

Special Provision
901-S-401-2
Plant Mix Pavements (HMA)--General
Marshall Design Mixtures
Project No. _____
_____ County

OFFICE OF STATE AID ROAD CONSTRUCTION
MISSISSIPPI DEPARTMENT OF TRANSPORTATION

DATE: February 5, 2008

SUBJECT: Hot Mix Asphalt (HMA) Pavements – Marshall Mixtures

The MISSISSIPPI STANDARD SPECIFICATIONS FOR STATE AID ROAD AND BRIDGE CONSTRUCTION, 2004 EDITION is hereby supplemented as follows:

Section S-401 – Plant Mix Pavements (HMA) – General, of the Mississippi Standard Specifications for State Aid Road and Bridge Construction, 2004 Edition, is hereby amended as follows and is applicable for HMA mixtures designed using the Marshall Method.

SECTION 901-S-401 –HOT MIX ASPHALT (HMA) Marshall Mixtures

Delete Subsection S-401.01 and replace with the following:

901-S-401.01--Description. This work consists of the construction of one or more lifts of hot mix asphalt (HMA) designed and controlled using the Marshall Method in accordance with these specifications and the specific requirements for the mixture to be produced and in reasonably close conformity with the lines, grades, thicknesses and typical sections shown on the plans or established by the Engineer.

It is the intent of this special provision to only revise those sections of S-401 which would not be applicable for mixtures designed by the Marshall Method. Those sections in the Mississippi Standard Specifications for State Aid Road and Bridge Construction, 2004 Edition, not addressed or revised herein or otherwise applicable to Marshall Method designed mixtures shall remain in force as written or shall not be considered applicable to this special provision. Where conflicts exist between this special provision and the standard specifications, this special provision shall govern for mixtures designed and placed by the Marshall Method.

Delete Subsection S-401.02.1.2 -- Aggregates in toto and replace with the following:

901-S-401.02.1.2--Aggregates. The source of the aggregates shall meet the applicable requirements of S-703, Subsections 901-S-401.02.1.2.1, 901-S-401.02.1.2.2 and 901-S-401.02.1.2.3 below, and as specified herein.

The several aggregate components, including mineral filler and other materials when required, shall be sized, uniformly graded, and combined in such proportions that the resulting mixture meets the gradation requirements of the specific type mixture under contract. Pre-mixing of aggregate fractions by controlled methods may be permitted to produce a more workable component which contributes to the gradation requirements of the job-mix formula. Bituminous material within the percentage limits designated for the specific type mixture shall be combined with the other components of the mixture.

The HMA mixture shall conform to the types set forth in 901-S-401.02.1.2.3.2, Table A. The type of mixture is the Contractor's option except when a specific type or types are designated in the contract.

The overall limits set out in 901-S-401.02.1.2.3.2, Table B, encompass the extreme limits for material or combinations of materials from all possible sources, and closer controls appropriate to the job materials shall be established for each specific mixture required under any contract in accordance with a job-mix formula established as set out in 901-S-401.02.3.2 below.

901-S-401.02.1.2.1--Coarse Aggregate (Material Retained on No. 8 Sieve).

Bituminous Base (BB-1)

Coarse aggregate shall be crushed stone, slag or granite; shell; expanded clay; expanded shale; crushed gravel (or combination of crushed and uncrushed) or combination thereof as set forth in Table A of 901-S-401.02.1.2.3.2. Crushed reclaimed concrete pavement shall also be allowed as a coarse aggregate provided it meets the quality requirements below and the final product produced therefrom meets all other specification requirements.

Individual sources of coarse aggregate shall conform to the following quality requirements:

1. Percentage of wear shall not exceed 45 when tested in accordance with AASHTO Designation: T 96.
2. Except for expanded clay and shale, the coarse aggregate shall have a minimum dry rodded unit weight of 70 pounds per cubic foot when tested in accordance with AASHTO Designation: T 19.
3. The coarse aggregate shall be free of any injurious coating which will prohibit the adherence of asphalt to the aggregate particles.

Coarse aggregate when combined with other aggregate fractions in the proper proportions shall conform to the requirements of 901-S-401.02.1.2.3.1 and the job-mix formula.

Leveling, Binder, and Surface Courses

Coarse aggregate shall be crushed gravel (or combination of crushed and uncrushed gravel), slag, stone or granite; shell; expanded clay; expanded shale or combination thereof as set forth in TABLE A of 901- S-401.02.1.2.3.2. Crushed reclaimed concrete pavement shall also be allowed as a coarse aggregate provided it meets the quality requirements below and the final product produced therefrom meets all other specification requirements.

With written permission of the Engineer, the specified surface course may be substituted for an underlying course. In this case, any crushed coarse aggregate or blend of crushed coarse aggregates without regard to a particular type of mix may be used. Provided, however, that the

aggregates and the resulting mixture meet all other requirements for specified surface course including crushing and fractured face requirements. Surfaces mixtures (SC-2) shall not be allowed in lower courses with the exception of thin leveling sections.

The percentage of wear shall not exceed 45 when tested in accordance with AASHTO Designation: T 96.

When tested in accordance with AASHTO Designation: T 19, the dry rodded unit weight of all aggregates except expanded clay and shale shall not be less than 70 pounds per cubic foot, and crushed slag used in the surface course shall have a dry rodded unit weight of not more than 90 pounds per cubic foot except the maximum unit weight is waived for chromium slag.

The coarse aggregate shall be free of any injurious coating which will prohibit the adherence of asphalt to the aggregate particles.

For surface course, the percent of thin or elongated pieces shall not exceed 15 by weight when tested in accordance with S-703.01, and the percentage of loss shall not exceed 20 when tested for soundness using magnesium sulfate in accordance with AASHTO Designation: T 104.

Crushed gravel, Class III, shall be the product resulting from crushing gravel aggregate of which no less than 98 percent is retained on the 3/8-inch sieve prior to crushing, and after crushing 100 percent passes the 3/8-inch sieve and no less than 65 percent passes the No. 4 sieve.

Shell shall consist of durable, washed particles of dead clam or dead reef oyster shell, or combination thereof. The shell shall be free of objectionable matter such as sticks, mud, clay lumps, cannery or live shell, or other deleterious matter. Not more than five percent by weight of the dredged material shall pass the No. 200 sieve; any such material shall be dispersed throughout the mass.

901-S-401.02.1.2.2--Fine Aggregate (Material Passing the No. 8 Sieve).

Bituminous Base (BB-1)

Fine aggregate shall consist of hard, durable particles of naturally disintegrated rock, or material obtained by crushing stone, slag, gravel, reclaimed concrete pavement or combinations thereof. Fine aggregate, when manufactured, shall be manufactured from material meeting the quality requirements for coarse aggregate, and it shall be free of lumps of clay and friable particles, loam, organic or foreign matter.

Individual sources of fine aggregate shall be non-plastic when tested in accordance with AASHTO Designation: T 90.

Natural deposits of fine aggregate shall contain no more than 10 percent by weight passing the No. 200 sieve when tested in accordance with AASHTO Designation: T 11.

When the fine aggregate is combined with other aggregate fractions in the proper proportion, the resultant mixture shall meet the requirements of 901-S-401.02.1.2.3.3 and the job-mix formula.

Fly ash, when used as a portion of the fine aggregate, shall be from an approved source.

Leveling, Binder, and Surface Courses

Fine aggregate shall consist of hard, durable particles of naturally disintegrated rock; material obtained by crushing stone, slag or gravel; stone or slag screenings; reclaimed concrete pavement; or combinations thereof. The amount of uncrushed fine aggregate permitted in the combined aggregate blend shall conform to the limitations in 901-S-401.02.1.2.3. Fine aggregate shall be free of lumps of clay and friable particles, loam, organic or foreign matter.

Fine aggregate produced by crushing stone, slag or gravel shall be manufactured from aggregate meeting the quality requirements of coarse aggregate.

Individual sources of fine aggregate shall be non-plastic when tested in accordance with AASHTO Designation: T 90.

Natural deposits of fine aggregate shall contain no more than 10 percent by weight passing the No. 200 sieve when tested in accordance with AASHTO Designation: T 11.

Individual fine aggregate components shall be of such consistency and dryness that a uniform and even flow from the cold feed will be provided.

Fine aggregate when combined with other aggregate fractions in the proper proportions shall meet the requirements of 901-S-401.02.1.2.3 and the job-mix formula.

Fly ash, when used as a portion of the fine aggregate to obtain desired properties of the mixture, shall be from an approved source.

901-S-401.02.1.2.3--Combined Aggregate Blend.

901-S-401.02.1.2.3.1--General. The several aggregate fractions for the mixture shall be sized, graded and combined in such proportions that the resultant composite blend will meet the gradation requirements of 901-S-401.02.1.2.3.2, TABLE B.

The minus No. 40 fraction of the combined aggregate shall be non-plastic when tested according to AASHTO Designation: T 90. The clay content for bituminous base, leveling and binder courses shall not exceed 1.0 percent, and for the surface course shall not exceed 0.5 percent by weight of the total mineral aggregate when tested according to AASHTO Designation: T 88.

Mineral filler and/or fly ash, when used to obtain desired properties of the mixture shall not exceed 3.0 percent by weight of the total aggregate blend.

The ratio, by weight, of dust (material passing No. 200 sieve) to asphalt binder shall be not less than 0.8 nor more than 1.6.

Of all the material passing the No. 8 sieve and retained on the No. 200 sieve, not more than 60 percent shall pass the No. 30 sieve.

At least 70 percent by weight of the combined mineral aggregate retained on the No. 4 sieve shall have one or more mechanically fractured faces for bituminous base courses.

At least 80 percent by weight of the combined mineral aggregate retained on the No. 4 sieve shall have one or more mechanically fractured faces for bituminous leveling and binder courses.

At least 90 percent, by weight, of the combined mineral aggregate retained on the No. 4 sieve shall have two or more mechanically fractured faces for bituminous SC-1 Surface Mixtures.

Uncrushed natural sand shall pass the 3/8-inch sieve and the content shall not exceed 20 percent by weight of the total mineral aggregate except for RAP.

901-S-401.02.1.2.3.2--Tables.

TABLE A specifies the types and coarse aggregate combinations for bituminous base and pavements.

TABLE B specifies the gradations of the combined aggregates for bituminous bases and pavements. The job-mix formula, excluding allowable tolerances in TABLE C, shall be within the limits of TABLE B. Unless otherwise designated on the plans or in the contract documents, the gradation number shall be as follows:

- Bituminous Base: Number BB-1
- Leveling and Binder Course: Number BC-1
- Surface Course and Leveling: Number SC-1 and SC-2

TABLE C lists the maximum tolerances allowed for any one test of gradation and asphalt content from the job-mix formula.

TABLE D lists the minimum percent Voids in Mineral Aggregate (VMA) allowed for design and plant produced mixtures.

TABLE A

OPTIONAL AGGREGATE TYPES

Type Construction	Bituminous Base Course	Leveling and Binder Courses	Surface Course
Coarse Aggregate:	Mixture Type Number		
Crushed Limestone	1	1	
Crushed Slag	2	2	
Crushed Granite	3	3	
Shell	4	4	
Expanded Clay or Expanded Shale	5	5	
Crushed Gravel or combination of crushed and uncrushed gravel combined with any coarse aggregate (Note 1)	6	6	
Crushed Gravel or combination of crushed and uncrushed gravel combined with Limestone or Slag (Notes 1 & 2)	7	7	
Crushed Gravel combined with Limestone or Slag (SC-1) (Note 3)			8
or			
Crushed Gravel (Class III) combined with Limestone or Slag (SC-2) (Note 3)			8
Crushed Gravel (Class III) (SC-2) (Note 4)			9

Note 1: At least 70% for bituminous base courses and 80% for bituminous leveling and binder courses by weight of the combined mineral aggregate retained on the No. 4 sieve shall have one or more mechanically fractured faces.

Note 2: At least 20% of the total combined aggregate by weight shall be limestone or slag.

Note 3: 20 to 50% of the total combined aggregate by weight shall be limestone or slag of

which 20 to 45% shall pass the No. 8 sieve. Used for SC-1 or SC-2 Mixes.

Note 4: Type 9 may be used only when designated or specified as an optional type in the contract. Used for SC-2 only.

TABLE B

**DESIGN MATER RANGE
Precent by Weight Passing Sieves**

Number	BB-1	BC-1	SC-1	SC-2
Sieve Size:				
1 ½ inch	100			
1 inch	83-100			
¾ inch		100		
½ inch	56-95	82-100	100	
3/8 inch		71-91	87-100	100
No. 4	29-70	40-73	54-80	69-100
No. 8	19-54	26-58	32-63	47-95
No. 16				30-76
No. 30	8-30	9-30	12-33	18-58
No. 50	4-20	6-20	6.-20	9-42
No. 200	2-10	2-10	2-10	4-10
Min. % A.C. by Wt. of Mix.*	4.0	4.0	4.0	4.0

* The actual percent of asphalt will be designated in the job-mix formula.

TABLE C

**TOLERANCES FROM JOB-MIX FORMULA
(Maximum for Any One Test)**

Sieve Sizes	Tolerances Percent (±)
Passing 3/8 inch and larger sieves	6
Passing Nos. 4, 8, and 16 sieves	5
Passing Nos. 30 and 50 sieves	4
Passing No. 200 sieve	1.5
Percent Asphalt Cement	0.4
Voids in Mineral Aggregate (VMA)	1.0

TABLE D

MINIMUM VOIDS IN MINERAL AGGREGATE (VMA)

Nominal Maximum Size*	VMA Minimum Percent
No. 4	17.0
3/8 Inch	15.0
1/2 Inch	14.0
3/4 Inch	13.0
1 Inch	12.0

Delete Subsection S-401.02.1.4 and replace with the following:

901-S-401-02.1.4--Miller Filler. Mineral filler shall meet the requirements of S-703.16.

Delete Subsection S-401.02.1.6--Asphalt Admixtures in toto and replace with the following:

901-S-401-02.1.6--Asphalt Admixtures. Additives for liquid asphalt, when required or permitted, shall meet the requirements of S-702.08, except that the minimum Tensile Strength Ratio (TSR) when tested in accordance with Mississippi Test Method MT-63 shall be 85.

901-S-401-02.3.1--Replace table for RAP percentages allowed with the following:

HMA Mixture	Maximum percent RAP By total weight of mix
BB-1	30
BC-1	30
Leveling	30
SC-1	15

Delete Subsection S-401.02.3.1.1--Mixture Properties in toto and replace with the following:

901-S-401-02.3.1.1--Mixture Properties. Marshall Stability of proposed HMA mixtures, when tested in accordance with Mississippi Test Method: MT-34, Marshall Stability Values of Compacted Bituminous Mixtures, shall be 1500 pounds for base, leveling, and binder mixtures and 1800 pounds for surface mixtures when subjected to seventy-five (75) blows of a Standard Marshall Hammer on each end of the specimen and tested at a temperature of 140°F.

The total percent air voids in the completed mixture shall be within the range of 3-5.

The ratio, by weight, of dust (material passing the No. 200 sieve) to asphalt binder shall not be less than 0.8 nor more than 1.6 for all mixtures.

Delete Subsection S-401.02.3.2--Job Mix Formula in toto and replace with the following:

901-S-401.02.3.2--Job Mix Formula. The job mix formula shall be established in accordance with Mississippi Test Method MT-35.

The job-mix formula for each mixture shall establish a single definite percentage of aggregate, including mineral filler, hydrated lime, and other materials when required, passing each required sieve size, and a single definite percentage of bitumen to be added to the aggregate and a single definite temperature at which the mixture is to be discharged from the mixer.

At least fifteen (15) days prior to the proposed use of each mixture to be supplied and placed under the contract, the Contractor shall submit in writing to the Engineer for his approval, a single (one) proposed job-mix formula or request the transfer of a verified job-mix formula for each mixture. The job-mix formula shall be signed by a Certified Mixture Design Technician (CMDT).

Prior to the use of each such mixture, the Contractor shall make available materials, conforming to the material specifications and proposed for use in the mixture, for sampling and testing by a State Aid approved laboratory, as the Engineer may consider necessary to determine approval or disapproval of the Contractor's job-mix formula, or the establishment of a proposed job-mix formula by the Engineer in lieu thereof. The following information shall be forwarded for each mix submitted.

- (1) The specific project for which the mixture will be used.
- (2) The source and description of each material component (virgin & reclaimed) to be used in the mixture.
- (3) A sample of each component (including anti-stripping agent) proposed in the mixture.
- (4) The gradation and proportions of the materials to be combined in the mixture.
- (5) A percentage of the combined aggregates passing each specified sieve and a graphical plot of the combined aggregate gradation on a 0.45 power chart shall be attached. A percentage of asphalt by weight of the total mix intended to be incorporated in the completed mixture.
- (6) A proposed temperature at which the mixture is intended to be discharged from the plant.
- (7) A copy of the current temperature viscosity curve for the asphalt binder used in the mix.
- (8) The name of the Contractor's representative responsible for the quality control of the mixture during production.
- (9) Accompanying design curves and other laboratory test data to show that the completed mixture will conform to the requirements for stability, flow, workability, density, and all other criteria specified in the contract.

A State Aid approved laboratory will perform the tests necessary for verification of a proposed job-mix formula or transfer for each required mixture at no charge to the Contractor; however, a charge will be made for additional job-mix formulas submitted by the Contractor for review. The Contractor will be charged for the tests conducted on submitted materials that will not blend into an approvable job-mix formula and the materials submitted for additional job-mix formulas. Likewise, the Contractor will be charged for any additional transfers of approved mixes after

tentative approval of a mix for a particular course has been given. Where the Contractor requests more than one job-mix for any course, only the job-mix used on the project will be furnished at no charge to the contractor.

In the case of a small quantity, under 200 tons, for a single pay item of bituminous mixture, as indicated in the proposal, is produced and supplied by an established plant, the approval of a job-mix formula shall be at the discretion of the Engineer, based on known satisfactory production of similar mixes made from materials previously tested and approved for other work; or, at the discretion of the Engineer, tested and approved for the work for which the job-mix formula is under consideration. Acceptance of the job-mix formula shall, also, be contingent upon proper placement qualities at the time the mixture is used in the work.

In the event the Contractor fails to submit a proposed job-mix formula sufficiently in advance of its proposed use for the Engineer to determine approval or non-approval, a job-mix formula will be established by the Engineer at the earliest practical time.

In all cases, determination of the job-mix formula to be used will be made by the Engineer and will be based on resistance to stripping, stability, flow, VMA, total voids, workability, density, skid resistance, and any other criteria specified for the mixture complete in place; it will be based also on the materials submitted but if the specified or desirable properties cannot be obtained, other materials shall be submitted by the Contractor. It shall be fully understood that the amount of bitumen approved or established for the job-mix formula shall be determined by the Engineer as being that most compatible with the desired characteristics of the mixture and in consideration of the percentage of materials passing the No. 200 sieve. The ranges of the components of the HMA mixture set out in 901-S-401.02.1.2.3.2-Table "B" shall have no bearing upon the determination of the percentage established for the job-mix formula, except that no job-mix formula will be approved or established having permissible ranges outside of the master range for the particular mixture.

The job-mix temperature shall be the lowest temperature that is considered to be satisfactory to obtain the desired mixture.

No mixture will be accepted for use, nor shall any mixture be placed until the Engineer has established or approved a "tentative" job-mix formula for the particular mixture.

The job-mix formula thus approved or proposed from the laboratory test results shall be considered as "tentative" until a sufficient amount of the mixture has been actually processed through the plant, spread and compacted to determine by tests the necessity and effectiveness of corrections and adjustments to the plant operation, and to spreading and compaction procedures.

When a change in source of materials, unsatisfactory results or changed conditions make it necessary, a new job-mix formula will be required. The conditions set out herein for the original job-mix formula are applicable to the new job-mix formula.

The tentative job-mix formula, with its adjustments to plant operation and spreading and compaction procedure when required, will be considered as conditionally approved until it is rejected, or its approval is confirmed by the Engineer.

After approval of the tentative job-mix formula is confirmed by the Engineer, the mixture furnished for the project shall conform thereto within the range of tolerances specified for the particular mixture. No change in properties or proportions of any ingredient of the mix shall be made without permission of the Engineer. The job-mix formula for each mixture shall be in effect until revised in writing by the Engineer.

The approved job-mix formula may be transferred for use on other contracts under the conditions set out in the Office of State Aid Road Construction's S.O.Ps.

Delete Subsection S-401.02.4--Substitution of Mixture in toto and replace with the following:

901-S-401.02.4--Substitution of Mixture. Except as otherwise specified in the contract, any HMA mixture specified in the contract for a course required above the course being placed may be substituted in lieu of the mixture specified for the course being placed, provided the course constructed with the substituted mixture meets the composition and physical requirements, complete-in-place and accepted, for the mixture being used or for the mixture for which the substitution is being made, and will be measured and paid for as provided for the course being placed. Density requirements will be as specified for the course for which the substitution is made. Any substitution of mixtures shall be of the same type. No other substitutions will be allowed. The quantity of substituted mixture shall be measured and paid for at the contract unit price for the mixture designated on the plans. The substitution of any mixture will be contingent on meeting the required total structure thickness and maintaining the laying thickness for the particular substituted mixture. Unless designated otherwise in the contract, the minimum laying thickness of any HMA course shall be not less than twice the nominal maximum sieve size for the aggregate used.

Change the title for Subsection S-401.02.5--Contractor's Quality Management Program as follows:

901-S-401.02.5--Contractor's Quality Control.

Delete Subsection S-401.02.5.1--General in toto and replace with the following:

901-S-401.02.5.1--General. The Contractor shall have full responsibility for quality control. The Contractor shall provide and maintain a quality control system that will furnish reasonable assurance that the HMA mixtures as well as all component materials incorporated in the work conform to the contract requirements whether manufactured or produced by the Contractor or procured from suppliers of subcontractors. The Contractor shall have responsibility for the initial determination and all subsequent adjustments in proportioning materials to produce the specified job-mix and other physical characteristics. When quality control testing indicates a trend toward borderline values, the Contractor shall initiate immediate action to reverse the

trend. When quality control testing confirms non-conformance to specified values, the Contractor shall take immediate corrective action or cease operations.

The Contractor's quality control shall include the following:

1. Determination of fractured face content of aggregates retained on the No. 4 sieve for base, binder, leveling and SC-1 surface mixtures at a minimum of one test per day of production.
2. Moisture tests on aggregate stockpiles at a minimum of one test per half day of production.
3. Extraction tests for gradation determination at a minimum of one test per half day of production. Gradation tests of combined aggregates may be sampled from conveyor belt or other approved sampling methods.
4. Determination of stability, total voids, Voids in Mineral Aggregate (VMA) and bulk specific gravity on laboratory compacted Marshall Specimens at a minimum of one test per half day of production.
5. Asphalt content using nuclear gauge or ignition oven at a minimum of three tests per day of production.
6. Stripping tests at a minimum of one stripping test at the beginning of each job-mix production and thereafter, at least once per each two weeks of production according to Mississippi Test Method: MT-63 and one stripping test per day of production according to Mississippi Test Method: MT-59. Should either the TSR (MT-63) or the boiling water (MT-59) stripping tests fail, a new anti-strip additive or rate shall be established or other changes made immediately that will result in a mixture which conforms to the specifications; otherwise, production shall be suspended until corrections are made.
7. Density tests as necessary to verify compaction (minimum of 3 per day).
8. Quality control charts, up-to-date and posted in a readily observable location.

At the beginning of placement for each course, except for temporary work of short duration and bridge replacement projects having 500 linear feet or less of pavement on each side of a structure, the Contractor shall construct a test strip of a maximum four hours duration for the purpose of evaluating the properties of the HMA mixture and determining maximum compaction of the mixture. When there are multiple bridge sites on a bridge replacement project, each site will be considered separately. At least one density growth curve shall be established within the test strip. If the test results are satisfactory, as approved by the Engineer, operations may resume. If unsatisfactory, appropriate adjustments shall be made, or a new job-mix formula obtained, and another test strip shall be constructed.

The rolling pattern established during construction of the test strip is to be used by the Contractor as a guide. When conditions change, variation from the rolling pattern may be necessary to maintain specification requirements, in which case a new rolling pattern shall be established.

Delete Subsection S-401.02.5.3--Testing Requirements in toto.

Delete Subsection S-401.02.5.4--Documentation in toto.

Delete Subsection S-401.02.5.5--Control Limits in toto.

Delete Subsection S-401.02.5.6--Warning Limits in toto.

Delete Subsection S-401.02.5.8--Action and Adjustments in toto.

Delete Subsection S-401.02.6.1--General in toto and replace with the following:

901-S-401.02.6.1--General. Acceptance for mixture quality (VMA, total voids, asphalt content and stability) will be based on random samples tested in accordance with Subsection 901-S-401.02.6.2 and 901-S-401.02.6.3 below. Pavement densities and smoothness will be accepted by lots as set out in S-401.02.6.4, S-401.02.6.5 and S-403.03.2.

Delete Subsection S-401.02.6.2—Test for Mixture Quality in toto and replace with the following:

901-S-401.02.6.2--Test for Mixture Quality. The rounding of test results will be in accordance with S-700.04.

The mixture will be accepted at the plant with respect to VMA, total voids, asphalt content and stability based on tests of HMA mixture samples obtained from trucks and run by state certified technicians or State Aid approved laboratory. At least one sample will be obtained at random for each three hours' production or fraction thereof with a maximum of three samples for a full day's production. When a test fails to meet the specified requirements, the Contractor will be notified immediately and a verification test will be performed. If the verification test confirms the failure, the Contractor shall make the necessary corrections or adjustments to meet the specifications. If the next regularly scheduled random acceptance sample indicates that the failure has not been corrected, operations will be suspended until corrections or adjustments are made. Nonconforming mixture placed on the roadway prior to correcting will be accepted or rejected by the Engineer in accordance with S-105.03, and payment will be made as set out below in Subsection 901-S-401.02.6.3. The Engineer may increase the testing frequency as necessary to assure conformity to the specifications.

The Engineer will determine acceptability of the combined aggregate blend based on testing personnel extraction tests of bituminous mixture samples obtained from trucks. At least one sample will be obtained at random for each day of production. When characteristics of the mixture indicate a change in gradation, additional tests will be performed as necessary to insure conformance to gradation requirements. When gradation is out of tolerance, the Contractor shall make necessary corrections or adjustments to meet the job-mix formula. Gradation must be in tolerance within a maximum production time of three hours as evidenced by an additional test or operations shall be suspended.

The Engineer will determine conformance to the specifications for Class III crushed gravel for surface mixture (SC-2) prior to incorporation in the work. At least one test will be performed at random during each week's production. One test will include an analysis of the gradation prior to and after crushing. Such aggregate not meeting the crushing requirements of the specifications will not be permitted in the work.

The Engineer will determine conformance to the specification requirements for crushed aggregate in base, leveling, binder and SC-1 surface mixtures prior to approval of a job-mix formula, at beginning of production and thereafter, at least one random test during each week's

production. A failing test will be reported immediately, and the Contractor shall make necessary corrections. If the corrections are not made within a maximum production time of three hours, as evidenced by results of another test, production shall be suspended until corrections are made.

Delete Subsection S-401.02.6.3--Acceptance Procedure for Mixture Quality in toto and replace with the following:

901-S-401.02.6.3--Acceptance Procedure for Mixture Quality. All obviously defective material or mixture will be subject to rejection by the Engineer. Such defective material or mixture shall not be incorporated into the finished work.

Each course will be accepted by lots. Material produced and placed during test strip(s), for each course will be designated as separate lots. Otherwise, the size of a lot will be designated as a day's run unless terminated by the Engineer. When less than a day's production and one or more tests have been made for VMA, total voids, asphalt content and stability, the work will be considered a lot. When less than a day's production and no tests have been made for VMA, total voids asphalt content and stability, the work will be included in the previous lot.

The bituminous mixture will be tested in accordance with the following procedures:

1. Voids in Mineral Aggregate (VMA) will be calculated in accordance with Mississippi Test Method: MT-35 using the bulk specific gravity of the compacted specimen prior to testing for stability and the bulk gravities of the aggregate components shown on the mix design.
2. Total air voids in the compacted mixture will be determined in accordance with Mississippi Test Method MT-35 using the bulk specific gravity of the compacted specimen prior to testing for stability and the maximum specific gravity of the uncompacted mixture determined from field laboratory tests.
3. Stability--Mississippi Test Method: MT-34, Marshall Stability Values of Compacted Bituminous Mixtures.
4. Asphalt Content--Mississippi Test Method MT-6, Nuclear Determination of Bitumen Content of paving Mixtures, or Incinerator oven per AASHTO Designation: T 308, Method A.
5. Mixture Gradation--Mississippi Test Method MT-31.

6. Density—AASHTO Designation: T 166, Bulk Specific Gravity of Compacted Bituminous Materials, or Mississippi Test Method MT-16 (Method C), Nuclear Method for Field In-Place Density Determination, except leveling courses and temporary work of short duration will be determined only by AASHTO T 166. When test strip(s) are not required on bridge replacement projects, either AASHTO Designation: T 166 or Mississippi Test Method: MT-16 (Method C) will be used for density determination. (Note - The nuclear gauge shall be correlated with the average of five pavement sample densities.)
7. Extractions shall be run to determine acceptability of the combined aggregate blend of samples of the bituminous mixture obtained from trucks. At least one sample will be obtained at random for each day of production.

Bituminous mixture placed prior to correction for deficiencies in VMA, total voids, stability, or asphalt content, as required above, and determined by the Engineer in accordance with S-105.03 to be satisfactory to remain in place, will be paid for at 90% of the contract unit price.

Delete Subsection S-401.02.6.4--Acceptance Procedure for Density in toto and replace with the following:

901-S-401.02.6.4--Acceptance Procedure for Density. Each completed lift will be accepted with respect to compaction on a lot basis from density tests performed by the Engineer. Material produced and placed during test strip(s) for each course will be designated as separate lots. Otherwise, the lot will be designated as a day's production unless terminated by the Engineer. When less than a day's production and one or more tests have been made for each of the characteristics of VMA, total voids, asphalt content and stability, the work will be considered as a lot.

When less than a day's production and no tests have been made for each of the characteristics of VMA, total voids, asphalt content and stability, the work will be included in the previous lot. Each lot will be divided into five approximately equal sublots. One density test will be taken at a random location in each of the sublots in accordance with State Aid SOP. When a nuclear density test of a subplot does not meet specified density requirements, two additional tests will be taken within a one-square-yard area of the first test. The average of the three tests shall be the density of the subplot, except when removal of the subplot or a portion thereof is required as set out below. The average of the five subplot density tests will be the test value for the lot. Additional tests may be required by the Engineer to determine acceptance of work appearing deficient.

When determined that a lot density is below 92.0 percent but not lower than 90.0 percent of maximum density, the Contractor shall make the necessary correction to plant and/or mixture to conform to the specified density requirements. If the next lot or portion thereof, shows that corrections have not been made, the Contractor's operation will be suspended until such corrections are made. After a suspension of operations a new test strip will be required during which the Contractor shall develop a new rolling pattern for compaction to specification requirements. Payment for the mixture placed prior to making correction will be made as set out below.

When determined that the density of a subplot is below 90.0 percent of maximum density, the subplot or portion thereof with a density outside these limits shall be removed and replaced at no

additional cost to the project. The density will be verified from a pavement sample taken within a one-square yard area of the original nuclear gauge test and tested in accordance with AASHTO Designation: T 166 prior to requiring removal and replacement.

The limits of removal will be established from pavement sample densities. Any required removal shall be full lane width and not less than 50 feet in length. A corrected subplot will be tested for approval and determination of the average test value for the lot in accordance with State Aid SOP. No resampling will be performed when pavement samples are used for determining density.

When test strip(s) are not required on bridge replacement projects, either AASHTO Designation: T 166 of Mississippi Test Method: MT-16 will be used for density determination. (Note - The Nuclear gauge shall be correlated with the average of five pavement sample densities.)

When determined that a lot density is below 92.0 percent but not lower than 90.0 percent of maximum density, the Contractor will have the right to remove and replace the subplot or sublots not meeting specified density requirements in lieu of accepting reduced payment for the lot as determined in accordance with the provisions set out in the following paragraph.

Each lot of work found not to be in conformity with the density requirement of not less than 92.0 percent (92.0%) may remain in place with a reduction in payment as set out in the following table:

PAYMENT SCHEDULE FOR COMPACTION

<u>Pay Factor</u>	Lot Density*	<u>% of Maximum Density</u>
**		above 97.0
1.00		above 92.0
0.90		91.0 – 91.9
0.75		90.0 – 90.9

*Any lot, subplot or portion thereof with a density of less than 90.0 percent (90.0%) of maximum density shall be removed and replaced at no additional cost to the Project.

** Field density greater than 97 percent - Plant corrections and/or mixture corrections shall be made by the Contractor or operations will be suspended until corrections are made as provided in Subsections 901-S-401.02.6.1, 901-S-401.02.6.2, and 901-S-401.02.6.3. Mixtures placed prior to corrections or suspension will receive 100 percent pay.

Delete Subsection S-401.03.9 in toto.

After Subsection S-401.03.13--Pavement Samples add the following subsections:

901-S-401.03.14--Method of Measurement. Marshall Design Hot Mix Asphalt (HMA), complete-in-place and accepted, will be measured by the ton. The weight of the composite mixture shall be determined in accordance with the provisions of S-401.03.2.1.11.

Unless shown as a separate pay item, the furnishing and application of the tack coat will not be measured for payment. When payment is provided, tack coat will be measured as set out in S-407.06.

The quantity of HMA mixture required to correct the work, when made at the expense of the Contractor, will not be measured for payment.

Any excavation required for widening will not be measured for payment; the cost thereof shall be included in other items of work.

Undercut required by the Engineer will be measured for payment under the appropriate excavation item as provided in the contract or as extra work. Pavement removal and any required trenching will not be included in the measurement for undercut.

901-S-401.15--Basis of Payment. Subject to the adjustments set out in 901-S-401.02.6.3 and 901-S-401.02.6.4, Marshall Design Hot Mix Asphalt (HMA), complete-in-place, accepted, and measured as prescribed above, will be paid for at the contract unit price per ton for each lift of pavement specified in the bid schedule and shall be full compensation for completing the work.

901-S-401.03.15.1--Price Adjustment for Thickness Requirement. When grade stakes are eliminated as provided in S-403.03.3 and the average thickness of all cores from lots representing a day's production is more than 3/8 inch thicker than the total specified thickness of the pavement, excluding lift(s) placed using an established grade line, a lump sum reduction in payment for the surface lift of lots representing a day's production will be made as follows:

$$\begin{matrix} \text{(Individual Day's} \\ \text{L.S. Reduction)} \end{matrix} = \begin{matrix} \text{(Monetary Value of the Day's} \\ \text{Surface Lift Production)} \end{matrix} \times \frac{\text{(D - 3/8)}}{\text{ST}}$$

Where:

D = The day's average deviation from total pavement thickness shown on the plans excluding lift(s) placed using an established grade line.

ST = Specified thickness for lift

The total L.S. reduction for the project is the summation of the individual day's reductions in payment.

901-S-401.03.15.2--Pay Items.

Payment will be made under:

901-S-401-A: Hot Mix Asphalt Base Course, (BB-___) -- per ton

901-S-401-A (W): Hot Mix Asphalt Base Course, (Trench Widening), (BB-___), -- per ton

901-S-401-B: Hot Bituminous Pavement Leveling Course, (BC-___), (Type ___ -- per ton

901-S-403-C: Hot Bituminous Pavement Binder Course, (BC-___), (Type ___ --) per ton

901-S-403-D: Hot Bituminous Pavement Surface Course, (SC___), (Type ___ --) per ton