



# Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

April 15, 2010

SUBJECT: FAP Route 342/FAI 290 (IL 53/I-290)  
Section (531-3.1, 0305-302K) RS-5  
Cook County  
Contract No. 60I38  
Item No. 309, April 23, 2010 Letting  
Addendum A

## NOTICE TO PROSPECTIVE BIDDERS:

Attached is an addendum to the plans or proposal. This addendum involves revised and/or added material.

1. Revised pages 30 - 38 of the special provisions, replacing the Stone Matrix Asphalt special provision.

Prime contractors must utilize the enclosed material when preparing their bid and must include any Schedule of Prices changes in their bidding proposal.

Bidders using computer-generated bids are cautioned to reflect any and all Schedule of Prices changes, if involved, into their computer programs.

Very truly yours,

Scott E. Stitt, P.E.  
Acting Engineer of Design and Environment

A handwritten signature in cursive script, reading "Ted B. Walschleger P.E." with a small "P.E." to the right.

By: Ted B. Walschleger, P. E.  
Engineer of Project Management

cc: Diane O'Keefe, Region 1, District 1; Mike Renner; R. E. Anderson;  
Estimates

TB W:MS:jc

**1031.08 RAP in Aggregate Surface Course and Aggregate Shoulders.** The use of RAP in aggregate surface course and aggregate shoulders shall be as follows.

- (a) Stockpiles and Testing. RAP stockpiles may be any of those listed in Article 1031.02, except "Other". The testing requirements of Article 1031.03 shall not apply.
- (b) Gradation. One hundred percent of the RAP material shall pass the 1 1/2 in. (37.5 mm) sieve. The RAP material shall be reasonably well graded from coarse to fine. RAP material that is gap-graded or single sized will not be accepted."

**STONE MATRIX ASPHALT (SMA)(DIST 1)**

Effective: April 1, 1997

Revised: April 1 2010

Description. This Special Provision establishes and describes the responsibilities of the Contractor in producing and constructing Polymerized Hot Mix Asphalt Binder Course, Stone Matrix Asphalt, N 80, or Polymerized Hot Mix Asphalt Surface Course, Stone Matrix Asphalt, N 80. The work shall be according to Sections 406, 1030, and 1032 of the Standard Specifications except as modified herein.

Materials.

(a) Aggregates. All aggregates shall be Class B Quality or better. The aggregate water absorption shall be 2.0 percent or less.

- (1) Coarse Aggregate. No individual coarse aggregate gradation is specified. The coarse aggregate gradation(s) used shall be capable of being combined with FA 20 stone sand and mineral filler to meet the approved mix design and the mix requirements noted herein.

For surface course, coarse aggregate shall be Class B Quality; the coarse Aggregate can be crushed steel slag, crushed quartzite, and crushed diabase.\*

For binder course, coarse aggregate shall be crushed stone (dolomite), crushed gravel crushed granite, crushed quartzite, and crushed diabase.

- (2) Fine Aggregate. Fine aggregate shall be Class B Quality stone sand meeting gradation FA 20.
- (3) Mineral Filler. Mineral filler shall be commercially manufactured mineral filler meeting Article 1011.01 of the Standard Specifications with the following additional requirement:

Additional minus No. 200 (minus 75 µm) material required by the mix design shall be mineral filler.

\*Blending of coarse Aggregate will be permitted.

- (b) Fiber Additive. A fiber additive shall be included in the SMA mixture. Typical ranges of dosage rates are shown but the actual dosage rate will be determined by the Engineer.

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A stabilizer such as cellulose fiber or Mineral fibers shall be added to the mixture. The dosage rate for cellulose shall be approximately 0.4 percent by total mixtures mass and sufficient to prevent drain down. Cellulose used in SMA mixtures shall conform to the properties outlined in Table 1. For mineral fiber, the dosage rate shall be approximately 0.5 percent by total mixture mass and sufficient to prevent drain down. Mineral fibers used in SMA mixtures shall conform to the properties outlined in table 2.

Table 1. Cellulose Fiber Quality Requirements

Property	Requirement
Sieve Analysis Method A – Alpine Sieve <sup>1/</sup> Analysis Fiber Length Passing No. 100 (0.015 mm) sieve	0.25 in. (6 mm) maximum 70 ± 10 %
Method B – Mesh Screen <sup>2/</sup> Analysis Fiber Length Passing No. 20 (850 µm) sieve No. 40 (425 µm) sieve No. 140 (106 µm) sieve Ash Content <sup>3/</sup> pH <sup>4/</sup> Oil Absorption <sup>5/</sup> Moisture Content <sup>6/</sup>	0.25 in (6 mm) maximum 85 ± 10 % 65 ± 10 % 30 ± 10 % 18 ± 5 % NON VOLATILES 7.5 + 1.0 5.0 ± 1.0 (Times fiber mass) Less than 5 % (by mass)

- 1/ Method A – Alpine Sieve Analysis. This test is performed using an Alpine Air Jet Sieve (Type 200 LS). A representative five gram sample of fiber is sieved for 14 minutes at a controlled vacuum of 11 psi (75 kPa) of water. The portion remaining on the screen is weighed.
- 2/ Method B – Mesh Screen Analysis. This test is performed using standard No. 20, No. 40, No. 60, No. 80, No. 100 and No. 140 (850 µm, 425 µm, 250 µm, 180 µm, 150 µm and 106 µm) sieves, nylon brushed and a shaker. A representative 0.35 oz. (10 g) sample of fiber is sieved, using a shaker and two nylon brushes on each screen. The amount retained in each sieve is weighed and the percentage passing calculated. Repeatability of this method is suspect and needs to be verified.
- 3/ Ash Content. A representative 0.07 to 0.11 oz. (2 to 3 g) sample of fiber is placed in a tared crucible and heated between 1100 and 1200 °F (595 and 650 °C) for not less than 2 hours. The crucible and ash are cooled in a desiccator and weighed.
- 4/ pH Test. A representative 0.176 oz. (5 g) of fiber is added to 0.10 quarts (100 mL) of distilled water, stirred and let sit for 30 minutes. The pH is determined with a probe calibrated with pH 7.0 buffer.
- 5/ Oil Absorption Test. A representative 0.176 oz. (5 g) of fiber is accurately weighed and suspended in an excess of mineral spirits for not less than 5 minutes to ensure total saturation. It is then placed in a screen mesh strainer (approximately 0.0008 sq. in. (0.5 sq mm) opening size) and shaken on a wrist action shaker for 10 minutes [approximately 1 1/4 in. (32 mm) motion at 240 shakes per minute].

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The shaken mass is then transferred without touching to a tared container and weighed. Results are reported as the amount (number or times its own weight) the fibers are able to absorb.

- 6/ Moisture content. A representative 0.35 oz. (10 g) of fiber is weighed and placed in a 250 °F (121 °C) forced air oven for 2 hours. The sample is then reweighed immediately upon removal from the oven.

Table 2. Mineral Fiber Quality Requirements

Property	Requirements
Sieve Analysis	
Fiber Length <sup>1/</sup>	0.25 in. (6 mm) Maximum mean test value
Thickness <sup>2/</sup>	0.0002 in (0.005 mm) Maximum mean test value
Shot Content <sup>3/</sup>	
Passing No. 230 (63 µm) Sieve	70 ± 10 %

- 1/ The fiber length is determined according to the Bauer McNett Fractionation.
- 2/ The fiber diameter is determined by measuring at least 200 fibers in a phase contrast microscope.
- 3/ Shot content is a measure of non-fibrous material. The shot content is determined on vibration sieves. Two sieves, No. 60 and No. 230 (250 µm and 63 µm), are typically utilized.

Prior to approval and use of the mineral fiber, the Contractor shall submit a notarized certification by the producer of these materials, stating they meet these requirements.

- (C) Recycled Materials: The use of Reclaimed Asphalt Pavement (RAP) and use of Recycled Asphalt Shingles (RAS) will not be permitted concurrently in the production of SMA mixtures.

Reclaimed Asphalt Pavement (RAP). The use of RAP will be allowed in the production of SMA mixtures. The percent of RAP in SMA mixtures will be limited to ten percent by weight of the total mixture. Use of the RAP shall be in accordance with District one Use of RAP Special Provision.

Recycled Asphalt Shingles (RAS) The use of RAS will be allowed in the production of SMA mixtures. The percent of RAS in SMA mixtures will be limited to five percent by weight of the total mixture. The Use of RAS shall be in accordance with District one Use of RAS Special Provision. RAS

- (c) Asphalt Binder (AB)

At the contractor's option, the asphalt binder shall be SBS/SBR PG 76-22 or SBS/SBR PG 76-28 meeting the requirements Article 1032.05(b) of the Standard Specifications. The elastic recovery of the Asphalt Binder used shall be a minimum of 80.

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When Recycled Asphalt Pavement (RAP) or Recycled Asphalt Shingles (RAS) is incorporate in the mix, the asphalt binder shall be as follows:

The ratio of added new asphalt binder to the total asphalt binder is 90% or higher the new asphalt binder grade shall be the same as above. When the ratio of added new asphalt binder to the total asphalt binder is 80% to 89%, the new asphalt binder grade shall be SBS/SBR PG 70-28.

Plant Requirements.

- (a) Asphalt Cement. The polymer modified asphalt cement shall be shipped, maintained and stored at the mix plant according to the manufacturer's requirements. Polymer asphalt cement shall be placed in an empty tank and not blended with other asphalt cements.
- (b) Mineral Filler System. The mineral filler system shall accurately proportion the large amounts of mineral filler required for the mixture. Alteration or adjustment of the current system may be required.

Mineral filler shall not be stored in the same silo as collected dust. As an option, collected bag-house dust may be used in lieu of manufactured mineral filler, provided; 1) there is enough is available for the production of the SMA mix for the entire project and 2) a mix design was prepared with collected bag-house dust.

- (c) Mineral Fiber Additive. Adequate dry storage shall be provided for the fiber additive. A separate feed system shall be provided to proportion the fiber into the mixture uniformly and in desired quantities. The feed system shall be interlocked with the aggregate feed or weigh system to maintain the correct proportions for all rates of production and batch sizes. The proportion of fibers shall be controlled accurately to within  $\pm 10$  percent of the amount of fibers required. Flow indicators or sensing devices for the fiber system shall be provided and interlocked with plant controls so mix production shall be interrupted if fiber introduction fails.
  - (1) Batch Plant. Loose fiber shall be pneumatically added through a separate inlet directly into the weigh hopper above the pugmill. The addition of fiber shall be timed to occur during the hot aggregate charging of the hopper. Adequate mixing time will be required to ensure proper blending of the aggregate and fiber additive. Both the wet and dry mixing times shall each be increased a minimum of 5 seconds. The actual mixing time increase shall be determined by the Engineer based on individual plant characteristics. The batch size shall not exceed 75 percent of pugmill size as rated by the Department.
  - (2) Drum Mix Plant. Loose fiber shall be introduced using specialized equipment which mixes asphalt cement with the loose fiber at the time of introduction into the drum mixer. This equipment shall be approved by the Engineer. Care shall be taken to ensure the loose fiber does not become entrained in the exhaust system of the drier or plant.

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- (3) Fiber Supply System: When fiber stabilizing additives are required as an ingredient of the mixture, a separate feed system shall be utilized to accurately proportion by weight the required quantity into the mixture in such a manner that uniform distribution will be obtained. The fiber system shall be interlocked with the aggregate feed or weigh system so as to maintain the correct proportions for all rates of production and batch sizes. The proportion of fibers shall be controlled accurately to within plus or minus 10 percent of the amount of fibers required and the fiber system shall automatically adjust the feed rate to maintain the material within this tolerance at all times. The fiber system shall provide in-process monitoring consisting of either a digital display or output or a printout of feed rate, in pounds per minute to verify feed rate. Flow indicators or sensing devices for the fiber system shall be provided and interlocked with plant controls so that mixture production will be interrupted if introduction of the fiber fails, or if the output rate is not within the tolerances given above.

When a batch type plant is used, the fiber shall be added to the aggregate in the weigh hopper or as approved and directed by the Engineer. The fibers are to be uniformly distributed prior to the injection of asphalt cement into the mixes.

When a continuous or drier-drum type plant is used, the fiber shall be added to the aggregate and uniformly dispersed prior to the injection of asphalt cement. The fiber shall be added in such a manner that it will not become entrained in the exhaust system of the drier or plant.

- (d) Hot-mix Storage. The mixture shall not be stored more than four hours without the approval of the Engineer. The engineer will assess the drain down of the mix in making this determination.

Mix Design. Add the following to the list of Illinois Modified AASHTO references in Article 1030.04 of the Standard Specifications:

AASHTO T 305 Method for determining drain down from the loose mixture.

The drain down shall be determined at the JMF AB content at the mixing temperature plus 30 F.

Each specific SMA mixture design shall be submitted to and verified by the Department as detailed in the Department's current "Bituminous Mixture Design Verification Procedure". The Contractor shall submit samples of all appropriate materials to the Department at least six weeks prior to production for mixture design verification.

The polymer asphalt supplier shall provide the Contractor with the temperature viscosity curves.

The Contractor shall supply the average gradation and the gradation ranges (including the Master Band on the critical sieve, if required) for each aggregate designated for use in the mixture.

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This information shall be used to judge whether the aggregates are compatible to produce an acceptable mix.

The mix design shall meet the following Gyratory Design (80-Gyrations) parameters:

Design Air Voids	3.50 % @ 80 Gyration
VFA	75 - 85
VMA (Surface Mixtures)	17 minimum, if Spec. Gravity of course is 2.76 or above.
VMA (Surface Mixtures)	16 minimum, If Spec. Gravity of Coarse is below 2.75.
VMA (Binder Mixtures)	16 minimum
Drain down (%)	0.3 maximum
Dust to AC Ratio	1.5 maximum

The surface and binder mixture gradation shall be according to the requirements in Table 5 for the mixture specified on the plans.

Table 5  
 Stone Matrix Asphalt Gradation

Mixture Gradation Target Value Range	
Sieve	Percent Passing
3/4 in. (19.0 mm)	100
1/2 in. (12.5 mm)	82 – 100
3/8 in. (9.5 mm)	68 max
No. 4 (4.75 mm)	20 – 30
No. 8 (2.36 mm)	16 – 24
No. 30 (600 μm)	12 – 16
No. 50 (300 μm)	10 – 15
No. 200 (75μm)	8 – 10

Weather Requirements. The mixtures shall be placed on a dry surface when the temperature of the roadbed is above 60 °F (15 °C).

Hauling/Laydown Equipment. The Contractor shall provide a release agent that minimizes sticking to equipment and is acceptable to the Engineer. The Contractor shall furnish a laborer to ensure that all truck beds are clean and no excess release agent is used prior to being loaded. All trucks shall be insulated and tarped when hauling the mixture to the paver.

The Contractor shall provide two steel-wheeled tandem rollers for breakdown ( $T_b$ ) meeting the requirements of Article 406.07(a) of the Standard Specifications, except one of the tandems shall be 84 inches (2.14 m) wide and a weight of 315 pound per linear inch (PLI) (5.63 kg/mm). Also one finish steel-wheeled roller meeting the requirements of Article 1101.01(e) of the Standard Specifications. Pneumatic-tired rollers will not be allowed.

Mix Placement. The mixture shall be placed at a minimum mixture temperature recommended by the polymer asphalt supplier and approved by the Engineer. The mixture temperature shall be measured in the truck just prior to placement in the paver.

The paver speed shall not exceed 20 ft/min (7 m/min) during placement.

Compaction shall commence immediately after the mixture has been placed.

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The breakdown rollers shall maintain an effective rolling distance of not more than 100 ft. (38 m) behind the paver. Rollers shall move at a uniform speed not to exceed 3 mph (5 km/h) with the drive roll nearest the paver.

Compaction shall continue until the required density range has been achieved. The required density range shall be 94 to 97 percent of theoretical maximum specific gravity ( $G_{mm}$ ). Care shall be taken to avoid excessive aggregate breakage.

Mix Production. The mixtures shall be produced at a temperature range recommended by the polymer asphalt supplier and approved by the Engineer to allow adequate compaction. The actual production temperature will be selected from the range by the Engineer based on individual plant characteristics and modifier used in the mixtures.

A manufacturer's representative from the polymer asphalt cement producer shall be present during each polymer mixture start-up and shall be available at all times during production and lay-down of the mix. A manufacturer's representative for the supplier/manufacture of the fibers and the equipment to introduce fibers into the mixture shall be present for calibration and first day of production (test strip).

A QC/QA mixture Test Strip will be required. The Test Strip shall be constructed at a location approved by the Engineer to determine the mix properties, density, and laydown characteristics. These test results and visual inspections on the mixture shall be used to make corrective adjustments if necessary.

Prior to the start of mix production and placement, The Engineer will review and approve all test strip results and rolling pattern.

The Test Strip performed as follows:

- (a) Team Members. The start-up team, if required, shall consist of the following:
  - (1) Resident Engineer
  - (2) District Materials Mixtures Control Engineer, or representative
  - (3) District Nuclear Density Gauge Specialist
  - (4) Contractor's QC Manager
  - (5) Contractor's Density Tester
- (b) Communication. The Contractor shall advise the team members of the anticipated start time of production for the test strip. The QC Manager shall direct the activities of the test strip team. A Department-appointed representative from the start-up team will act as spokesperson for the Department.
- (c) The Test Strip shall consist of approximately 400 tons (375 metric tons). It shall contain two growth curves which shall be compacted by a static steel-wheeled roller and tested as outlined herein.
  - (1) Mix Information. On the day of construction of the Test strip, the Contractor shall provide the start-up team documentation of test data showing the combined hot-bin or the combined aggregate belt sample and mineral filler at a drier-drum plant.

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- (2) Mix and Gradation Test Strip Samples. The first and second sets of mixture and gradation samples shall be taken by the Contractor at such times as to represent the mixture between the two growth curves and the rolling pattern area, respectively. All test strip samples shall be processed by the Contractor for determination of mix composition and Hot-Mix Asphalt properties including air voids. This shall include washed gradation tests. This information shall then be compared to the JMF and required design criteria.
- (3) Compaction Equipment. It shall be the responsibility of the start-up team to verify roller compliance before commencement of growth curve construction.

All paving and rolling equipment intended for use on a project shall be utilized on the test strip.

- (4) Constructing of the Test Strip. After the Contractor has produced the mix, transported the mix, and placed approximately 100 to 150 tons (90 to 140 metric tons) of mix, placement of the mix shall stop, and a growth curve shall be constructed. After completion of the first growth curve, paving shall resume for 50 to 100 tons (45 to 90 metric tons) of mix, placement shall stop, and the second growth curve shall be constructed within this area. Additional growth curves may be required if an adjustment/plant change is made during the test strip. The Contractor shall use the specified rolling procedures for all portions of the test strip except for the growth curve areas which shall be compacted as directed by the Engineer.
- (5) Location of Test Strip. The test strip shall be located on a pavement type similar to the contract pavement and acceptable to the Engineer. It shall be on a relatively flat portion of the roadway. Descending/Ascending grades or ramps shall be avoided.
- (6) Compaction Temperature. In order to make an accurate analysis of the density potential of the mixture, the temperature of the mixture on the pavement at the beginning of the growth curve shall be 325 °F (152 °C).
- (7) Compaction and Testing. The Engineer will specify the roller(s) speed and number of passes required to obtain a completed growth curve. The nuclear gauge shall be placed near the center of the hot mat and the position marked for future reference. With the bottom of the nuclear gauge and the source rod clean, a 15 seconds nuclear reading (without mineral filler) shall be taken after each pass of the roller. Rolling shall continue until the maximum density is achieved and three consecutive passes show no appreciable increase in density or no evidence of destruction of the mat. The growth curve shall be plotted. No testing of initial passes shall be taken until the fourth pass is completed.

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- (8) Final Testing. After the growth curve information is obtained, a final one minute nuclear reading, using mineral filler to eliminate surface voids, shall be taken at the marked position. This reading is used to adjust the maximum density reading obtained during the growth curve.
- (9) Evaluation of Growth Curves. Mixtures which exhibit density potential less than 94 percent or greater than 97 percent of the maximum theoretical density (D) shall be considered as sufficient cause for mix adjustment. If a mix adjustment is made, an additional test strip may be constructed. The Department will pay half the cost of the contract unit price for a test strip if additional one is required. The information shall then be compared to the AJMF and required design criteria.

If the nuclear density potential of the mixture does not exceed 91 percent, the operation will cease until all test data is analyzed or a new mix design is produced.

In addition, other aspects of the mixture, such as appearance, segregation, texture, or other evidence of mix problems, should be noted and corrective action taken at this time.

- (d) Documentation. The Test Strip and rolling pattern information (including growth curves) will be tabulated by the contractor with copies provided to each team member, and the original submitted to the Engineer. Any change to the rolling pattern shall be approved by the Engineer.
- (e) Density. The density of the finished SMA binder course shall be measured either by nuclear test methods or from cores obtained by the contractor at random locations. For the SMA surface course, only the core method will be accepted.

Control Charts/Limits. Control charts/limits shall be according to QC/QA requirements except density and air voids shall be plotted on the control charts within the following control limits:

<u>Parameter</u>	<u>Individual Test</u>	<u>Moving Average</u>
Density	94 % - 97 %	
Air Voids	± 1.0 % (of design)	± 0.80 % (of design)

Basis of Payment. This work will be measured and paid for according to Article 406.14 of the Standard Specifications at the contract unit price per ton (metric ton) for POLYMERIZED HOT-MIX ASPHALT BINDER COURSE, STONE MATRIX ASPHALT, N 80 or POLYMERIZED HOT-MIX ASPHALT SURFACE COURSE, STONE MATRIX ASPHALT, N 80. The plan quantities shall be adjusted using the actual binder and surface approve Mix Designs Gmb.

The test strip will be paid for at the contract unit price each for TEST STRIP (STONE MATRIX ASPHALT), which price shall not include the 400 tons (360 metric tons) of mix, as well as the appropriate testing, which will be paid for at the unit price in the contract for the item being placed.

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