

# TRANSPORTATION BULLETIN



Illinois Department of Transportation

## ADDENDUM NO. 1

Dated: January 10, 2007

For: Transportation Bulletin

Letting Date: January 19, 2007

Volume 9 No. 49r Dated: December 8, 2006, Revised January 9, 2007

### Item No. 5A – Apply Porous Friction Course and Mark Runway 10-28

Galesburg Municipal Airport

Galesburg, Illinois

Knox County

IL Project No.: GBG-3624

AIP Project No.: 3-17-0047-B9

Contract No.: GA005

### REASON FOR ADDENDUM:

Policy Memorandum Number 96-2 has been revised effective January 15, 2007, modifying the Contractor's responsibilities and requirements regarding the development of the Job Mix Formula for bituminous base course and bituminous surface course. Additionally, this addendum includes modifications to Recurring Special Provisions applicable to this project in order to incorporate the new Contractor responsibilities and requirements.

### TO ALL PLAN HOLDERS:

1.) IDA Policy Memorandum 96-2 is revised as follows:

State of Illinois  
Department of Transportation  
Division of Aeronautics

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**POLICY MEMORANDUM**

January 15, 2007

Springfield, Illinois

Number 96-2

TO: CONTRACTORS

SUBJECT: REQUIREMENTS FOR LABORATORY, TESTING, QUALITY CONTROL, AND PAVING OF BITUMINOUS CONCRETE MIXTURES

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 bituminous concrete 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. The Quality Assurance and acceptance responsibilities of the Engineer are described in Policy Memorandum 96-3.

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 as well as the Engineer's acceptance testing as described in Policy Memorandum 96-3.

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 1559	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
ASTM D 2041	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D 2172	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
IDOT	Ignition Method for Determining Asphalt Content

ASTM D 2726	Bulk Specific Gravity of Compacted Bituminous Mixtures using Saturated Surface Dry Specimens
ASTM D 3203	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D 2950	Density of Bituminous Concrete in Place by Nuclear Method
ASTM D 4125	Asphalt Content of Bituminous Mixtures by Nuclear Method
ASTM C 127	Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate
ASTM C 128	Standard Test Method for Specific Gravity and Absorption of Fine Aggregate

The Asphalt Institute's *Mix Design Methods for Asphalt Concrete Manual No. 2 (MS-2)*

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, the Engineer 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 Job Mix Formula approval letter that concurs or rejects the Contractor's proposed JMF. The Contractor will be required to perform the sampling and laboratory testing and develop a complete mix design, according to the following guidelines:  
[Note: A testing summary chart can be found in Appendix B.]

- A. Material sources meeting the requirements of the contract shall be submitted in writing at or before the preconstruction conference (see BITUMINOUS WORKSHEET in Appendix A) in the following format:
  1. To: Steve Long, Acting Chief Engineer  
Attn: Mike Wilhelm, 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 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 64-22 shall be used unless otherwise approved by the IDA Engineer of Materials.
- 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. The sample size shall be approximately 280 lb. for each coarse aggregate, 150 lb. for each fine aggregate, 15 lb. for the mineral filler or collected dust, and 1 gallon of asphalt cement.
- C. The Contractor shall split the aggregate samples down and run gradation tests according to the testing methods referenced in Appendix B of this memorandum. The remaining aggregates shall be set aside for further Mix Design testing. The results of the gradation tests, along with the most recent stockpile gradations, shall be reported by fax to the IDA Engineer of Materials for engineering evaluation. If the gradation results are deemed non-representative or in any way unacceptable, new representative samples may be required at the direction of the IDA Engineer of Materials. Only composite gradations are required under this procedure.
- D. Based on the accepted gradation results, the Contractor will determine blend percentages in accordance with the contract specifications (see Section 201/401 – 3.2 JOB MIX FORMULA under Table 4) for each aggregate to be used in determining the Job Mix Formula, as well as mix temperature and asphalt content(s), and number of Marshall Blows for preparation of the Marshall Mix Design, or number of gyrations for Superpave Mix Design, depending on which design is specified in the contract. The Contractor will verify the aggregate percentages, mix temperatures, asphalt content(s), and number of Marshall blows (or gyrations) with the IDA Engineer of Construction & Materials before beginning any testing.
- E. After verification of the information from step D., the Contractor shall make specimens and perform the following tests at various asphalt contents in order to obtain the optimum mix design. [Note: Actual test designation is referenced in Appendix B of this memorandum.]

**Marshall Tests**

Maximum Specific Gravity -- " $G_{mm}$ "

Bulk Specific Gravity -- " $G_{sb}$ "

Marshall Stability

Marshall Flow

% air voids

The JMF will be designed in accordance with Table 4 as modified in the Recurring Special Provisions for the type of mix being produced. Appendix C contains a copy of the Table 4 targets and ranges for the JMF.

- F. All technicians who will be performing mix design testing and plant sampling/testing shall have successfully completed the IDOT Division of Highways Bituminous Concrete Level 1 Technician Course "Bituminous 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 Bituminous Concrete Level 2 Technician.
- G. The mix design testing results and resulting optimal JMF shall be reported to the IDA Engineer of Construction & Materials with the following data included:
- Aggregate & liquid asphalt material codes
  - Aggregate & liquid asphalt producer numbers, names, and locations
  - Aggregate Blend of each aggregate
  - Optimum Blend % for each sieve
  - AC Specific Gravity
  - Bulk Specific Gravity and Absorption for each aggregate
  - Summary of Marshall Design Data: AC % Mix, Stability, Flow,  $G_{mb}$ ,  $G_{mm}$ , VMA, Voids (Total Mix), Voids Filled

- h) Optimum design data listing AC % Mix, Stability, Flow,  $G_{mb}$ ,  $G_{mm}$ , VMA, Voids (Total Mix), Voids Filled
- i) Percent of asphalt that any RAP will add to the mix
- j) Graphs for the following: gradation on 0.45 Power Curve, AC vs. Voids (Total Mix), AC vs. Specific Gravities, AC vs. Voids Filled, AC vs. Stability, AC vs. Flow and VMA

H. The IDA Engineer of Construction & Materials shall generate and issue a concurrence or rejection of the Contractor's proposed Mix Design with the JMF for the manufacture of bituminous mixtures based upon the Contractor's submitted testing and complete mix design results. The Contractor shall not be permitted to use the proposed BITUMINOUS mix in production 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 bituminous mixtures 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 bituminous 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 (Appendix A). 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 Bituminous Concrete Level II Technician Course "Bituminous 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 when a batch plant is utilized. Minimum of one (1) gradation for each aggregate per day of production or every 1,000 tons when a drum plant is used, and one (1) gradation per week for mineral filler when a drum plant is used.
- C. A certification from the quarry for the total quantity of aggregate listing the source, gradation type, 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 and tested by the Contractor for Marshall, Extraction, Gradation, Maximum Specific Gravity, and Air Void tests in accordance with the appropriate ASTM standard referenced herein. [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		
1/2 in.	± 7 %	± 4 %
No. 4	± 7 %	± 4 %
No. 8	± 5 %	± 3 %
No. 30	± 4 %	± 2.5 %
No. 200 *	± 2.0 % *	± 1.0 % *
Asphalt Content	± 0.45 %	± 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 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 (Drier Drum). (% Passing 1/2 in., No. 4., No. 8, No. 30, and No. 200 Sieves)
2. Asphalt Content
3. Bulk Specific Gravity of Marshall Sample
4. Maximum Specific Gravity of Mixture

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.

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

- A. The purpose of the test section is to determine if the mix is acceptable and can be compacted to a consistent passing density.

A quick way to determine the compactibility of the mix is by the use of a nuclear density gauge in the construction of a growth curve. An easy way to construct a growth curve is to use a good vibratory roller. To construct the curve, an area the width of the roller in the middle of the mat is chosen and the roller is allowed to make one compactive pass. With the roller stopped some 30 feet away, a nuclear reading is taken and the outline of the gauge is marked on the pavement. The roller then makes a compaction pass in the opposite direction and another reading is taken. This scenario is continued until at least two (2) passes are made past the maximum density obtained.

The maximum laboratory density potential of a given mix is a direct function of the mix design air voids. Whereas, the actual maximum field density is a function of the type of coarse aggregates, natural or manufactured sands, lift thickness, roller type (static or vibratory), roller and paver speed, base condition, mix variation, etc. All of these items are taken into consideration with the growth curve.

1. High Density in the Growth Curve. If the growth curve indicates a maximum achievable field density of between 95 to 98 percent of the Theoretical Maximum Density (D), you can proceed with the Rolling Pattern. On the other hand, if the maximum achievable density is greater than 98 percent, a quick evaluation (by use of an extractor, hot bin gradations, nuclear asphalt determinator, etc.) must be made of the mix. When adjustments are made in the mix, a new growth curve shall be constructed.
2. Low Density in the Growth Curve. If the growth curve indicates the maximum achievable density is below 94 percent, a thorough evaluation of the mix, rollers, and laydown operations should be made. After a thorough evaluation of all factors (mix, rollers, etc.), asphalt or gradation changes may be in order as directed by the Engineer. Again, any changes in the mix will require a new growth curve. Note that the nuclear density test is a quality control tool and not an acceptance test. All acceptance testing is to be conducted by the use of cores, unless otherwise specified.
3. Acceptance of Test Section. The Contractor may proceed with paving the day after the test section provided the following criteria have been met:
  - a. Four random locations (2 cores per location cut longitudinally and cored by the Contractor) will be selected by the Engineer within the test strip. No individual core can be below a minimum of 94% density.
  - b. All Marshall and extraction test results from mix produced for the test section must be within the tolerances required by specification.
  - c. The Contractor shall correlate his nuclear gauge to the cores taken in the test section. Additional cores may be taken at the Contractor's expense for this purpose within the test section area, when approved by the Engineer.
4. Density Acceptance under Production Paving. The responsibility for obtaining the specified density lies with the Contractor. Therefore, it is important that the nuclear density gauge operator communicate with the roller operators to maintain the specified density requirements. The Contractor shall provide a Bituminous Concrete Density Tester who has successfully completed the Department's "Bituminous Concrete Nuclear Density Testing Course" to run all required density tests on the job site. Density acceptance testing, unless otherwise specified, is described as follows:
  - a. The Contractor shall cut cores at random locations within 500 ton sublots as directed by the Resident Engineer.
  - b. The cores should be extracted so as not to damage them, since they are used to calculate the Contractor's pay.
  - c. The Engineer will run preliminary  $G_{mb}$  tests on the cores to give the Contractor an indication of how compaction is running for the next day's paving.



- d. A running average of four (4) Maximum Theoretical Gravities ( $G_{mm}$ ) will be used for calculating percent compaction.
- e. Final core density tests and pay calculations will be performed by the Resident Engineer and delivered to the Contractor.

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

Supersedes Policy Memorandum 96-2 dated April 1, 2004

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. \_\_\_\_\_

MARSHALL DATA

% Asphalt \_\_\_\_\_

M. Stability \_\_\_\_\_

Flow \_\_\_\_\_

D \_\_\_\_\_

0 \_\_\_\_\_

% Air Voids \_\_\_\_\_

Q.C. Manager Name: \_\_\_\_\_

Phone number: \_\_\_\_\_

Laboratory Location: \_\_\_\_\_

Fax Number: \_\_\_\_\_

Remarks: \_\_\_\_\_



# Bituminous Mixtures Extraction

Date: \_\_\_\_\_

Airport: \_\_\_\_\_ Consultant: \_\_\_\_\_

Illinois Project: \_\_\_\_\_ Contractor: \_\_\_\_\_

AIP Project No.: \_\_\_\_\_ Producer: \_\_\_\_\_

Mix #: \_\_\_\_\_ Dry Time: \_\_\_\_\_ Lot: \_\_\_\_\_ Sublot: \_\_\_\_\_

Type: \_\_\_\_\_ Washed: \_\_\_\_\_

Sieve	Wt.	Accum. Wt.	% Passing	Mix Formula	Tolerance	Spec Range
1.5						
1						
3/4						
1/2						
3/8						
4						
8						
16						
30						
50						
100						
200						
Tot Agg						
Bit						

Extraction Data	
Pan, New Filter & Sample	g _____
Pan & New Filter	g _____
Sample	g _____
Pan, Used Filter, Aggregate	g _____
Pan & New Filter	g _____
Aggregate	g _____
Pan & Used Filter	g _____
Pan & New Filter	g _____
Dust in Filter	g _____
Sample	g _____
Aggregate	g _____
Bitumen	g _____

New Bit:	Marshall Stab:	Blows:	Gyro:	Flow:	TSR:
Bulk SPGR:	Max SPGR:	% Voids:	DEN (PCF):		

Remarks: \_\_\_\_\_

CC: \_\_\_\_\_ Tested by: \_\_\_\_\_



## APPENDIX B



**QUALITY CONTROL TESTING (PLANT)**

<b>PARAMETER</b>	<b>FREQUENCY</b>	<b>SAMPLE SIZE</b>	<b>TEST METHOD</b>	<b>REPORT FORM</b>
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
Maximum Specific Gravity	Minimum 1 per 1000 tons	1200 gm per test	ASTM D 2041	AER M-11 and AERM-14
Bulk Specific Gravity	Minimum 1 per 1000 tons	1250 gm per briquette	ASTM D 2726	AER M-11 and AERM-14
Marshall Stability and Flow	Minimum 1 per 1000 tons	1250 gm per briquette	ASTM D 1559	AER M-11 and AERM-14
% Air Voids	Minimum 1 per 1000 tons		ASTM D 3203	AER M-11 and AERM-14
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

### **MIX DESIGN TESTING**

<b>PARAMETER</b>	<b>FREQUENCY</b>	<b>SAMPLE SIZE</b>	<b>TEST METHOD</b>	<b>REPORT FORM</b>
Representative samples of each aggregate and asphalt cement.	1 per aggregate and 1 asphalt cement.	280 lb. (coarse) 150 lb. (fine) 15 lb. (min. filler) 1 gallon asphalt cement	ASTM D 75	N/A
Aggregate Gradation	1 per aggregate	CA07/11: 5000 gm CA13: 2000 gm CA16: 1500 gm Fine agg: 500 gm	ASTM C 136	Bituminous Worksheet (Appendix A)
Maximum Specific Gravity	2 per specified asphalt content	1200 gm per test	ASTM D 2041	Bituminous Worksheet (Appendix A)
Bulk Specific Gravity	3 briquettes per specified asphalt content	1250 gm per briquette	ASTM D 2726	Bituminous Worksheet (Appendix A)
Marshall Stability and Flow	3 briquettes	1250 gm per briquette	ASTM D 1559	Bituminous Worksheet (Appendix A)
% Air Voids	1 per specified asphalt content (Avg. of $G_{sb}/G_{mm}$ )		ASTM D 3203	Bituminous Worksheet (Appendix A)

**QUALITY CONTROL TESTING (PAVER)**

<b>PARAMETER</b>	<b>FREQUENCY</b>	<b>SAMPLE SIZE</b>	<b>TEST METHOD</b>	<b>REPORT FORM</b>
Nuclear Density Test	As required by the Contractor to maintain consistent passing density	Various locations	ASTM D 2950	

## APPENDIX C

**AGGREGATE BITUMINOUS BASE COURSE**

<b>Percentage by Weight Passing Sieves Job Mix Formula (JMF)</b>		
<b>Sieve Size</b>	<b>Gradation B Range 1" Maximum</b>	<b>Ideal Target</b>
1-1/4 in.	---	---
1 in.	100	100
3/4 in.	93 – 97	95
1/2 in.	75 – 79	77
3/8 in.	64 – 68	66
No. 4	45 – 51	48
No. 8	34 – 40	37
No. 16	27 – 33	30
No. 30	19 – 23	21
No. 100	6 – 10	8
No. 200	4 – 6	5
<b>Bitumen %:</b>		
<b>Stone</b>	<b>4.5 – 7.0</b>	<b>5.5</b>

**AGGREGATE BITUMINOUS SURFACE COURSE**

<b>Percentage by Weight Passing Sieves Job Mix Formula (JMF)</b>		
<b>Sieve Size</b>	<b>Gradation B Range <sup>3/4</sup>" Maximum</b>	<b>Ideal Target</b>
1 in.	100	---
3/4 in.	100	100
1/2 in.	99 - 100	100
3/8 in.	91 - 97	94
No. 4	56 – 62	59
No. 8	36 - 42	39
No. 16	27 - 32	30
No. 30	19 - 25	22
No. 100	7 – 9	8
No. 200	5 – 7	6
<b>Bitumen %:</b>		
<b>Stone</b>	<b>5.0 – 7.0</b>	<b>6.0</b>

**2.) Amend the Supplemental Specifications and Recurring Special Provisions, Adopted July 1, 2004, to include the following:**

**Replace Check Sheet No. 11 with the following:**

State of Illinois  
Department of Transportation  
Division of Aeronautics

**SPECIAL PROVISION FOR**

**ITEM AR201001 BITUMINOUS BASE COURSE – METHOD I**  
(Under 2,500 tons/pay item/location)

This Special Provision Modifies Item 201 Bituminous Base Course of the Standard Specifications.

201-1.1 Add to the second paragraph:

“The Contractor shall be responsible for the Quality Control in the production and construction of the HMA (Hot Mix Asphalt) base course.”

“The HMA base course shall be laid in a maximum of two (2) inch lifts. Thicker lifts not to exceed three (3) inches may be authorized by the Resident Engineer provided a continuous paving operation is maintained.”

201-2.1 AGGREGATE

Delete the first paragraph and replace with the following:

“Aggregates shall consist of crushed stone or crushed gravel, or recyclable asphalt pavement (RAP), blended with crushed or natural sand(s) and/or mineral filler.

Crushed Stone: Crushed stone shall be defined as the angular fragments resulting from crushing by mechanical means the following types of rocks quarried from undisturbed consolidated deposits; granite and similar phanerocrystalline igneous rocks; limestone; dolomite; or massive metamorphic quartzite, or similar rocks.

Crushed Gravel: Crushed gravel shall be the product resulting from crushing by mechanical means, and shall consist entirely of particles obtained by crushing gravel, all of which before crushing will be retained on a screen with openings equal to or larger than the maximum nominal size of the resulting crushed material. If approved by the Engineer, final product gradations may be obtained by screening or blending various sizes of crushed gravel material.

Recyclable Asphalt Pavement (RAP): Recyclable asphalt pavement shall be defined as the product resulting from milling and/or crushing of HMA pavement composed of aggregates and asphalt that originally met the quality requirements as stated herein. The Contractor shall furnish evidence satisfactory to the Division and the FAA that the material met the specified quality requirements.

Mineral Filler: Mineral filler shall consist of dry limestone dust, or other material approved by the Engineer and shall meet the requirements of ASTM D242.

The portion of the materials retained on the No. 8 sieve shall be known as coarse aggregate, the portion passing the No. 8 sieve and retained on the No. 200 sieve as fine aggregate, and the portion passing the No. 200 sieve as mineral filler.”

201-2.1(a) COARSE AGGREGATE

Delete the first paragraph and replace with the following:

“Coarse aggregate shall consist of sound, tough, durable particles conforming to the following quality requirements:

QUALITY TEST (IDOT C Quality)	PERCENT
Na <sub>2</sub> SO <sub>4</sub> Soundness, 5 Cycle ASTM C 88 Max. % Loss	20
Los Angeles Abrasion ASTM C 131 Max. % Loss	45

DELETERIOUS TEST	PERCENT
Materials (Max. % allowed)	
Shale %	4.0
Clay Lumps %	0.5
Soft & Unsound Frag. %	8.0
Other Deleterious %	2.0
<i>Total Deleterious Allowed %</i>	<i>10.0</i>

Delete the second and third paragraphs.

201-2.1(b) FINE AGGREGATE

Delete the first paragraph and replace with the following:

“Fine aggregate shall be defined as follows:

Sand: Sand shall be the fine granular material resulting from the natural disintegration of rock. Sand produced from deposits simultaneously with and by the same operations as gravel coarse aggregate may contain



crushed particles in the quantity resulting normally from the crushing and screening of oversize particles.

Stone Sand: Stone sand shall be produced by washing or processing by air separation the fine material resulting from crushing rock quarried from undisturbed consolidated deposits.

Slag Sand: Slag sand shall be the graded product resulting from the screening of air cooled blast furnace slag. Air cooled blast furnace slag shall be the nonmetallic product, consisting essentially of silicates and aluminosilicates of lime and other bases, which is developed in a molten condition simultaneously with iron in a blast furnace.

Steel Slag Sand: Steel slag sand shall be the graded product resulting from the screening of crushed steel slag. Crushed steel slag shall be the nonmetallic product which is developed in a molten condition simultaneously with steel in an open hearth, basic oxygen or electric furnace.”

The fine aggregate shall also conform to the following quality requirements:

QUALITY TEST(IDOT B Quality)	PERCENT
Na <sub>2</sub> SO <sub>4</sub> Soundness, 5 Cycle ASTM C 88 Max. % Loss	15
Minus No. 200 Sieve Mat'l. ASTM C 136 Max. % Loss [1]	6.0 [2]

DELETERIOUS TEST	PERCENT
Materials (Max. % allowed)	
Shale %	3.0
Clay Lumps %	3.0
Coal, Lignite & Shells %	3.0
Conglomerate %	3.0
Other Deleterious %	3.0
<i>Total Deleterious Allowed %</i>	<i>5.0</i>

[1] Fine aggregate shall not contain more than 3 percent clay (2 micron or smaller) particles.

[2] Does not apply to Stone Sand.

201-2.1(c) SAMPLING AND TESTING

Delete this paragraph and replace with the following:

“All aggregates proposed in the manufacture of the mix will be sampled and tested by the Contractor. ASTM D 75 shall be used in sampling coarse aggregate and fine aggregate, and ASTM C 183 shall be used in sampling mineral filler. The Contractor shall provide the Engineer with aggregate producer (quarry) and Contractor (plant) quality control gradations. No aggregate shall be used in the production of mixture without prior approval.

201-2.1(d) SOURCES OF AGGREGATES

Delete this paragraph and replace with the following:

“All aggregate sources that are approved by the Illinois Department of Transportation, Division of Highways, conforming to the description, gradation and quality specified herein, shall be permitted for use in the manufacture of the HMA base course. The supplier of aggregates must participate and meet the requirements of the Illinois Department of Transportation Division of Highways Source Certification Program (AGCS). The Engineer reserves the right to inspect the source(s) and manufacturing of all aggregates. If satisfactory quality control and production procedures are not being implemented, the Engineer may remove approval of the source(s). Approval of the source(s) of aggregate(s) does not relieve the Contractor in any way of the responsibility for delivery to the job site aggregates that meet the requirements specified herein.”

201-2.1(e) SAMPLES OF AGGREGATES

Delete this paragraph and replace with the following:

“All the source(s) of the proposed aggregates for use by the Contractor in the Contractor’s proposed HMA mix design must be approved in writing by the I.D.A. Engineer of Construction & Materials prior to use in any design or production of HMA material.”

201-2.3 BITUMINOUS MATERIAL

Add the following to the first paragraph:

“Performance Graded asphalt PG 64-22 shall be used.”

201-3.2 JOB MIX FORMULA (JMF)

Delete the first paragraph and insert the following:

“The Contractor is responsible for the job mix formula (JMF) and no HMA mixture for payment shall be produced until a letter from the Illinois Division of Aeronautics’ Engineer of Construction & Materials approving the Contractor’s proposed JMF has been issued to the Contractor. The approved JMF shall indicate the definite percentage on each sieve for each aggregate, the percent of bitumen, and the number of Marshall blows specified for the individual project. The Contractor shall provide all laboratory sampling and testing to the Engineer upon the completion of the proposed JMF. The exact tests and procedures are outlined in the Illinois Division of Aeronautics (IDOA) latest *Policy Memorandum 96-2: “Requirements for Laboratory, Testing, Quality Control and Paving of Bituminous Concrete Mixtures.”*

Delete the third paragraph and replace with the following:

“The HMA mixture shall be tested according to the Asphalt Institute, ‘Marshall Method of Mix Design’, in the current Manual MS-2, *Mix Design Method for Asphalt Concrete*, and shall meet the criteria set forth in Tables 2 and 4 herein.”

**Table 2. MARSHALL DESIGN CRITERIA**

Properties	Over 60,000 lb. [1]	Under 60,000 lb.
Number of Blows	75	50
Stability (Min.)	1800	1500
Flow	8-16	8-18
Percent Air Voids	1.5 – 4.0	1.5 – 3.5
Voids filled with asphalt (%)	75-90	75-90

[1] Stone sand (IDOT Gradation FA20 or FA21) shall be required as part of the fine aggregate portion of the JMF. The exact amount of stone sand will be determined by the Contractor based on preparation of the Mix Design. The percentage of stone sand will be verified as acceptable by the Division of Aeronautics based upon the Contractor’s final proposed JMF. The Division reserves the right to request a change in the amount of stone sand at any point in the mix design process, as well as during production, based upon performance of the mix during placement.

Delete: Table 3. MINIMUM PERCENT VOIDS IN MINERAL AGGREGATE

Replace Table 4 with the following:

TABLE 4. AGGREGATE BITUMINOUS BASE COURSE

Percentage by Weight Passing Sieves Job Mix Formula (JMF)		
Sieve Size	Gradation B Range 1" Maximum	Ideal Target
1-1/4 in.	---	---
1 in.	100	100
3/4 in.	93 – 97	95
1/2 in.	75 – 79	77
3/8 in.	64 – 68	66
No. 4	45 – 51	48
No. 8	34 – 40	37
No. 16	27 – 33	30
No. 30	19 – 23	21
No. 100	6 – 10	8
No. 200	4 – 6	5
Bitumen %:		
Stone	4.5 – 7.0	5.5

Add the following sentence to the end of the fifth paragraph:

“When approved by the Engineer, the Contractor may add up to 25 percent of recyclable asphalt pavement to meet the required gradations, provided he can produce a consistent mixture meeting the mix design, temperature, and density requirements specified herein.”

Delete the second sentence of the seventh paragraph and replace with the following:

“The tolerances listed in TABLE 5 will only apply when they cause a grading band within the band listed in TABLE 4. Otherwise, the grading bands listed in TABLE 4 shall apply.”

Delete the second and third sentences of the ninth paragraph and replace with the following:

“Deviation from the approved JMF for bitumen content and gradation of aggregates shall not be greater than the tolerances permitted and shall be based on extraction, or calibrated ignition oven test for aggregate gradations and asphalt content. Results falling outside the set tolerances shall be cause for rejection of all the material placed from the time of testing until a passing test is obtained. The applicable ASTM and IDOT tests are outlined in the current IDOA *Policy Memorandum 96-2: “Requirements for Laboratory, Testing, Quality Control and Paving of Bituminous Concrete Mixtures.”* These tests shall be performed by Contractor quality control personnel. Split mix samples shall be maintained by the Contractor for random testing by the Engineer.”

Delete the last paragraph for this section.

#### 201-3.4    TEST SECTION

Delete this section.

#### 201-4.2    HMA MIXING PLANT

Insert the following as the first paragraph:

“The HMA hot-mix plant(s) shall conform to the following requirements, or the Engineer may accept the use of a hot-mix plant approved by the IDOT Division of Highways for the manufacture of Class I HMA mixtures in accordance with Section 1102 of the current *Standard Specifications for Road and Bridge Construction*. When recyclable asphalt pavement is used, the hot-mix plant shall also conform to the additional IDOT plant requirements for hot-mix recycling.”

(a) Requirements for all plants:

(12) Testing laboratory

Delete the first sentence of this paragraph and insert the following:

“The Contractor or producer shall provide a testing laboratory, meeting the requirements of the Illinois Division of Aeronautics’ latest *Policy Memorandum 96-2: “Requirements for Laboratory, Testing, Quality Control and Paving of Bituminous Concrete Mixtures”* for Quality Control and acceptance testing during periods of mix production, sampling, and testing, and whenever materials subject to the provision of these specifications are being supplied or tested.”

201-4.3 HAULING EQUIPMENT

ADD:

“All trucks used for hauling HMA mixtures shall have a tightly closing tailgate to prevent spilling of material on airfield pavements or entrance roads used for haul roads. Prior to leaving the placing site, the end of the truck beds shall be cleaned of all loose material which may spill onto the pavements and the tail gate shall be secured.”

201-4.4 HMA PAVERS

Add the following after “activated screed” in the first sentence of the first paragraph:

“capable of vibrating at approximately 3000 VPM”.

Add the following at the end of the first paragraph:

“All width extensions required to place material shall have the same placement features and equipment functions as provided on the main body of the paver. Augers shall be extended as additional sections of screed are bolted on or automatically adjustable screeds are extended. The augers need not be extended when the screed extensions on either side of the machine are one foot or less and the finished surface of the mat is uniform. The use of any machine obsolete in design or in poor mechanical condition will not be permitted.”

Delete the second sentence of the third paragraph and replace with the following:

“An automatic grade control system shall be used to automatically maintain the screed elevation as specified herein.”

201-4.7 PREPARATION OF MINERAL AGGREGATE

Add the following as the second sentence of the first paragraph:

“Immediately after heating, the base course aggregate(s) shall be screened into at least four sizes. This requirement does not apply to drum mixer plants.”

#### 201-4.9 TRANSPORTING, SPREADING AND FINISHING

Add the following to the end of the third paragraph:

“The Engineer may increase the asphalt content of the first lift by up to 0.3 percent when the HMA mixture is placed directly on a prepared subgrade.”

Add the following paragraph after the fourth paragraph:

“The first lane of the first lift of the HMA base course shall be started at the center of the pavement with a taut stringline (guide wire) set to grade at both sides of the paver. The automatic grade control system of the paver shall be used to control grade of both sides of the paver from these reference stringlines. The grade control for the adjacent lanes of pavement shall be maintained by using a matching shoe with the previous laid pavement and a stringline on the outer edge of the next lane. A stringline and matching shoe shall be used to pave all remaining lanes of the first lift of base course. If grade is established on the first lift, succeeding lifts shall be laid with a traveling ski on both sides of the paver for the center lane with matching shoe and traveling ski on adjacent lanes. If grade is not established on the first lift, the Resident Engineer shall require taut stringline references until satisfactory grade is established.”

#### 201-4.10 COMPACTION OF MIXTURE

Delete the third paragraph and substitute the following:

“Sufficient rollers shall be used to handle the output of the plant. Rolling shall continue until all roller marks are eliminated producing a surface of uniform texture true to grade and cross section.

The Contractor shall provide, at all times, an approved Troxler (or equal) nuclear density gauge with a qualified operator to maintain quality control of the density as specified herein.”

#### 201-4.11 JOINTS

Add the following as the fourth paragraph for this section:

All longitudinal joints constructed are to be compacted in such a manner that they are “pinched” to provide adequate density at the joint. The method of “pinching” shall be as defined in Article 406.16 on compaction of HMA concrete in the most current issue of the I.D.O.T. Standard Specifications for Road and Bridge Construction. The Contractor shall cut one core per 2,500 tons or one per project at a random location over the longitudinal construction joint. The core shall be delivered to the Resident Engineer for density testing. The density at the joint shall be a minimum of 90%.

201-4.13    ACCEPTANCE TESTING OF HMA MIXES FOR DENSITY

Delete this entire section and insert the following:

“201-4.13 ACCEPTANCE TESTING OF HMA MIXES FOR DENSITY.

After the completion of compaction, the pavement will be tested and accepted on the basis of percent air voids in the final compacted mat. The HMA base course shall be compacted to a minimum density of 93 percent (7 percent air voids) of the Maximum Theoretical Specific Gravity (ASTM D 2041). If, during construction, the density test falls below 93 percent, additional approved rollers shall be required.

Two random nuclear density tests shall be taken for each 500 tons of mix placed. Each nuclear density test shall be the average of five (5) nuclear tests taken as a cross-section of the pavement. The Resident Engineer shall have a nuclear gauge and qualified operator on the project when constructing this item. One random mix sample shall be taken from each 1,000 tons of mix laid, for Marshall, Extraction, Maximum Specific Gravity, and Air Void tests.”

201-4.15    SAMPLING PAVEMENT

Delete this section.

201-6.1    Payment will be made under:

Item AR201610 -- Bituminous Base Course -- per ton.  
Item AR201620 -- Bituminous Base Course, Leveling -- per ton.

**3.) Revise the Section III Special Provisions as follows:**

Page 17, Section 201666-2.2 Base Course Material:

Rewrite this section of the Special Provisions to Read:

“201666-2.2 BASE COURSE MATERIAL. The bituminous base course material used for base course crack repair shall conform to the applicable portions of the Recurring Special Provision for Item AR201001 Bituminous Base Course – Method 1 and the applicable portions of Item 201 of the Standard Specifications for Construction of Airports. Marshall Design Criteria conforming to the Table 2 properties criteria for aircraft under 60,000 lbs. shall be utilized. The aggregate used shall meet the requirements of the Recurring Special Provision for Item AR201001 Bituminous Base Course – Method 1 (Check Sheet No. 11) and IDA Policy Memorandum 96-2 dated January 15, 2007.

Recyclable asphalt pavement (RAP) shall not be used in the mixture for this project.