

State of Illinois
Department of Transportation
Division of Highways
Bureau of Materials and Physical Research
Springfield

POLICY MEMORANDUM

Revised: January 1,2008 This Policy Memorandum supersedes number 07-27 dated June 15, 2007	4-08.0
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TO: REGIONAL ENGINEERS AND HIGHWAY BUREAU CHIEFS

SUBJECT: APPROVAL OF HOT-MIX ASPHALT PLANTS AND EQUIPMENT

1 SCOPE

This policy governs the approval of hot-mix asphalt (HMA) plants for both Prequalification and production purposes.

2 REFERENCE DOCUMENTS

- 2.1 *Standard Specifications for Road and Bridge Construction*, edition current at the time of the advertisement for bids, Illinois Department of Transportation.
- 2.2 *Supplemental Specifications and Recurring Special Provisions*, edition current at the time of the advertisement for bids, Illinois Department of Transportation.
- 2.3 Prequalification Rules (Manual), Illinois Department of Transportation.
- 2.4 "The Fundamentals of the Operation and Maintenance of the Exhaust Gas System in a Hot Mix Asphalt Facility", IS-52, National Asphalt Pavement Association.
- 2.5 "The Uniform Burner Rating Method for Aggregate Dryers", IS-76, National Asphalt Pavement Association.
- 2.6 Illinois-Modified AASHTO T 11 (Washed Gradations)
- 2.7 Illinois-Modified AASHTO T 2 (Aggregate Sampling)
- 2.8 Illinois-Modified AASHTO T 27 (Sieve Analysis)
- 2.9 Illinois-Modified AASHTO T 30 (Sieve Analysis of Extracted Aggregate)
- 2.10 Illinois-Modified AASHTO T 164 (Extraction Method)
- 2.11 Illinois-Modified AASHTO T 308 (Ignition Oven Method)

3 DEFINITIONS

- 3.1 BUREAU - The Department's Bureau of Materials and Physical Research.
- 3.2 High ESAL and Low ESAL APPROVAL - A field test administered by the Bureau to determine the capability of an HMA plant to produce mix within the Department's specifications. The test is a prerequisite to production of High ESAL or Low ESAL mixtures for the Department. It may be conducted concurrent with the start of a contract. It is not a prerequisite for initial Prequalification. (Section 7 of this Policy describes the procedure in detail.)
- 3.3 DEPARTMENT - Illinois Department of Transportation.
- 3.4 DISTRICT - One of nine of the Department's highway district offices located throughout the state of Illinois.
- 3.5 EQUIPMENT FACTOR - A Prequalification factor that is a measure of the annual dollar value of production capacity for selected equipment and plant facilities. For HMA plants, the Work Category and Production Rating are used to determine the Equipment Factor.
- 3.6 HMA PLANT - A plant intended to produce High ESAL, Low ESAL or All Other mixtures for the Department. For the purposes of Prequalification, an HMA plant includes equipment specified in the Department's Prequalification Rules and the *Standard Specifications for Road and Bridge Construction*.
- 3.7 POSITIVE DUST CONTROL EQUIPMENT (PDCE) - PDCE shall consist of a system that is an integral part of the production process. The system shall accurately weigh all of the secondary dust collected in the baghouse, transfer the material to a storage silo, accurately weigh the required amount of fines to be returned from the storage silo, and transfer them back to the mixture. The positive dust control weighing devices shall have an accuracy of 0.5 percent of the actual weight of material. The system shall be capable of automatically monitoring the dust collection process and adjusting the amount of asphalt cement added to the mixture. The entire system shall be interlocked with the plant controls to respond to production rate changes, start up, and shut down situations. The weighing process shall be displayed and recorded in 0.1 units. The PDCE shall be capable of accurately wasting dust without having any adverse effects on the mixture.
- 3.8 PREQUALIFICATION APPROVAL STATUS - A rating process established by the Department which requires all prospective bidders to obtain a Certificate of Eligibility prior to being considered for issuance of bidding proposal forms and plans for any contract awarded by the Department, as well as contracts awarded by local agencies requiring approval of award by the Department.

- 3.9 PREQUALIFICATION SECTION – The section within the Bureau of Construction of the Department responsible for determining responsibility, financial ratings, work ratings and the issuance of bidding proposals.
- 3.10 PRODUCTION RATING - A nominal production rating for an HMA plant. It is calculated by the Bureau and is one factor used to determine the Prequalification Equipment Factor. It is also the maximum field production rate approved for Department work. (Section 6 of this Policy describes this approval in detail.)
- 3.11 WORK RATING - A dollar value of work of a particular category of construction that an applicant can perform with his/her organization and equipment in one construction season.
- 3.12 BITUMINOUS PLANT WORK CATEGORIES – A Prequalification designation determined by the Bureau for an HMA plant based on equipment specification compliance and/or HMA produced.

4 GENERAL

4.1 PREQUALIFICATION

- 4.1.1 Prior to Prequalification, the Contractor shall complete a plant survey on forms furnished by the Department. The Contractor shall submit the forms to the District in which the plant is located, or the nearest District if the plant is located out-of-state. The District shall forward the submittal to the Bureau.
- 4.1.2 During the Prequalification process, each HMA plant will be evaluated by the Bureau. The Bureau will determine the Prequalification Work Category and Production Rating used in determining the Contractor's Work Rating.
- 4.1.3 The Bureau will evaluate the submittal and conduct investigations as necessary.
- 4.1.4 The Bureau will provide the Work Category to the Prequalification Section. The Work Category will be used by the Prequalification Section to establish a Work Rating for the Contractor according to the Prequalification Rules.
- 4.1.5 An HMA plant will be evaluated for a single owner only. The pre-qualification rating for a leased plant will apply to a single Contractor only.

4.2 PLANT APPROVAL FOR HIGH ESAL AND LOW ESAL MIXTURES

HMA plants intending to produce High ESAL and/or Low ESAL for the Department shall be evaluated by the Department for High ESAL and Low ESAL Approval as specified herein.

4.3 RE-APPROVAL / PLANT MODIFICATIONS

4.3.1 All plants will be re-surveyed for consideration for continued approval every 5 years. The Department will notify the Contractor to resubmit the survey forms.

4.3.2 Modifications may require a reevaluation of the plant. This includes plant relocation or the modification or addition of equipment. The Contractor shall notify the District of such changes.

4.3.3 The Department may waive the High ESAL and Low ESAL evaluation procedure if the Bureau recommends that changes in ownership or modifications made under Article 4.3.2 do not materially affect the production capability of the HMA plant.

4.4 REVOCATION OF PLANT APPROVAL

If the Department determines the HMA plant is unable to consistently produce HMA within the specification tolerances as defined in the contract, the Approval Status may be revoked by the Bureau which would require the Contractor to repeat the plant approval process. The Bureau will notify the Prequalification Section of any and all plant approval revocations.

4.5 REINSTATEMENT PROCESS

If the HMA plant approval is revoked, the Contractor shall provide the Bureau a written plan of corrective action. Once the Bureau reviews and finds the plan acceptable, the plant approval process may begin. If the Bureau requires the installation of the Positive Dust Control Equipment (PDCE), the installation shall comply with section 3.7 above. If PDCE or any other plant modifications are required, the equipment shall be installed and/or modifications made prior to the production of any HMA for the Department. With approval of the Bureau, the installation may be performed prior to the start of the next construction season. The Bureau may stipulate operational conditions or restrictions on the plant until all required modifications are completed.

5 PREQUALIFICATION WORK CATEGORIES

The physical status of the plant determines the Equipment Factor and Work Rating associated with the plant. The Bureau will classify each HMA plant in one of the work categories below. Under each category, the plant shall include the equipment specified in the referenced documents.

- 5.1 Bituminous Plant Mix – Applicable to a new or used HMA plant that meets the equipment requirements to produce High ESAL and Low ESAL mixtures as stated in the *Standard Specifications for Road and Bridge Construction*. This category is permitted to produce all types of HMA. HMA plants in this category must go through and receive High ESAL and Low ESAL approval, as specified herein, to produce High ESAL and Low ESAL mixtures as described in Section 7.
- 5.2 Bituminous Aggregate Mixture – Applicable to a new or used HMA plant that meets the equipment requirements to produce All Other mixtures as stated in the *Standard Specifications for Road and Bridge Construction*. This category will be limited to only the production of stabilized sub – base HMA and HMA shoulder.

6 PRODUCTION RATES

All HMA plants will be evaluated by the Bureau and assigned a nominal Production Rating. Production Ratings will be based on this policy and the industry standards, as applicable, in the referenced NAPA publications (NAPA Procedure). Production Ratings will be given in tons (metric tons) of HMA mixture per hour.

- 6.1 ASSUMED CRITERIA - Ratings will be based on the conventions described in the referenced NAPA publications. Variables included in the NAPA algorithm are assigned the following values:
 - 6.1.1 Assumed gas flow velocity of 1,000 feet (300 meters) per minute for all dryers.
 - 6.1.2 Radius is calculated at the exhaust end chamber of the dryer.
 - 6.1.3 Assume 147 ft³ (4.2m³) per minute of air required per ton (metric ton) of aggregate.
 - 6.1.4 HMA mixture is assumed to contain 5% asphalt binder.
 - 6.1.5 Combined aggregate contains 5% moisture.

6.2 EXCEPTIONS TO NAPA PROCEDURE:

6.2.1 The Contractor may request a temporary increase in Production Rating if the incoming aggregate contains less than 5% moisture. The Contractor shall (1) provide moisture analysis of the aggregate stockpiles, (2) demonstrate to the Engineer that increased production does not affect the quality of the HMA mix, and (3) provide testing requested by the Engineer during the analysis and production.

6.2.2 The Contractor may request a permanent modification to the Production Rating if the design of the plant is not consistent with the schematics and standards contained in the NAPA Procedure. The Contractor shall provide the Manufacturer's certification and all calculations supporting the exception. For plants modified by the Contractor, the Contractor shall provide engineering justification for any request.

6.2.3 For all exceptions, the responsibility for supporting data rests with the Contractor. The Department may reject requests that, in the sole opinion of the Engineer, are not adequately supported.

6.3 OTHER LIMITING FACTORS - The NAPA Procedure may not be applicable in all cases. The plant may include equipment that restricts production capacity below that calculated by the NAPA Procedure. In these instances, the Bureau will calculate the Production Rating based on these restrictions. The Department will provide the Contractor with written notification of any such determination, along with the calculations used to determine the Production Rating. Examples follow:

6.3.1 Sand Screens - Criteria

6.3.1.1 Maximum production rate = $R = 1.5$ tons per hour per ft^2 of 1/8-inch screen (15 metric tons per hour per m^2 of 3.2mm screen).

6.3.1.2 Sand is 1/3 of aggregate blend.

6.3.1.3 Total aggregate rate = sand screen area x R x 3

6.3.2 Pugmill - Criteria

6.3.2.1 Capacity based on charts supplied by manufacturer, or

6.3.2.2 Alternate formula: Capacity = Net volume below centerline of shaft x $1.15 \times 100 \text{ lbs/ft}^3$ ($1,600 \text{ kg/m}^3$).

6.3.2.3 Conversion factor from lbs / batch to tons per hour [TPH] = 0.0325 (kg / batch to metric tons per hour = 0.065). This equation assumes 65 batches per hour.

6.3.3 Aggregate Scale/Hopper Capacities

6.3.4 Asphalt Cement Scale/Bucket Capacities

6.3.5 The Contractor may request a recalculation of the Production Rating when plant modifications change the conditions on which the Limiting Factor was calculated.

7 HIGH ESAL AND LOW ESAL APPROVAL

The following will be used to evaluate the consistency of mixtures produced by HMA plants seeking approval to produce High ESAL and Low ESAL mixtures. This includes the sampling, testing, and acceptance requirements for an accelerated gradation and asphalt binder content testing program. It allows for rapid and early determination of reliable target values for gradation and asphalt content.

- 7.1 The test shall be performed on a High ESAL (Superpave IL-25.0 or IL-19.0) binder mix prior to use of the plant for binder production. It may be conducted concurrent with the start of a contract. It may be carried over into an additional contract only with the approval of the Bureau.
- 7.2 The Contractor shall proportion the binder mixture to meet the job mix formula (JMF). The Engineer may consent to the use of a High ESAL surface mixture for the test if binder is not included in the initial project. If the evaluation is performed on a surface mixture, a restriction of "Surface Mixture Only" approval will apply. An additional evaluation on a binder mixture will be required in order for full High ESAL and Low ESAL Approval to be granted.
- 7.3 The Bureau will designate the plant as either Type 1 or Type 2 prior to the start of the High ESAL and Low ESAL Approval process.
 - 7.3.1 Type 1 Plants are defined as those which have a prequalification rating of 250 tons (180 metric tons) per hour or greater of mixture.
 - 7.3.2 Type 2 Plants are defined as those which have a prequalification rating of less than 250 tons (180 metric tons) per hour of mixture.
- 7.4 PROCEDURE - Test production specifications are as follows:
 - 7.4.1 Lot Sizes
 - 7.4.1.1 Plant Type 1. The quantity shall be 5,000 tons (4,500 metric tons) of approved JMF mixture. The evaluation will include 5 lots of approximately 1,000 tons (900 metric tons) each. Each of the 5 lots will be further divided into 5 sublots (for a total of 25 tests).

7.4.1.2 Plant Type 2. The quantity shall be 3,000 tons (4,500 metric tons) of approved JMF mixture. The evaluation will include 5 lots of approximately 600 tons (545 metric tons) each. Each of the 5 lots will be further divided into 5 sublots (for a total of 25 tests).

7.4.2 The procedure will be run over a period of not less than 3 production days.

7.4.3 No more than 2 lots in any day may be included in the evaluation (to allow for lab testing between days).

7.4.4 One lot may be produced before this evaluation process to determine preliminary target values. With approval of the Engineer, this lot may be used to establish preliminary target values and rolling patterns per the specified start-up procedures.

7.4.5 The Contractor will not be required to cease production between lots. Mixture produced between lots will be evaluated according to the contract specifications.

7.5 SAMPLING - Sampling shall follow the referenced methods:

7.5.1 Aggregate - The Contractor shall take hot-bin or belt samples, with back up splits reserved for the Department's use, for each subplot.

7.5.2 HMA Mixture - The Contractor shall take random samples, with back up splits reserved for the Department's use, from each subplot (25 total) from randomly selected trucks. Approximate sample size shall be $\pm 2,000\text{g}$ for binder mixtures and $\pm 1,000\text{g}$ for surface mixtures.

7.6 TESTING

7.6.1 Following the referenced test methods, the Contractor shall perform gradation and asphalt binder content analysis for each subplot. Testing will be performed on each hot-mix asphalt sample. Asphalt binder content (AC) control limits and limits on control sieves will be as follows:

PARAMETER	CONTROL LIMIT (INDIVIDUAL TEST)	CONTROL LIMIT (MOVING AVERAGE OF 4)
% Passing		
12.5 mm (1/2 inch)	± 6%	± 4%
4.75 mm (No. 4)	± 5%	± 4%
2.36 mm (No. 8)	± 5%	± 3%
600 µm (No. 30)	± 4%	± 2.5%
75 µm (No. 200)	± 1.5%	± 1.0%
Asphalt Binder Content	± 0.3%	± 0.2%

7.6.2 Results for each test will be evaluated for conformance with the specified control limits. Note: "Moving average" is the average of the results of the current test and the previous 3 individual tests (4 total).

The Department will test a minimum of one sample per lot for verification purposes.

7.7 ADJUSTMENTS

On the basis of visual analysis and test results, the Contractor may make plant adjustments to improve consistency of the mix. The Engineer will cooperate and assist in this effort when requested.

7.8 ACCEPTANCE

The Bureau may approve the plant for normal production when the evaluation shows that the plant can produce mixture that consistently complies with the project specifications. This will generally be defined as when the moving average of each test (all sieves and asphalt binder content) for a single lot remains within the specified control limits. Each successive lot should also show improving and consistent results. However, the individual test results will also be evaluated for consistency. The final two lots will have no individual test results outside the individual control limits.

7.9 NON-COMPLIANCE

7.9.1 In the case of non-compliance, the Bureau may authorize the production of one or more additional lots for testing. Before any such additional production, the Bureau will require the Contractor to submit a plan of corrective action for approval. The Contractor shall demonstrate contract compliance of all material produced.

7.9.2 The Contractor shall be responsible for performing all additional testing beyond the 25 tests included in this procedure, and providing back up

samples for use by the Department. No additional HMA mixture shall be produced for Department contracts until all testing is completed.

7.9.3 The Engineer may direct or carry out any other corrective action available through the QC/QA Special Provision or the Standard Specifications or other contract documents.

7.9.4 Repeating Plant Approval Process:

7.9.4.1 A Contractor failing to produce consistent mixture as defined herein may only continue producing mix if the plant approval process is repeated. A Contractor may repeat the approval process within the same contract with the approval of the Engineer.

7.9.4.2 In order to repeat the approval process on a different contract, the Contractor shall provide a written plan of corrective action to the Bureau. Permission to repeat the plant approval process will only be granted if the Bureau finds the plan of corrective action to be acceptable.

7.9.5 Plant Deficiencies - If the Bureau determines that the plant, as configured, is not capable of meeting the conditions for plant approval, the installation of Positive Dust Control Equipment or other modifications may be required. Approval and scheduling shall proceed per Article 4.5 above.

7.10 COMPENSATION

The Contractor shall be responsible for all costs, including additional laboratory testing due to non-compliance. These costs will be considered as included in the contract unit price for the HMA item involved.



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