

**INDIANA DEPARTMENT OF TRANSPORTATION
OFFICE of MATERIALS MANAGEMENT**

**CONTRACTOR QUALITY CONTROL PLANS
ITM No. 803-11P**

1.0 SCOPE.

- 1.1** This procedure covers the preparation of a QCP by a Contractor. The QCP shall be provided, maintained, and followed to assure all materials furnished and placed for acceptance are in accordance with the contract requirements.
- 1.2** The values stated in either acceptable English or SI metric units are to be regarded separately as standard, as appropriate for a specification with which this ITM is used. Within the text, SI metric units are shown in parenthesis. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other, without combining values in any way.
- 1.3** This ITM may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. The user of the ITM is responsible for establishing appropriate safety and health practices and to determining the applicability of regulatory limitations prior to use.

2.0 REFERENCES.

- 2.1 Standards.** AASHTO, ASTM, ITM, SSPC, and other referenced standards shall be identified under each type of Contractor's QCP contained herein.

- 3.0 TERMINOLOGY.** Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101. Specific terms and abbreviations to a type of Contractor's QCP shall be defined within that type of QCP requirements, as necessary.

4.0 GENERAL REQUIREMENTS.

- 4.1** The QCP shall be contract specific and state how the Contractor proposes to control the materials, equipment, and operations on the contract.
- 4.2** The QCP shall be signed and dated by the Contractor's representative at the time the QCP is submitted to the Engineer.
- 4.3** The Department will review, sign, and date the QCP if the contents of the QCP are in compliance with the requirements as stated herein.

- 4.4** The QCP shall be maintained to reflect the current status of the operations, and revisions shall be provided in writing prior to initiating the change. The change shall not be implemented until the revision has been accepted.
- 4.5** The QCP shall contain the name, qualifications, telephone number, duties, and employer of all quality control personnel necessary to implement the QCP. The minimum number of quality control functions shall be as follows:
 - 4.5.1** QCP Manager. The person responsible for the overall administration of the QCP
 - 4.5.2** QCP Field Manager. The person responsible for the execution of the QCP and liaison with the Engineer. The QCP Field Manager for HMA Pavements shall be a Certified HMA Field Supervisor. The QCP Field Manager for PCCP shall be a Certified PCCP Field Supervisor.
 - 4.5.3** Quality Control Technician. The person responsible for conducting quality control tests and inspection to implement the QCP. There may be more than one quality control technician.
 - 4.5.4** One quality control person may perform the duties of any of the other functions listed in 4.5.1, 4.5.2, or 4.5.3.
- 4.6** The QCP shall contain, but not be limited to, the proposed methods of sampling, testing, calibration, construction control, monitoring, and anticipated frequencies.
- 4.7** Placement operations shall not begin before the QCP has been accepted.
- 4.8** As a minimum, the QCP shall contain the information as stated herein for the following operations:
 - 4.8.1** HMA Pavements -- 5.0
 - 4.8.2** Portland Cement Concrete Pavements -- 6.0
 - 4.8.3** Structural Concrete -- 7.0
 - 4.8.4** Field Painting of Steel Bridges -- 8.0
 - 4.8.5** Shop Painting of Steel for Bridges -- 9.0
 - 4.8.6** Seal Coat -- 10.0
 - 4.8.7** Micro-Surfacing -- 11.0
 - 4.8.8** Trenchless Pipe Installation -- 12.0

6.0 PORTLAND CEMENT CONCRETE PAVEMENT QCP.

6.1 References.

6.1.1 AASHTO Standards.

T 121 Mass per Cubic Meter (Cubic Foot), Yield, and Air Content (Gravimetric) of Concrete

T 152 Air Content of Freshly Mixed Concrete by the Pressure Method

T 309 Temperature of Freshly Mixed Hydraulic Cement Concrete

6.1.2 ASTM Standards.

C 173 Air Content of Freshly Mixed Concrete by the Volumetric Method

6.1.3 ITM Standards.

402 Strength of Portland Cement Concrete Pavement (PCCP) Using the Maturity Method

901 The Proper Use of the Profilograph and the Interpretation of Profilograms

902 Verifying Sieves

909 Verifying Thermometers

910 Verifying Balances

911 Verifying Slump Cones

6.1.4 Other.

ACI 306 Cold Weather Concreting

6.2 Quality Control Technician. The technician shall be an American Concrete Institute (ACI) certified concrete field testing technician, grade 1.

6.3 Testing Facility. The location of the testing facility and a list of test equipment. The testing facility shall be in accordance with 508.09. A statement of accessibility of the testing facility shall be included that allows Department personnel to witness quality control activities, and to review quality control tests.

6.3.1 **Testing Equipment.** A list of the testing equipment proposed for quality control testing, and the test methods and frequency of calibration or verification of the equipment. The equipment shall meet the requirements of the test methods identified in 508.09. The Contractor shall maintain a record of all equipment calibration or verification results at the testing facility. The minimum frequency and procedures shall be as follows:

Equipment	Requirement	Minimum Frequency	Procedure
Air Meter	Calibration	3 months	AASHTO T 152 or ASTM C173
Balances	Verification	12 months	ITM 910
Sieves	Check Physical Condition	12 months	ITM 902
Slump Cones	Verify Dimensions	12 months	ITM 911
Thermometers	Verification	12 months	ITM 909
Unit Weight Measure	Calibration	12 months	AASHTO T 121

6.4 Materials. The source, transportation, handling, and storage procedures, as applicable, for materials to be used in the PCCP.

6.4.1 Admixtures - type

6.4.2 Aggregates - size

6.4.3 Curing Materials

6.4.4 Dowel Bars - size

6.4.5 Dowel Bar Assemblies - size

6.4.6 Fly Ash - class

6.4.7 Ground Granulated Blast Furnace Slag - grade

6.4.8 Joint Fillers - type

6.4.9 Joint Materials – type

6.4.10 Portland Cement - type

6.4.11 Reinforcing Steel - size and type

6.4.12 Water - Potable or non potable. If non-potable, the sampling and testing procedures shall be included.

6.5 Process Control of Aggregates. A plan for control of the gradation and moisture in the aggregate stockpiles, identification of stockpiles by signing or other acceptable methods, techniques for construction of proper stockpiles, and loading procedures.

- 6.5.1 The gradation control band tolerances on each sieve for aggregates not in accordance with the gradations of 904.02 and 904.03 shall be included.

Gradation tests for each aggregate size shall be conducted daily when concrete paving operations exceed 200 yd² (200 m²) per day. The procedure for determination of the combined aggregate gradation shall be included. Gradation tests shall verify the maximum size of the aggregates and the mathematically combined amount passing the No. 200 (75 μm) sieve of fine and coarse aggregates which have been proportioned in accordance with the CMD. Gradation tests shall also verify compliance with intermediate sieves in accordance with 904.02 and 904.03 or with sieve band tolerances as stated herein.

- 6.5.2 The procedure for determination of the water absorption of the aggregate shall be included. The minimum frequency shall be two tests for each aggregate used during the concrete paving operations.

6.6 Trial Batch Demonstration. The procedures, location, and type of equipment to be utilized during the trial batch demonstration(s). The identification and intended use of each mixture shall be included.

6.7 Concrete Batching. The techniques and controls of the concrete batching operations. A description of the plant, including the capacity and intended batch size, and the methods and sequence by which the plant produces a batch shall be included. The minimum mixing time shall be stated.

The initial and routine equipment checks, including those conducted on mixers, scales, water meters, and admixture dispensers, shall be included. All material checks, including frequencies of testing, shall be identified. The methods to monitor ingredients used, and the record of each batch shall be included.

6.8 Process Control of Concrete. The procedures for sampling and testing the concrete mix for flexural strength, air content, unit weight, water/cementitious ratio, and temperature. The frequency of tests shall be included and as a minimum shall meet the following:

- 6.8.1 Flexural Strength. The minimum frequency of tests shall be one set of two beams for each subplot.
- 6.8.2 Air Content. The minimum frequency of tests shall be one air content for each subplot.

- 6.8.3 Unit Weight. The minimum frequency of tests shall be one unit weight for each subplot.
- 6.8.4 Water/Cementitious Ratio. The minimum frequency shall be one per week or one for every five lots, whichever is more restrictive by frequency.
- 6.8.5 Concrete Temperature at Paver. The minimum frequency of tests shall be one concrete temperature test for each 2h of paving.

6.9 Process Control of Pavement. The procedures for determining the pavement depth, surface profile, and surface smoothness shall be as follows:

- 6.9.1 Pavement Depth. The procedure for monitoring the depth of the concrete pavement
- 6.9.2 Surface Profile. The procedure for measuring the surface profile and correcting profile non-compliance of the concrete pavement
- 6.9.3 Surface Smoothness. The procedure for measuring the smoothness and correcting smoothness non-compliance of the concrete pavement. The certification of the profilograph in accordance with ITM 901 shall be included.

6.10 Control Charts. The procedures for charting quality control results for tests for flexural strength, unit weight, and air content of the concrete. The control charts shall indicate process control limits for each subplot and lot, 100 percent payment limits, and have a legend. The charts shall be maintained at a readily accessible location at the common testing facility. The control chart legend shall be as follows:

- 6.10.1 The target value, if applicable, shall be the center of the chart and shall be represented by a heavy long dash followed by a short dash line.
- 6.10.2 Control limits shall be represented by heavy solid lines.
- 6.10.3 One hundred percent payment limits shall be indicated by short dashed lines.
- 6.10.4 The horizontal lines on the chart indicating the 100 percent payment limits, control limits, and target value, if applicable, shall be numerically identified in the left margin.
- 6.10.5 The vertical distance between upper and lower control limits shall be no less than 2 in. (50 mm).

6.10.6 The plot point for the test results shall be surrounded by a small circle, and each consecutive point shall be connected by a solid straight line.

6.10.7 Test results shall be plotted left to right in chronological order, and dates corresponding to each test shall be shown along the horizontal axis.

Any proposed deviation from these procedures shall be identified in the QCP.

6.11 Response to Test Results. The response to process control tests shall include as a minimum the following:

6.11.1 Water Absorption. The procedure for corrective action when the absorption test results for a particular size of aggregate differs from the design mix value by more than 0.5 percent. A statement that production shall be discontinued when this tolerance is exceeded shall be included.

6.11.2 Other Quality Control Tests. The procedure for corrective action for results outside of satisfactory limits for each type of test.

6.12 Concrete Hauling. The equipment and methods for delivery to the paver. The description or plan drawing of the traffic patterns in the vicinity of the plant and for delivery of the concrete mix to the site of work shall be stated. Information concerning temporary adjustments to traffic flow shall be included. When using transit mixers, the procedures for adding water to the PCC and the required mixing time to increase workability shall be included.

6.13 Concrete Paving. The procedures for placement of the concrete shall include as a minimum the following.

6.13.1 Paving Plan. The general sequence of construction, the widths and methods of placement for all areas, and the planned date for paving to begin and to be completed on each phase of the contract

6.13.2 Cold Weather Paving. The procedures to be utilized when ambient temperature is below 35°F (2°C). Procedures shall address protection of subgrade, treatment of concrete components, and protection of the PCCP. ACI 306 may be used for additional guidance.

6.13.3 Night Paving. The procedures to be utilized for artificial lighting when natural light is insufficient. The procedures shall include the number and type of units with respect to the paving operations.

6.13.4 Paving. The techniques used to place concrete throughout the project with specific details pertaining to difficult locations, such as joining existing pavement, gaps, headers, crossovers, approaches, or tapers

6.13.5 Equipment. Identification of the equipment used in the paving operations on each phase of the contract

6.13.6 Alignment and Profile. The methods of controlling the alignment and profile

6.13.7 Placement and Consolidation. Methods of depositing plastic concrete from the hauling equipment to the grade. The proposed methods of spreading and consolidating shall be included.

6.14 Joints. The type of sealant to be used and the manufacturers recommended installation procedure for each type of joint construction. The measures to be taken to prevent the flow of cementitious material into previously placed and sawn joints, when placing adjacent concrete pavement shall be included.

6.14.1 D-1 Contraction. The procedure for identifying the contract conditions so that the joints are continuous from edge of pavement to edge of pavement. Methods of installation, alignment, timing of sawing, and protection shall be included.

6.14.2 Longitudinal. The method of construction, which shall include details of how the reinforcing steel is to be placed and when the joints are to be saw cut, at identified planned locations

6.14.3 Transverse Construction. The method of construction, which shall include details of the type of header and reinforcing used, when paving operations are suspended

6.14.4 Longitudinal Construction. The method of construction and proposed spacing if other than shown on the plans

6.15 Finishing, Texturing, and Curing. The methods for finishing, texturing, and curing the PCCP. The equipment to be used shall be identified.

6.16 Documentation. A statement that the test results for control shall be maintained for a period of three years upon completion of the contract shall be included. The records, either electronic and/or hard copies, shall be maintained at a readily accessible location for review by the Department at any time. The documentation shall include results for the aggregate tests, mixture tests, and the profile, smoothness, and depth of pavement tests.

**PORTLAND CEMENT CONCRETE PAVEMENT
QUALITY CONTROL PLAN CHECKLIST**

CONTRACT NO. _____ **DATE** _____

CONTRACTOR _____

SIGNATURE PAGE

- Submitted 15 days prior to paving
- QCP signed and dated by QCP Manager

QUALITY CONTROL PERSONNEL

QCP Manager

- Name
- Qualifications
- Telephone number
- Duties
- Employer

QCP Site Manager

- Name
- Qualifications
- Telephone number
- Duties
- Employer
- * Same person as QCP Manager

Quality Control Technicians

- Name
- Qualifications (ACI Cert Concrete Field Testing Tech, Grade 1)
- Telephone number
- Duties
- Employer
- * Same person as QCP Manager
- * Same person as QCP Site Manager

TESTING FACILITY

- Location
- List of test equipment
- Access statement
- Test methods and frequency of calibration/verification

* Only if applicable

MATERIALS -- Source, Transportation, Handling, and Storage Procedures

- * Admixtures - type
- Aggregates - size
- Curing materials
- Dowel bars - size
- Dowel bar assemblies, size
- * Fly ash - class
- * Ground granulated blast furnace slag - grade
- Joint fillers - type
- Joint materials - type
- Portland cement - type
- Reinforcing steel, size and type
- Water - if non-potable, the sampling and testing procedures

PROCESS CONTROL OF AGGREGATES**Gradation**

- * Control band tolerances on each sieve for aggregates not in accordance with 904.02(g) and 904.03(e)
- Sampling procedure
- Sample reduction procedure
- Test method
- Procedure for determination of combined aggregate gradation
- Testing frequency for each aggregate size (minimum - one test for each day of concrete paving operations)

Water Absorption

- Test methods
- Testing frequency (minimum two tests for each aggregate used during concrete paving operations)

Aggregate Stockpiles

- Stockpiling procedure
- Procedure for identification of stockpiles
- Loading procedures

TRIAL BATCH DEMONSTRATION

- Location
- Type of equipment
- Procedures
- Identification and intended use of each mixture

* Only if applicable

CONCRETE BATCHING

- Description of plant, including capacity and intended batch size
- Method and sequence of batching
- Minimum mixing time
- Initial and routine equipment checks (e.g., mixers, scales, water meters, and admixture dispensers) Material checks and frequency of testing
- Methods of monitoring ingredients
- Method of recording each batch

PROCESS CONTROL OF CONCRETE**Flexural Strength**

- Sampling procedure
- Test method
- Testing frequency (minimum one set of two beams/sublot)

Air Content

- Sampling procedure
- Test method
- Testing frequency (minimum one test/sublot)

Unit Weight

- Sampling procedure
- Test method
- Testing frequency (minimum one test/sublot)

Water/Cementitious Ratio

- Frequency of determination (minimum of one/week or one/5 lots whichever is more restrictive)

Temperature at Paver

- Test method
- Testing frequency (minimum 2/h of paving)

PROCESS CONTROL OF PAVEMENT

- Procedure for monitoring depth
- Procedure for measuring surface profile
- Procedure for correcting profile non-compliance
- Procedure for measuring smoothness
- Procedure for correcting smoothness non-compliance
- Profilograph certification included

CONTROL CHARTS

- Procedure for charting quality control test results for flexural strength, unit weight, and air content
- [*] Deviations from standard control chart legend

* Only if applicable

RESPONSE TO TEST RESULTS

Water Absorption

- Procedure for corrective action when test results differs from design mix value by more than 0.5 percent
- Statement that production shall be discontinued when tolerance is exceeded

Other Quality Control Tests

- Procedure for corrective action
 - Flexural Strength
 - Unit Weight
 - Air Content

CONCRETE HAULING

- Equipment and methods for delivery to paver
- Traffic pattern at plant vicinity and to the site of work
- * Temporary adjustments to traffic flow
- * Procedure for adding water to PCC and required mixing time when using transit mixers

CONCRETE PAVING

Paving Plan

- General sequence of construction
- Widths and methods of placement for all areas
- Planned date for paving to begin and to be completed on each phase of the contract

Cold Weather Paving (Below 35°F (2°C))

- Protection of subgrade
- Treatment of concrete components
- Protection of PCCP

Night Paving

- * Procedure for utilizing artificial lighting when natural light is insufficient
- * Number and type of units

Paving

- Technique of concrete placement throughout project (includes joining existing pavement, caps, headers, crossovers, approaches, or tapers)

Equipment

- List of paving equipment on each phase of project

Alignment and Profile

- Methods of controlling alignment and profile

Placement and Consolidation

- Methods of depositing plastic concrete from hauling equipment to grade
- Methods of spreading and consolidating

* Only if applicable

JOINTS

- Type of sealant and manufacturers recommendation of installation for each type of joint construction
- Preventive measures for flow of cementious material into previously placed and sawn joints

D-1 Contraction

- Procedure for identifying project conditions so that joints are continuous from edge of pavement to edge of pavement
- Method of installation
- Method of alignment
- Timing of sawing
- Method of protection

Longitudinal

- Method of construction to include reinforcing steel placement and timing of saw cuts

Transverse

- Method of construction to include details of type of header and reinforcing steel when paving operations are suspended

Longitudinal Construction

- Method of construction and proposed spacing if other than shown on plans

FINISHING, TEXTURING, AND CURING

- Methods for finishing, texturing, and curing PCCP
- List of equipment

DOCUMENTATION

- Statement that aggregate and mixture tests, and profile, smoothness, and depth of pavement measurements shall be maintained for a period of three years after completion of contract and that the location shall be readily accessible for review by the Department.

* Only if applicable