), #50 (300 µm), #100 (150 µm), #200 (75 µm), and pan.

2. Moisture: Coarse Aggregate(s) & Sand

3. Unit Weight

4. Plastic Air Content

5. Coarseness & Workability Factors

6. Water/cementitious Ratio

Charting will be completed within 24 hours after testing. Working range limits shall be indicated on the control charts.

The Contractor shall notify the Engineer whenever the process approaches a specification limit and shall take action, which results in the test results moving toward the specification target, away from the limit.

All charts and records documenting the contractor quality control inspections and tests shall become property of the Iowa DOT upon completion of the work.

The PCC Level II Technician shall document the changes to the mix design, allowed by the specification, on the Iowa DOT QM-C Mix Adjustment form (IM 530, Appendix A). The PCC Level III Technician shall concur with the changes and shall periodically review mix changes affect on workability and placement in the field.

FIELD VERIFICATION TESTING

For continuous construction operation, a lot will be defined as a week of paving. Lots less than three days of paving will be grouped with the previous week lot. Intermittent construction operation involving quantities less than 250 cubic yards per day, shall be grouped to establish a lot. The Engineer will perform verification testing at the following minimum test frequencies:

MINIMUM TEST FREQUENCIES

	Verification	
Unit Weight Plastic Concrete	None	IM 340
Gradation (Individual aggr., % passing)	1st/day, then twice per lot	IM 302
Flexural Strength, Third Point Loading - 28 days *	1/10,000 cu. yd. (1/10,000 m³)	IM 328
Air Content Unconsolidated Concrete	1/700 cu. yd. (1/700 m³)	IM 318
Water/Cement Ratio	None	IM 527
Vibration Frequency	1/week	IM 384

*One set of two beams at the above rate shall be cast for pavement design purposes. The beams shall be delivered to the Central Laboratory in Ames for testing. Transported beams shall be stripped and wrapped in wet burlap and plastic to ensure adequate curing during delivery. Include information on project number, contractor, date cast and air content with delivery.

CONTROL & ACCEPTANCE PROCESS OF PLASTIC AIR TESTING

On the first air test of each day, the Contractor and Agency shall run side by side tests to ensure both air meters are within the tolerance in IM 216. If the air tests are outside the tolerance, both air meters should be calibrated in accordance with IM 318 to resolve the difference.

Thereafter, the Engineer will randomly test the plastic air content at the minimum frequency in the table above. The Contractor may elect to run side by side comparison at the same time as the Engineer to ensure both meters are operating properly. When a verification test result is outside the tolerance for the target air content, the Contractor will be immediately notified.

The unconsolidated air content limits will be established according to Article 2301.04C using Contractor test results. The Contractor shall notify the Engineer whenever an individual quality control test result is outside the tolerance for the target air content. Lot acceptance shall be based on the agency verification test results on the unconsolidated mix on the grade.

DETERMINING COARSENESS & WORKABILITY INCENTIVE

On the first day of paving, the Engineer will direct and witness sampling and splitting of one sample of each aggregate. The split sample shall meet the requirements of IM 216. If correlation is not established, the District Materials Engineer will resolve the differences.

Thereafter, The Engineer will direct and witness sampling of one random independent sample per day. The agency will take immediate possession of the samples. The Engineer will randomly test a minimum of two samples per lot. The Engineer will determine aggregate percentages based on the batch weights at the time the sample was obtained, compute the average coarseness and workability factors for the combined samples tested, and average the results. If the average results obtained by the Engineer fall within the same pay zone as the Contractor, appropriate incentive will be paid for the lot.

If the average results obtained by the agency are not in the same pay zone as the Contractor, the Engineer will test the remaining samples representing the lot and average all results for the lot. If the average results of all verification samples for the lot fall within the same pay zone as Contractor results for the lot, incentive will be paid for the lot. If the average results of all verification samples for the lot are in a different pay zone than Contractor, the agency results will govern for the basis of incentive for the lot.

CORRECTIVE ACTION

The Contractor shall take prompt action to correct conditions that have resulted, or could result, in the incorporation of noncompliant materials.

NONCOMPLIANT MATERIALS

The Contractor shall establish and maintain an effective and positive system for controlling noncompliant material, including procedures for its identification, isolation and disposition. Reclaiming or reworking of noncompliant materials shall be in accordance with procedures acceptable to the Iowa DOT.

All noncompliant materials and products shall be positively identified to prevent use, shipment, and intermingling with conforming materials and products.

AVOIDANCE OF DISPUTES

Every effort should be made by Contractor and Engineer personnel to avoid any potential conflicts in the Quality Assurance Program prior to and during the project by using partnering concepts. Potential conflicts should be resolved at the lowest possible levels between the Contractor and Engineer personnel. Correction of problems and performance of the final product should be the primary objective of this resolution process.

TESTING

If less than 500 cu. yd. (500 m^3) are produced in one day that day's production may be grouped with the following day's production.