

ALABAMA ASPHALT PAVEMENT ASSOCIATION



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Alabama Asphalt Pavement Association

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Montgomery, AL 36104

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UNDERSTANDING AN ASPHALT JOB MIX FORMULA

SEPTEMBER 20, 2022

ASCE MONTGOMERY
BRANCH MEETING

What Is An Asphalt Job Mix Formula (JMF)?

- ▣ Approved Materials Recipe For Making A Specific Asphalt Mix.
- ▣ Mix Designed By Contractor And Submitted To ALDOT For Approval.

What Does An Asphalt Job Mix Formula (JMF) Look Like?



Kay Ivey
Governor

Alabama Department of Transportation
Materials Testing Report
Sample Card No: 38374 Sample Type: Job Control
Approval Date: 05/17/2021



John R. Cooper
Transportation Director

Contract ID: 20210129066

Project No: STPAA-HSIP-0014(549)

Prime Contractor: S. T. BUNN CONSTRUCTION COMPANY, INC.

Inspection Analysis of: SUPERPAVE, WEARING

Material Code: 424.02_001

Producer/Supplier:

Sampled From: STOCKPILE

Intended Use: SURFACE/U.BINDER/L.BINDER/BASE/PLW

Region/Area: Fayette

County: GREENE

Project Manager: Strawn, Larry - 11589

Sampled By: Vinson, Jackie - 11097

Date Sampled: 05/17/2021

Date Tested: 05/17/2021

Qty Represented: UNK

Gyratory Compactor (HMA4302D)

Lab Reference Number	GH-0130-21	Date Expires:	05/17/2023
Contractor's Address:	ST BUNN CONSTRUCTION CO., INC. 611 HELEN KELLER BLVD TUSCALOOSA, AL 35404	Date:	05/17/2021
Section:	424 A/B, C/D	Producer:	ST BUNN CONSTR. CO., INC.
Max. Size Aggregate:	1/2"	Plant:	ALL PLANTS
Metric Aggregate Size:	12.5MM	Intended Use:	**
		Binder Grade:	PG 67-22 HUNT
		Specific Gravity of AC:	1.037

% (Approx)	Description	I.D.#	Source	BPN-9
23	1/2" SLAG	1614	ST BUNN CONSTR.; TUSCALOOSA, AL	
19	SAND	1841	ST BUNN FOSTERS PIT; FOSTER, AL	
37	SANDSTONE SCRNS	1809	BUNN BROTHERS; BROOKWOOD, AL	
1	BAGHOUSE FINES		PLANT	
20	RAP		STOCKPILE #21-5-1	

Job Mix:		Other information:		Note:
Sieves	% Passing	% AC Required	5.70*	
1 1/2" (37.5 mm)		AC Req'd/Ton, lbs/MT, kg	114.0 57.0	
1" (25.0 mm)		Max. Sp. Gr. Mix	2.588	*4.60% PG 67-22
3/4" (19.0 mm)		Wt., lbs/Mass, kg/m ³	154.8 248.0	must be added to the mix. The remaining 1.10% comes from the RAP. comes from RAS.
1/2" (12.5 mm)	100	TSR	0.84	
3/8" (9.5 mm)	100(-)	Anti-Strip	0.25	
#4 (4.75 mm)	73	EVOTHERM		#Gyrations: 60 %Gmm: 95.8
#8 (2.36 mm)	47	Effective AC	5.32	
#16 (1.18 mm)	35	Dust/Asphalt Ratio	1.15	Additional Notes:
#30 (600 μm)	27	Coarse Agg. Angularity	99/96	MIXING TEMP 325°F GH-0130-21 **SURFACE/UPPER BINDER/LOWER BINDER/BASE/PATCHING, LEVELING, WIDENING
#50 (300 μm)	16	Fine Agg. Angularity	45	
#100 (150 μm)	9	Agg Bulk SG	2.815	
#200 (75 μm)	6.1	% VMA	17.4	CT INDEX: 72.3 HT-IDT (PSI): 82.7

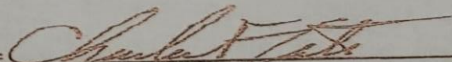
Hot-Mix Asphalt Engineer:

Materials Engineer Approval:

Pay Items: 424A336, 424A336

Standard Remarks: This material has been tested in accordance with ALDOT specifications.

Approved By: Cato, Charlie - 11098

Signature: 
Armstead, William - 13377
Testing Engineer

Information On An Asphalt Job Mix Formula (JMF)

JMF - Basic Information

- ▣ Project Number.
- ▣ ALDOT Region / Area.
- ▣ County.
- ▣ Prime Contractor.
- ▣ Producer.
- ▣ Prime Contractor And Producer May Be Different.
- ▣ Asphalt Plant (ALDOT Approved Plant) (ALDOT List I-5).
- ▣ ALDOT Approval Signature.



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Region/Area: Fayette
County: GREENE

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Date: 05/17/2021

611 HELEN KELLER BLVD

Producer: ST BUNN CONSTR. CO., INC.

TUSCALOOSA, AL 35404

Plant: ALL PLANTS

Section: 424 A/B, C/D

Intended Use: **

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Metric Aggregate Size: 12.5MM

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Signature:

Charles F. Armstead

Armstead, William - 15377
Testing Engineer

JMF - Mix Information

- ▣ Mix Type (ALDOT Section).
- ▣ ESAL Range.
- ▣ Mix Size (Maximum Aggregate Size).
- ▣ Intended Use Of Mix (Wearing, Binder, Base, Patching, Leveling, Widening, Etc.).



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Region/Area: Fayette
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Pay Items: 424A336, 424A336
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Signature:
 Armstead, William - 13377
 Testing Engineer

Mix Types

- ▣ Dense Graded (Section 327 – Bituminous Base And Section 424 – Superpave).
- ▣ Stone Matrix Asphalt (Section 423 – SMA).
- ▣ Open Graded (Section 327 – PATB And Section 420 – OGFC).

ESAL Definition

- ▣ Equivalent Single Axle Load.
- ▣ 18,000 Pound Load.
- ▣ Pavement Designs.
- ▣ Trucks Not Cars Cause Pavement Damage.
- ▣ Pavement Thickness Greatly Controlled By Number And Weight Of Trucks.

ALDOT ESAL Designations

ESAL Designation	Calculated 20 Year ESALs
ESAL Range A/B	0 - 1,000,000
ESAL Range C/D	1,000,000 - 10,000,000
ESAL Range E	10,000,000 - 30,000,000
Section 423 (SMA)	Greater Than 30,000,000

Definitions

- ▣ Maximum Aggregate Size Is Defined As The Smallest Sieve Through Which 100 Percent Of The Aggregate Particles Pass.
- ▣ Nominal Maximum Aggregate Size Is Defined As The Largest Sieve That Retains Some Of The Aggregate Particles, But Generally Not More Than 10 Percent.

JMF - Mix Information

- ▣ Mix Materials.
- ▣ Material Description.
- ▣ Material Percentage (Total Must Be 100%).
- ▣ Material ID #And Source (ALDOT Approved Producer And Material) (ALDOT List I-1 For Coarse Aggregates And Fine Aggregates).



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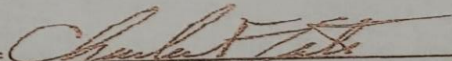
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Hot-Mix Asphalt Engineer:

Materials Engineer Approval: _____

Pay Items: 424A336, 424A336
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Approved By: Cato, Charlie - 11098

Signature: 
Armstead, William - 13377
Testing Engineer

Fine Aggregate And Coarse Aggregate Definitions

- ▣ Coarse Aggregate Is Aggregate Retained On The No. 4 Sieve.
- ▣ Fine Aggregate Is Aggregate Passing The No. 4 Sieve.

Recycled Asphalt Pavement (RAP)

- ▣ For Wearing Surface Layers, Up To 20% RAP May Be Used In Asphalt Mixes.
- ▣ For Binder And Base Layers, Up To 35% RAP May Be Used In Asphalt Mixes.
- ▣ For Some Mixes Greater Than 35% RAP Has Been Used With Excellent Results.
- ▣ Working On Specifications For 100% RAP Mixes.

Recycled Asphalt Pavement (RAP)

- ▣ For Permeable Asphalt Treated Base (PATB), No RAP May Be Used In Asphalt Mixes.
- ▣ For Open Graded Friction Course (OGFC), No RAP May Be Used In Asphalt Mixes.

JMF - Mix Information

- ▣ Percent Passing Individual Sieves For Total Mix.
- ▣ Mix Gradation.



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1/2" Mix (Section 424)

Sieve Size	1/2" Mix (Section 424) % Passing	Project JMF % Passing
1/2"	100	100
3/8"	90 - 100	100
#4	32 - 90	73
#8	32 - 67	47
#200	2 - 10	6.1

JMF - Mix Information

- ▣ Liquid Asphalt Binder Grade And Source.
- ▣ ALDOT Approved Liquid AC Source (ALDOT List I-4).
- ▣ % Liquid AC Required.
- ▣ % Effective AC.
- ▣ % Virgin AC And % RAP AC.



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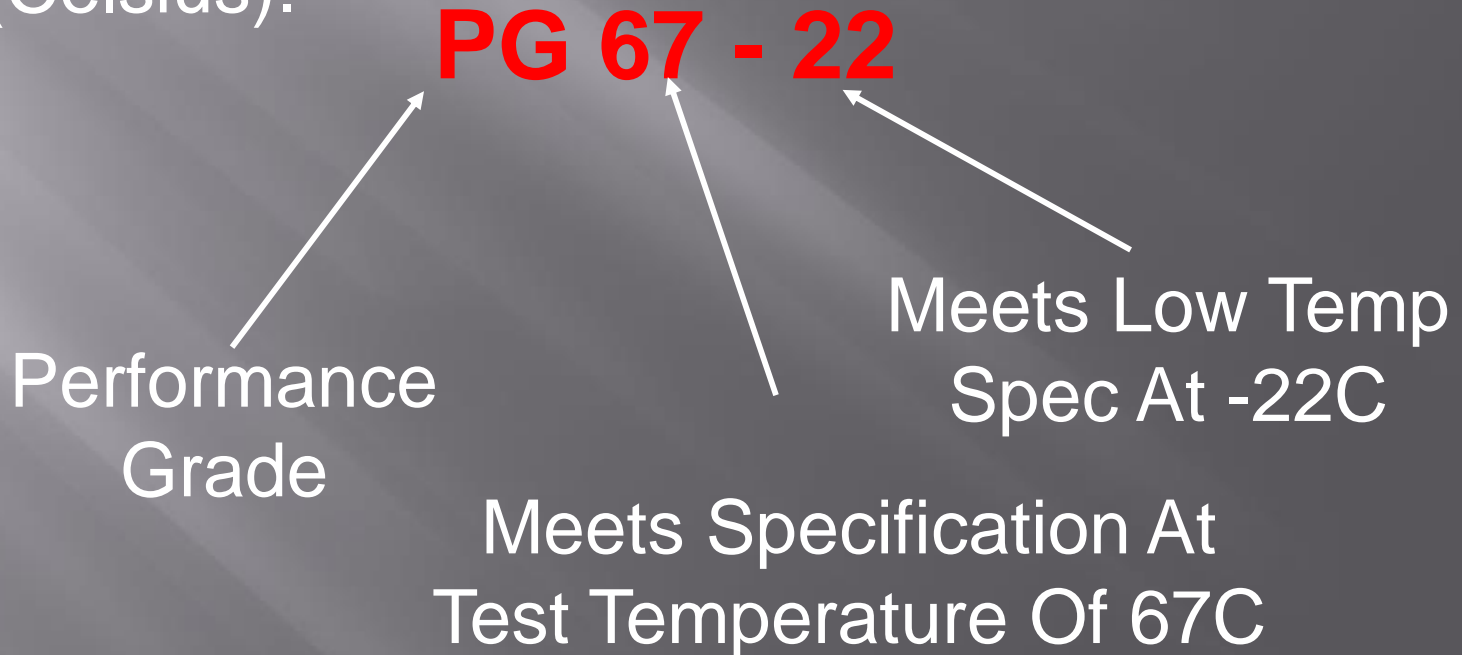
Signature:
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Superpave Asphalt Binder Specification

PG Grades Are Designated By Their High And Low Temperature Limits (Celsius).

PG 67 - 22

Performance
Grade



Meets Specification At
Test Temperature Of 67C

Meets Low Temp
Spec At -22C

PG Grade Selection For Alabama

- ▣ Section 424 Mixes , ESAL Ranges A-D :
PG 67-22.
- ▣ Section 424 Mixes , ESAL Range E :
PG 76-22.
- ▣ Section 327 Mixes : PG 67-22.
- ▣ Section 420 Mixes : PG 76-22.
- ▣ Section 423 Mixes : PG 76-22.

Why % Liquid AC Required And % Effective AC?



JMF - Mix Information

- ▣ Coarse Aggregate Angularity.
- ▣ Fine Aggregate Angularity.



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Sample Card No: 38374 Sample Type: Job Control
Approval Date: 05/17/2021



John R. Cooper
Transportation Director

Contract ID: 20210129066

Project No: STPAA-HSIP-0014(549)

Prime Contractor: S. T. BUNN CONSTRUCTION COMPANY, INC.

Inspection Analysis of: SUPERPAVE, WEARING

Material Code: 424.02_001

Producer/Supplier:

Sampled From: STOCKPILE

Intended Use: SURFACE/U.BINDER/L.BINDER/BASE/PLW

Region/Area: Fayette

County: GREENE

Project Manager: Strawn, Larry - 11589

Sampled By: Vinson, Jackie - 11097

Date Sampled: 05/17/2021

Date Tested: 05/17/2021

Qty Represented: UNK

Gyratory Compactor (HMA4302D)

Lab Reference Number GH-0130-21

Date Expires: 05/17/2023

Contractor's Address: ST BUNN CONSTRUCTION CO., INC.

Date: 05/17/2021

611 HELEN KELLER BLVD

Producer: ST BUNN CONSTR. CO., INC.

TUSCALOOSA, AL 35404

Plant: ALL PLANTS

Section: 424 A/B, C/D

Intended Use: **

Max. Size Aggregate: 1/2"

Binder Grade: PG 67-22 HUNT

Metric Aggregate Size: 12.5MM

Specific Gravity of AC: 1.037

% (Approx)	Description	I.D.#	Source	BPN-9
23	1/2" SLAG	1614	ST BUNN CONSTR.; TUSCALOOSA, AL	
19	SAND	1841	ST BUNN FOSTERS PIT; FOSTER, AL	
37	SANDSTONE SCRNS	1809	BUNN BROTHERS; BROOKWOOD, AL	
1	BAGHOUSE FINES		PLANT	
20	RAP		STOCKPILE #21-5-1	

Job Mix:		Other information:		Note:
Sieves	% Passing	% AC Required	5.70*	
1 1/2" (37.5 mm)		AC Req'd/Ton, lbs/MT, kg	114.0 57.0	
1" (25.0 mm)		Max. Sp. Gr. Mix	2.588	*4.60% PG 67-22
3/4" (19.0 mm)		Wt., lbs/Mass, kg/m ³	154.8 2480.	must be added to the mix. The remaining 1.10% comes from the RAP. comes from RAS.
1/2" (12.5 mm)	100	TSR	0.84	
3/8" (9.5 mm)	100(-)	Anti-Strip	0.25	
#4 (4.75 mm)	73	EVOTHERM		#Gyrations: 60 %Gmm: 95.8
#8 (2.36 mm)	47	Effective AC	5.32	
#16 (1.18 mm)	35	Dust/Asphalt Ratio	1.15	
#30 (600 μm)	27	Coarse Agg. Angularity	99/96	Additional Notes:
#50 (300 μm)	16	Fine Agg. Angularity	45	MIXING TEMP 325°F GH-0130-21 **SURFACE/UPPER BINDER/LOWER BINDER/BASE/PATCHING, LEVELING, WIDENING
#100 (150 μm)	9	Agg Bulk SG	2.815	
#200 (75 μm)	6.1	% VMA	17.4	CT INDEX: 72.3 HT-IDT (PSI): 82.7

Hot-Mix Asphalt Engineer:

Materials Engineer Approval:

Pay Items: 424A336, 424A336

Standard Remarks: This material has been tested in accordance with ALDOT specifications.

Approved By: Cato, Charlie - 11098

Signature:

Armstead, William - 13377
Testing Engineer

Coarse Aggregate Angularity

- ▣ For ESAL Range C/D Wearing Surface Mix.
- ▣ Required CAA Of At Least 85/80.
- ▣ 85% Has At Least One Fractured Face And 80% Has Two Or More Fractured Faces.

Fine Aggregate Angularity

- ▣ For ESAL Range C/D Wearing Surface Mix.
- ▣ Required FAA Of At Least 45.

JMF - Mix Information

- ▣ % VMA.



Kay Ivey
Governor

Alabama Department of Transportation
Materials Testing Report
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Material Code: 424.02_001

Producer/Supplier:

Sampled From: STOCKPILE

Intended Use: SURFACE/U.BINDER/L.BINDER/BASE/PLW

Region/Area: Fayette

County: GREENE

Project Manager: Strawn, Larry - 11589

Sampled By: Vinson, Jackie - 11097

Date Sampled: 05/17/2021

Date Tested: 05/17/2021

Qty Represented: UNK

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Lab Reference Number GH-0130-21

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Contractor's Address: ST BUNN CONSTRUCTION CO., INC.

Date: 05/17/2021

611 HELEN KELLER BLVD

Producer: ST BUNN CONSTR. CO., INC.

TUSCALOOSA, AL 35404

Plant: ALL PLANTS

Section: 424 A/B, C/D

Intended Use: **

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Binder Grade: PG 67-22 HUNT

Metric Aggregate Size: 12.5MM

Specific Gravity of AC: 1.037

% (Approx)	Description	I.D.#	Source	BPN-9
23	1/2" SLAG	1614	ST BUNN CONSTR.; TUSCALOOSA, AL	
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1	BAGHOUSE FINES		PLANT	
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Job Mix:		Other information:		Note:
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#50 (300 µm)	16	Fine Agg. Angularity	45	
#100 (150 µm)	9	Agg Bulk SG	2.815	CT INDEX: 72.3 HT-IDT (PSI): 82.7
#200 (75 µm)	6.1	% VMA	17.4	

Hot-Mix Asphalt Engineer:

Materials Engineer Approval:

Pay Items: 424A336, 424A336

Standard Remarks: This material has been tested in accordance with ALDOT specifications.

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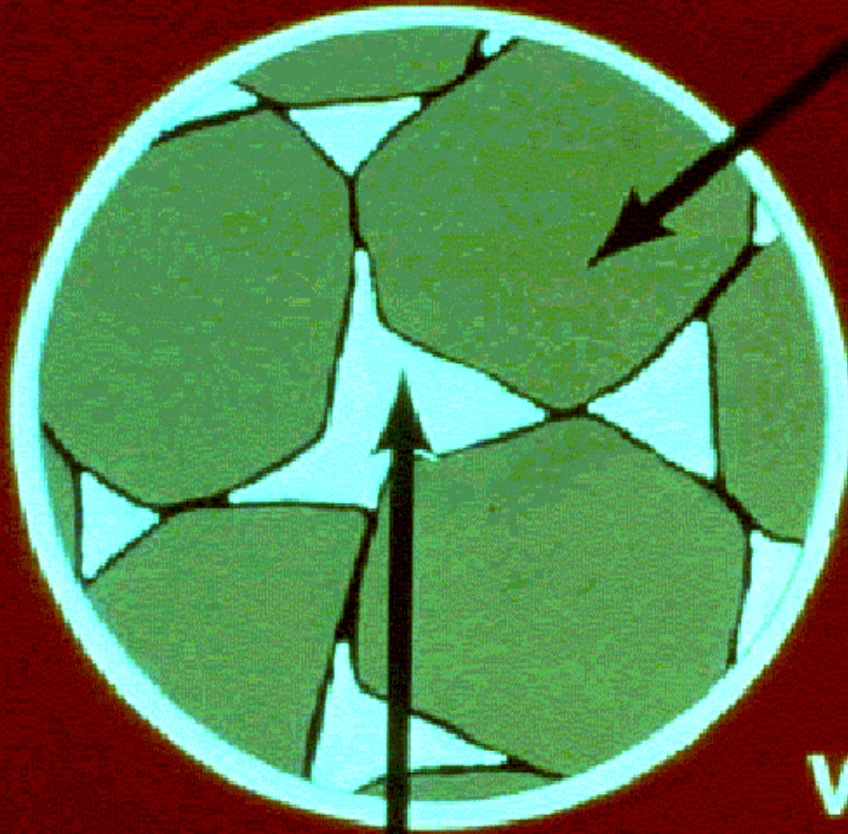
Signature:

Armstead, William - 13377
Testing Engineer

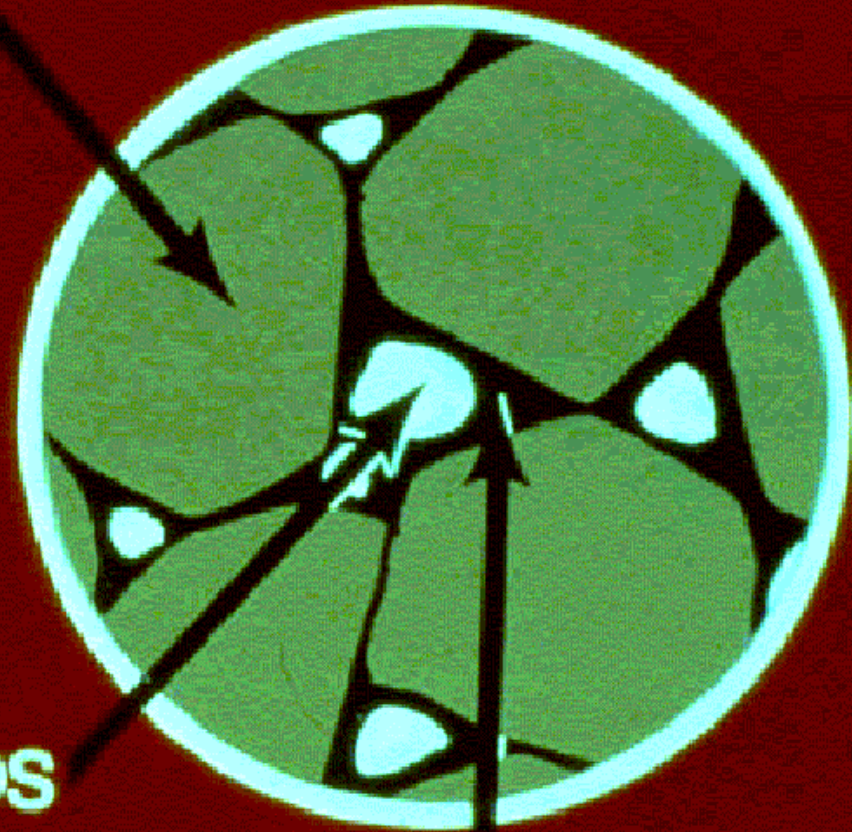
What Is VMA?

- ▣ Voids In Mineral Aggregate.

AGGREGATE



VMA



VOIDS

ASPHALT

$VMA = \text{Air Voids} + \text{Volume Of Effective Asphalt}$

Voids In Mineral Aggregate (VMA)

- ▣ For 1/2" Mix.
- ▣ Minimum Design VMA Is 15.5%.

JMF - Mix Information

- ▣ Dust / Asphalt Ratio.



Kay Ivey
Governor

Alabama Department of Transportation
Materials Testing Report
Sample Card No: 38374 Sample Type: Job Control
Approval Date: 05/17/2021



John R. Cooper
Transportation Director

Contract ID: 20210129066

Project No: STPAA-HSIP-0014(549)

Prime Contractor: S. T. BUNN CONSTRUCTION COMPANY, INC.

Inspection Analysis of: SUPERPAVE, WEARING

Material Code: 424.02_001

Producer/Supplier:

Sampled From: STOCKPILE

Intended Use: SURFACE/U.BINDER/L.BINDER/BASE/PLW

Region/Area: Fayette

County: GREENE

Project Manager: Strawn, Larry - 11589

Sampled By: Vinson, Jackie - 11097

Date Sampled: 05/17/2021

Date Tested: 05/17/2021

Qty Represented: UNK

Gyratory Compactor (HMA4302D)

Lab Reference Number	GH-0130-21	Date Expires:	05/17/2023
Contractor's Address:	ST BUNN CONSTRUCTION CO., INC. 611 HELEN KELLER BLVD TUSCALOOSA, AL 35404	Date:	05/17/2021
Section:	424 A/B, C/D	Producer:	ST BUNN CONSTR. CO., INC.
Max. Size Aggregate:	1/2"	Plant:	ALL PLANTS
Metric Aggregate Size:	12.5MM	Intended Use:	**
		Binder Grade:	PG 67-22 HUNT
		Specific Gravity of AC:	1.037

% (Approx)	Description	I.D.#	Source	BPN-9
23	1/2" SLAG	1614	ST BUNN CONSTR.; TUSCALOOSA, AL	
19	SAND	1841	ST BUNN FOSTERS PIT; FOSTER, AL	
37	SANDSTONE SCRNS	1809	BUNN BROTHERS; BROOKWOOD, AL	
1	BAGHOUSE FINES		PLANT	
20	RAP		STOCKPILE #21-5-1	

Job Mix:		Other information:		Note:
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1 1/2" (37.5 mm)		AC Req'd/Ton, lbs/MT, kg	114.0 57.0	
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3/4" (19.0 mm)		Wt., lbs/Mass, kg/m ³	154.8 2480.	must be added to the mix. The remaining 1.10% comes from the RAP. comes from RAS.
1/2" (12.5 mm)	100	TSR	0.84	
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#4 (4.75 mm)	73	EVOTHERM		#Gyrations: 60 %Gmm: 95.8
#8 (2.36 mm)	47	Effective AC	5.32	
#16 (1.18 mm)	35	Dust/Asphalt Ratio	1.15	Additional Notes:
#30 (600 μm)	27	Coarse Agg. Angularity	99/96	MIXING TEMP 325°F GH-0130-21 **SURFACE/UPPER BINDER/LOWER BINDER/BASE/PATCHING, LEVELING, WIDENING
#50 (300 μm)	16	Fine Agg. Angularity	45	
#100 (150 μm)	9	Agg Bulk SG	2.815	
#200 (75 μm)	6.1	% VMA	17.4	CT INDEX: 72.3 HT-IDT (PSI): 82.7

Hot-Mix Asphalt Engineer:

Materials Engineer Approval:

Pay Items: 424A336, 424A336

Standard Remarks: This material has been tested in accordance with ALDOT specifications.

Approved By: Cato, Charlie - 11098

Signature:

Armstead, William - 13377
Testing Engineer

Dust / Asphalt Ratio

- ▣ Also Called Dust Proportion Or Dust To Asphalt Content Or Dust To Bitumen Ratio.
- ▣ Based On Effective Asphalt Content.
- ▣ Why Important?

Dust / Asphalt Ratio

- ▣ For 1/2" Mix.
- ▣ Dust / Asphalt Ratio Range Of 0.60 To 1.4.

JMF - Mix Information

- ▣ TSR.



Kay Ivey
Governor

Alabama Department of Transportation
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John R. Cooper
Transportation Director

Contract ID: 20210129066

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Material Code: 424.02_001

Producer/Supplier:

Sampled From: STOCKPILE

Intended Use: SURFACE/U.BINDER/L.BINDER/BASE/PLW

Region/Area: Fayette

County: GREENE

Project Manager: Strawn, Larry - 11589

Sampled By: Vinson, Jackie - 11097

Date Sampled: 05/17/2021

Date Tested: 05/17/2021

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	TUSCALOOSA, AL 35404	Plant:	ALL PLANTS
Section:	424 A/B, C/D	Intended Use:	**
Max. Size Aggregate:	1/2"	Binder Grade:	PG 67-22 HUNT
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20	RAP		STOCKPILE #21-5-1	

Job Mix:	Sieves	% Passing	Other information:	Note:
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			#Gyrations: 60	%Gmm: 95.8
			Additional Notes:	
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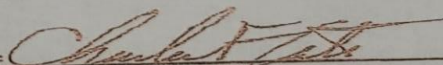
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Signature: 
Armstead, William - 13377
Testing Engineer

What Is TSR?

- ▣ Tensile Strength Ratio.

Tensile Strength Ratio (TSR)

- ▣ For 1/2" Mix.
- ▣ Minimum TSR Value Of At Least 0.80.

JMF - Mix Information

- ▣ Maximum Specific Gravity Of Mix.
- ▣ Aggregate Bulk Specific Gravity.



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Region/Area: Fayette

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Specific Gravity

- ▣ What Is Definition Of Specific Gravity?

Specific Gravity

- ▣ Specific Gravity = Weight / Volume
- ▣ Based On Water At 4C Or 39.2F – Heaviest Weight Of Water – 1.000

Specific Gravity

- ▣ Alabama Aggregate Gravity Range : 2.550 – 3.600
- ▣ Liquid AC Gravity : 1.03 – 1.05

Pavement Design Program

- ▣ PaveXpress
- ▣ www.pavexpressdesign.com
- ▣ Accessible Via Web And Mobile
- ▣ Free, No Cost To Use
- ▣ Based On AASHTO Pavement Design Equations
- ▣ User - Friendly
- ▣ Share, Save And Print Project Designs
- ▣ Interactive Help And Resource Links

AAPA Publications

- ▣ www.alasphalt.com
- ▣ Asphalt Pavement Design Guide For Low-Volume Roads And Parking Lots
- ▣ Alabama Porous Pavement Parking Lots Guide Specifications
- ▣ OGFC Best Practices Guidelines

Questions ?????



ALABAMA ASPHALT PAVEMENT ASSOCIATION



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Alabama Asphalt Pavement Association

630 Adams Avenue

Montgomery, AL 36104

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Web site: www.alasphalt.com