

State of Illinois
Department of Transportation
Division of Aeronautics

POLICY MEMORANDUM

August 1, 2011

Springfield, Illinois

Number 2011-1

TO: CONTRACTORS

SUBJECT: REQUIREMENTS FOR LABORATORY, TESTING, QUALITY CONTROL, AND PAVING OF POROUS FRICTION COURSE

I. SCOPE

The purpose of this policy memorandum is to define to the Contractor the requirements concerning the laboratory, testing, Quality Control, and paving of Porous Friction Course (PFC) mixtures. References are made to the most recent issue of the Standard Specifications for Construction of Airports and to American Society for Testing and Materials (ASTM) testing methods.

II. LABORATORY

The Contractor shall provide a laboratory located at the plant and approved by the Illinois Division of Aeronautics (IDA). The laboratory shall be of sufficient size and be furnished with the necessary equipment and supplies for adequately and safely performing the Contractor's Quality Control testing.

The effective working area of the laboratory shall be a minimum of 600 square feet with a ceiling height of not less than 7.5 feet. Lighting shall be adequate to illuminate all working areas. It shall be equipped with heating and air conditioning units to maintain a temperature of 70° F ± 5° F.

The laboratory shall have equipment that is in good working order and that meets the requirements set forth in the following ASTM test standards:

ASTM C 117	Test Method for Materials Finer than 75 µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 136	Sieve or Screen Analysis of Fine and Coarse Aggregate
ASTM C 566	Total Moisture Content of Aggregate by Drying
ASTM D 75	Sampling Aggregates
ASTM D 2172	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
IDOT	Ignition Method for Determining Asphalt Content
ASTM D 4125	Asphalt Content of Bituminous Mixtures by Nuclear Method
	The Asphalt Institute's <i>Mix Design Methods for Asphalt Concrete Manual No. 2 (MS-2)</i>

The laboratory and equipment furnished by the Contractor shall be properly calibrated and maintained. The Contractor shall maintain a record of calibration results at the laboratory. The Engineer may inspect measuring and testing devices at any time to confirm both calibration and condition. If the Resident Engineer determines that the equipment is not within the limits of dimensions or calibration described in the appropriate test method, he may stop production until corrective action is taken. If laboratory equipment becomes inoperable or insufficient to keep up with mix production testing, the Contractor shall cease mix production until adequate and/or sufficient equipment is provided.

III. MIX DESIGN SUBMITTAL

Based upon data and test results submitted by the Contractor, the Illinois Division of Aeronautics Engineer of Construction & Materials shall issue the final approved Job Mix Formula (JMF). The Contractor will be required to perform the initial sampling and laboratory testing of the aggregates and submit the representative aggregate gradations and material sources to IDA. (See BITUMINOUS WORKSHEET in Appendix A for recommended form for submittal)

- A. Material sources meeting the requirements of the contract shall be submitted in writing at or before the preconstruction conference (see Appendix A) in the following format:
1. To: Steven J. Long, P.E., Acting Chief Engineer
Attn: Michael F. Wilhelm, P.E., Engineer of Construction & Materials
Division of Aeronautics
One Langhorne Bond Drive
Springfield, Illinois 62707
 2. Producer name and location of each aggregate
 3. Producer # for each aggregate (producers are assigned this MISTIC number by IDOT Central Bureau of Materials)
 4. Material code for each aggregate
 5. Gradation and Quality designation for each aggregate (i.e. CA-11, etc.)
 6. Producer, producer #, and specific gravities of asphalt cement
 7. Performance Graded Binder SBS PG 70-28 shall be used for airports located north of U.S. Route 36 in Illinois. Airports located south of U.S. Route 36 in Illinois shall use either SBS PG 70-28 or SBS PG 70-22, at the Contractor's option
- B. The Contractor shall obtain representative samples of each aggregate. The individual obtaining samples shall have successfully completed the IDOT Aggregate Technician Course under the IDOT Division of Highways, QC/QA program.
- C. The Contractor shall split the aggregate samples down and run gradation tests. The results of the gradation tests, along with the most recent stockpile gradations, shall be reported to the IDA Engineer of Construction & Materials for engineering evaluation. New representative samples may be required at the direction of the IDA Engineer of Construction & Materials if the gradation results are deemed non-representative or in any way unacceptable.
- D. Based on the accepted gradation results, IDA will determine blend percentages in accordance with the contract specifications (see Section 402 and Appendix C) for each aggregate to be used in determining the Job Mix Formula, as well as asphalt content(s), depending on which design thickness is specified in the contract.

- E. All technicians who will be performing mix design testing and plant sampling/testing shall have successfully completed the IDOT Division of Highways HMA Concrete Level 1 Technician Course "HMA Concrete Testing". The Contractor may also provide a Gradation Technician who has successfully completed the Department's "Gradation Technician Course" to run gradation tests only under the supervision of a HMA Concrete Level 2 Technician.
- F. The IDA Engineer of Construction & Materials shall issue the final approved Mix Design with the JMF for the manufacture of PFC based upon the Contractor's submitted aggregate testing. The Contractor shall not be permitted to place any PFC for the project until this concurrence letter is issued to the Contractor by the IDA Engineer of Construction & Materials, and the mix passes all test section requirements, when a test section is specified.
- I. The above procedure, III. MIX DESIGN SUBMITTAL shall be repeated for each change in source or gradation of materials.

IV. MIX PRODUCTION TESTING

The Quality Control of the manufacture and placement of PFC is the responsibility of the Contractor. The Contractor shall perform or have performed the inspection and tests required to assure conformance to contract requirements. Quality Control includes the recognition of defects and their immediate correction. This may require increased testing, communication of test results to the plant or the job site, modification of operations, suspension of PFC mix production, rejection of material, or other actions as appropriate. The Resident Engineer shall be immediately notified of any failing tests and subsequent remedial action. Form AER M-14 shall be reported to the Engineer and Resident Engineer no later than the start of the next work day. In addition, AER M-9 and M-11 shall be given to the Resident Engineer daily. The Contractor shall provide a Quality Control (QC) Manager who will have overall responsibility and authority for Quality Control. This individual shall have successfully completed the IDOT Division of Highways HMA Concrete Level II Technician Course "HMA Concrete Proportioning and Mixture Evaluation." In addition to the QC Manager, the Contractor shall provide sufficient and qualified personnel to perform the required visual inspections, sampling, testing, and documentation in a timely manner. The following plant tests and documentation shall be required: [Note: A summary chart of testing can be found in Appendix B.]

- A. Minimum of one (1) complete hot bin or combined belt analysis per day of production or every 1,000 tons, whichever is more frequent.
- B. Minimum one (1) stockpile gradation for each aggregate and/or mineral filler per week.
- C. A certification from the quarry for the total quantity of aggregate shipped to the plant listing the source, gradation type, tonnage, and quality designation of aggregate shipped.
- D. Original asphalt shipping tickets listing the source and type of asphalt shipped.
- E. One mix sample per 1,000 tons of mix. The sample shall be split in half. One half shall be reserved for testing by the Engineer. The other half shall be split & tested by the Contractor for extraction and gradation in accordance with the appropriate ASTM standard. [See Appendix B.]
 - 1. In place of the extraction test, the Contractor may provide the asphalt content by a calibrated ignition oven test using the IDOT Division of Highways' latest procedure. The correction (calibration) factor for aggregate type shall be clearly indicated in the reported test results.

From these tests, the Contractor shall interpret the test data and make necessary adjustments to the production process in order to comply with the approved JMF.

V. QUALITY CONTROL

A. Control Limits

Target values shall be determined from the approved JMF. The target values shall be plotted on the control charts within the following control limits:

<u>Parameter</u>	<u>Control Limits</u>	
	<u>Individual Test</u>	<u>Moving Avg. of 4</u>
% Passing		
No. 4 or larger	± 7 %	± 4 %
No. 8 and No. 30	± 4 %	± 2.5 %
No. 200 *	± 1.0 % *	± 1.0 % *
Asphalt Content	± 0.4 %	± 0.2 %

* No. 200 material percents shall be based on washed samples. Dry sieve gradations (-200) shall be adjusted based on anticipated degradation in the mixing process.

B. Control Charts

Standardized control charts shall be maintained by the Contractor at the field laboratory. The control charts shall be displayed and be accessible at the field laboratory at all times for review by the Engineer. The individual required test results obtained by the Contractor shall be recorded on the control chart immediately upon completion of a test, but no later than 24 hours after sampling. Only the required plant tests and resamples shall be recorded on the control chart. Any additional testing of check samples may be used for controlling the Contractor's processes, but shall be documented in the plant diary.

The results of assurance tests performed by the Resident Engineer will be posted as soon as available.

The following parameters shall be recorded on control charts:

1. Combined Gradation of Hot-Bin or Combined Belt Aggregate Samples (% Passing No. 4., No. 8, No. 30, and No. 200 Sieves)
2. Asphalt Content

C. Corrective Action for Required Plant Tests

Control Limits for each required parameter, both individual tests and the average of four tests, shall be exhibited on control charts. Test results shall be posted within the time limits previously outlined.

1. Individual Test Result. When an individual test result exceeds its control limit, the Contractor shall immediately resample and retest. If at the end of the day no material remains from which to resample, the first sample taken the following day shall serve as the resample as well as the first sample of the day. This result shall be recorded as a retest. If the retest passes, the Contractor may continue the required plant test frequency. Additional check samples should be taken to verify mix compliance.

2. Asphalt Content. If the retest for asphalt content exceeds control limits, mix production shall cease and immediate corrective action shall be instituted by the Contractor. After corrective action, mix production shall be restarted, the mix production shall be stabilized, and the Contractor shall immediately resample and retest. Mix production may continue when approved by the Engineer. The corrective action shall be documented.

Inability to control mix production is cause for the Engineer to stop the operation until the Contractor completes the investigation identifying the problems causing failing test results.

3. Combined Aggregate/Hot-Bin. For combined aggregate/hot-bin retest failures, immediate corrective action shall be instituted by the Contractor. After corrective action, the Contractor shall immediately resample and retest. The corrective action shall be documented.

- a. Moving Average. When the moving average values trend toward the moving average control limits, the Contractor shall take corrective action and increase the sampling and testing frequency. The corrective action shall be documented.

The Contractor shall notify the Engineer whenever the moving average values exceed the moving average control limits. If two consecutive moving average values fall outside the moving average control limits, the Contractor shall cease operations. Corrective action shall be immediately instituted by the Contractor. Operations shall not be reinstated without the approval of the Engineer. Failure to cease operations shall subject all subsequently produced material to be considered unacceptable.

- b. Mix Production Control. If the Contractor is not controlling the production process and is making no effort to take corrective action, the operation shall stop.

D. Field QC for Porous Friction Course

Placement of the PFC requires adherence to the weather and seasonal limits set forth in Section 402-4.1, which must be evaluated by the R.E. each day prior to placement. No material shall be placed until the tack coat has set for the cure times listed in Table 1 of Section 603 in the Standard Specifications

Temperature of the delivered material must be constantly monitored, as the recommended temperature range of 275-300 degrees F may need to be adjusted based upon visual results of the placed material. The Contractor is responsible for the final outcome of the mix. Therefore, the temperature may need to be adjusted in order to yield an acceptable mat. Any temperature adjustments must be reported to the R.E. for concurrence before action is taken.

VI. TEST SECTION ACCEPTANCE (**Note: Applies only when specified.**)

- A. The purpose of the test section is to determine if the mix is visually acceptable and can be rolled properly without any streaking of liquid AC, and shall be done in accordance with Section 402-3.3 of the Standard Specifications.

Acceptance of Test Section. The Contractor may proceed with paving the day of the test section provided:

- a. All extraction/ignition oven test results from mix produced for the test section must be within the tolerances required by specification.
- b. The mix shall not exhibit, at any time during placement, spots or streaks of liquid AC. All areas where this occurs shall be corrected in accordance with Section 402-4.10. Skin patching and hand-working of the PFC mixture will not be allowed.
- c. Verbal approval by IDA representatives.

Steven J. Long, P.E.
Acting Chief Engineer

APPENDIX A

BITUMINOUS WORKSHEET

Airport: _____ Project No.: _____ AIP No.: _____

Mix Design #: _____ Material Code: _____ Producer: _____
Prod. #: _____

AGGREGATE

Mat'l. Code: _____

Producer #: _____

Prod. Name _____

Location: _____

Percent Passing

Sieve Size

1 inch _____

3/4 inch _____

1/2 inch _____

3/8 inch _____

No. 4 _____

No. 8 _____

No. 16 _____

No. 30 _____

No. 50 _____

No. 100 _____

No. 200 _____

Washed (y/n) _____

O.D. Gravity _____

App. Gravity _____

Absorption _____

Asphalt Gravity _____

Asphalt Source _____

Asphalt Producer No. _____

Q.C. Manager Name: _____ Phone number: _____

Laboratory Location: _____ Fax Number: _____

Remarks: _____

APPENDIX B

QUALITY CONTROL TESTING (PLANT)

PARAMETER	FREQUENCY	SAMPLE SIZE	TEST METHOD	REPORT FORM
Aggregate Gradations: Hot bins for batch and continuous plants--- Individual cold-feeds or combined belt-feeds for drier drum plants.	Minimum 1 per day of production and at least 1 per 1000 tons.	CA07/11: 5000 gm CA13: 2000 gm CA16: 1500 gm Fine agg: 500 gm 1 gallon asphalt cement	ASTM C 136	AER M-9
Aggregate gradations: Stockpiles	Minimum 1 per aggregate per week per stockpile.	CA07/11: 5000 gm CA13: 2000 gm CA16: 1500 gm Fine agg: 500 gm *Note: The above test sample sizes are to be obtained from splitting down a larger sample from the stockpiles.	ASTM C 136	AER M-9
Extraction	Minimum 1 per 1000 tons	1000 gm (surface) 1500 gm (base)	ASTM D 2172	AER M-11 and AERM-14
Ignition Oven Test	Minimum 1 per 1000 tons	1500 gm		AER M-14
Nuclear Asphalt Gauge	Minimum 1 per 1000 tons	1000-1100 gm	ASTM D 2145	AER M-14

APPENDIX C

POROUS FRICTION COURSE BLEND PERCENTAGES

Percentage by Weight Passing Sieves Job Mix Formula (JMF)		
Sieve Size	Gradations	
	$\frac{3}{4}$ " Maximum	$\frac{1}{2}$ " Maximum
3/4 in.	100	---
1/2 in.	70 - 100	100
3/8 in.	45 - 75	80 - 100
No. 4	20 - 40	20 - 40
No. 8	12 - 20	12 - 20
No. 16	---	---
No. 30	8 - 14	8 - 14
No. 100	---	---
No. 200	3 - 5	3 - 5
Compacted Thickness:	1 inch	3/4"
Bitumen %:	6.7	6.7