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POLICY AND PROCEDURE DIRECTIVE

TO: ALL MANUAL HOLDERS	PPD NO. 4
SUBJECT: ASPHALTIC CONCRETE MIX DESIGN PROPOSALS AND SUBMITTALS	EFFECTIVE DATE: February 27, 2009

1. GENERAL

1.1 This Policy and Procedure Directive supersedes P.P.D. No. 96-6.

1.2 The information provided herein is given to assist those involved in the preparation and submittal of asphaltic concrete mix design proposals in accordance with the requirements of the Specifications.

1.3 The use of previously used mix designs is addressed in Section 6 of this Policy and Procedure Directive.

2. MATERIALS GROUP RESPONSIBILITIES

2.1 The Regional Materials Engineer, the Materials Group Bituminous Engineer, or the Materials Group Pavement Materials Testing Engineer will be responsible for the approval/disapproval of all asphaltic concrete mix designs.

3. REQUIREMENTS FOR MIX DESIGN LABORATORIES

3.1 To ensure that testing laboratories are capable of performing all asphaltic concrete mix design testing in conformance with the appropriate test procedures, laboratories wishing to perform asphaltic concrete mix design testing must have had an equipment and procedural inspection by Department personnel to demonstrate mix design testing. Any deficiencies found shall be corrected before mix designs will be accepted. Arrangements for laboratory inspections are made by contacting the Materials Group Quality Assurance Engineer.

3.2 Mix design laboratories must satisfy the requirements of the Arizona Department of Transportation "System for the Evaluation of Testing Laboratories".

4. REQUIREMENTS FOR MIX DESIGN ENGINEER

4.1 The Specifications require that asphaltic concrete mix designs be prepared under the direct supervision of a professional engineer, registered in the state of Arizona, experienced in the development of asphaltic concrete mix designs and mix design testing. The following items should help clarify the Department's policy relative to this subject.

1) Mix designs shall be sealed, signed, and dated by the engineer responsible for the mix design.

2) The policy does not preclude the use of consultant engineers, provided the consulting engineer performs direct supervision of the testing and mix design development, has evaluated the test equipment and procedures used in the laboratory and found them in compliance with all test method requirements, and is thoroughly knowledgeable in asphaltic concrete mix design preparation.

3) The use of the term "direct supervision" is interpreted to include the requirement that the mix design engineer be physically present on a routine basis while the mix design testing is being done and is in responsible charge of that work.

4) The preparation of mix designs by or under the supervision of a professional engineer who is not experienced in the development of asphaltic concrete mix designs and mix design testing is clearly prohibited. While experience by the mix design engineer in preparation of asphaltic concrete mix designs in accordance with Arizona Test Methods is preferred, experience in mix design preparation under comparable procedures may be substituted if the mix design engineer demonstrates that he/she is fully aware of the Arizona procedures and is prepared to conform to them.

5) Submission of a mix design which does not comply with test method requirements will be considered cause for rejection of that mix design. Should such a failure be of a significant or reoccurring nature, the Department may refuse to accept mix design proposals from that mix design engineer.

6) All laboratories that wish to submit asphaltic concrete mix designs must submit information to the Materials Group Bituminous Engineer, which indicates that the requirements described above have been met. This information must be provided prior to submitting asphaltic concrete mix designs. Information provided should include evidence of registration and experience in asphaltic concrete mix designs and mix design testing. Also included should be information which outlines how the requirement for providing direct supervision is to be satisfied.

5. REQUIRED MIX DESIGN SUMMARY ITEMS

5.1 Asphaltic concrete mix designs shall be submitted in a summary format that clearly indicates the required mix design information shown below.

- 1) Project Number and "TRACS" Number.
- 2) Prime Contractor.
- 3) Type of Mix Design. If the same mix design is developed to satisfy the requirements for more than one type of mix, for example 1/2" AC and 3/4" AC, the mix design shall clearly state this, and also show the specifications governing each individual type of mix.
- 4) Name and address of testing laboratory which developed the mix design.
- 5) Name, signature, and seal of the professional engineer who is responsible for the mix design. Mix designs shall be sealed, signed, and dated in accordance with the requirements of the Arizona State Board of Technical Registration. The date the mix design is signed by the engineer, as shown on his registration seal, will be the mix design date. Revised mix designs shall be submitted containing all information for the design. Revised mix designs shall be identified as such, and shall be sealed, signed, and dated by the responsible engineer.
- 6) Specific location(s) of original source(s) of mineral aggregate.
- 7) The gradation of the mineral aggregate in each stockpile.
- 8) Mix design mineral aggregate composite percentages and gradation, along with the appropriate mix design grading bands. The mix design composite gradation of the mineral aggregate shall be a washed gradation in accordance with the requirements of Arizona Test Method 201.
- 9) Source, type, percentage, and specific gravity of mineral admixture. The mix design shall be developed by, and so state, laboratory mixing procedures which simulate the method of adding mineral admixture which will be used in the production of the asphaltic concrete.
- 10) The percent of mineral admixture, by specification, is by weight of the mineral aggregate. The composite gradation of the combined mineral aggregate and mineral admixture, determined in accordance with Arizona Test Method 815, and the appropriate mix design grading bands are to be shown in the mix design proposal.
- 11) Supplier, refinery, grade (including any modifiers), and specific gravity of asphalt cement. For asphalt-rubber mix designs: the asphalt-rubber design, including asphalt

cement type and source; crumb rubber type, gradation, and source; percent crumb rubber by weight of asphalt cement; asphalt cement binder properties; asphalt-rubber binder properties; blending procedures; and reaction time.

12) When required, viscosity-temperature curve along with the laboratory mixing and compaction temperature ranges. For PG asphalt binders that have a maximum laboratory mixing temperature exceeding 325 °F or a maximum laboratory compaction temperature exceeding 300 °F, the laboratory mixing and compaction temperature ranges shall be specified in writing by the asphalt binder supplier. The actual laboratory mixing and compaction temperatures used shall be reported on the mix design.

13) Abrasion for each source of mineral aggregate used.

14) Sand equivalent of the combined mineral aggregate.

15) Fractured coarse aggregate particles of the mineral aggregate.

16) When required, uncompacted void content of the mineral aggregate.

17) When required, percent carbonates in aggregate.

18) When required, flat and elongated particles of the mineral aggregate.

19) Coarse and fine aggregate specific gravities, coarse and fine aggregate water absorption, combined coarse and fine aggregate specific gravities, and combined water absorption. In some cases, the calculation of combined water absorption has been done incorrectly. The proper method of calculating the combined water absorption is given in Arizona Test Method 251.

20) Asphalt (or asphalt-rubber) absorption, as required.

21) Recommended mix design asphalt content.

22) The following mix design characteristics at the recommended asphalt content shall be given: percent air voids; percent voids in mineral aggregate (VMA); bulk density; Marshall stability and flow (when applicable); when required, Immersion Compression results (wet strength, dry strength, and index of retained strength); and the calculated maximum density of bituminous mixture. When determining the maximum theoretical specific gravity of the bituminous mixture (Arizona Test Method 806), it shall be assured that the requirement for no more than 18 grams difference between the total weight of aggregate, mineral admixture, and binder before mixing and the total "weight of the samples in air" is complied with.

23) When required, the dust to binder ratio, calculated by dividing the mix design composite gradation target for the No. 200 sieve (including mineral admixture) by the effective asphalt content.

24) Any stipulations upon which the use of the mix design is contingent. (For example, minimum or maximum percentage of special materials such as washed or imported aggregates.)

5.2 The mix design shall be submitted to the Engineer under a cover letter signed by an authorized representative of the contractor.

6. PREVIOUSLY USED MIX DESIGNS

6.1 The contractor may propose the use of a mix design that has been developed for a previous project. The proposed mix design shall meet the requirements of the current project. The contractor shall provide evidence that the type and source of bituminous material, the type of mineral admixture, and the source and methods of producing mineral aggregate have not changed since the formulation of the previous mix design. The contractor shall also provide current test results for all specified characteristics of the mineral aggregate proposed for use. The Engineer will determine if the previously used mix design is suitable for the intended use and if the previous use of the mix design was satisfactory to the Department. The Engineer will either approve or disapprove the proposed mix design. Should the Engineer disapprove the use of the previously used mix design, the contractor shall prepare and submit a new mix design proposal in accordance with the requirements of these specifications.

6.2 A previously used mix design older than two years from the date it was formulated, sealed, signed, and dated shall not be allowed for use. Once approved for use on a project, a mix design may be used for the duration of the project.

7. ADDITIONAL MIX DESIGN REQUIREMENTS

7.1 In addition to the mix design summary, worksheets showing laboratory data and test results are also to be included in the mix design. The loading used in the preparation of immersion compression specimens must be reported as part of the test data.

7.2 If any tests shown in the mix design were performed by another testing laboratory, the mix design must clearly state the tests, where they were performed, and the mix design engineer under whose direction the testing was accomplished. The laboratory performing this mix design testing and the mix design engineer must meet the requirements of this Policy and Procedure Directive.

7.3 For asphaltic concrete produced under ADOT Specifications 406, 409, 416, or 417, representative samples of the mineral aggregate, mineral admixture, and asphalt cement

used in the mix design are submitted to the Engineer for calibration of the ignition furnace, and the determination of sand equivalent and fractured coarse aggregate particles. If required, the uncompacted void content shall also be determined.

7.4 For asphaltic concrete produced under ADOT Specification 415, representative samples of the mineral aggregate, mineral admixture, and asphalt-rubber used in the mix design are submitted to the Engineer for calibration of the ignition furnace, and the determination of sand equivalent, fractured coarse aggregate particles, and uncompacted void content.

7.5 Mix design proposals for asphaltic concrete produced under ADOT Specifications 406, 409, 415, 416, or 417 are submitted to the Engineer. The Engineer shall send a copy of the mix design to the Regional Materials Engineer. The Regional Materials Engineer, the Materials Group Bituminous Engineer, or the Materials Group Pavement Materials Testing Engineer shall review the mix design proposal for completeness and accuracy, and shall approve or disapprove the mix design proposal. The mix design must be approved by the Regional Materials Engineer, the Materials Group Bituminous Engineer, or the Materials Group Pavement Materials Testing Engineer prior to the start of asphaltic concrete production.



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