

SUBMITTAL



Submittal number	112.0	Date	05/06/2020
Project	TRAILS AT CROWFOOT F1	6954 N. CROWFOOT VALLEY RD. PARKER, CO 80134	
Project number	201810		
Spec section			
Subsection		Status	Open
Current action	Submitted	Ball in court	
Topic	Asphalt Paving Mix Design - Alternate Plant		

Submitter	MICHAEL TOMAS SNYDER
Reviewer	
Cc	

Date submitted	05/06/2020	Submission due date	05/06/2020
Released for review	05/06/2020	Review due date	05/13/2020
Date returned		Required on site date	05/13/2020
Date closed			

Notes

Please see attached Asphalt Paving Mix Designs- Alternate Plant:

Reference Attached:

1) Product No. 5493, Mix Design No. 2243, Description: (3/4)SP75(64-22)20% "Bottom Mat", Dated 4/10/2020

2) Product No. 5462, Mix Design No. 1243, Description: (1/2)SP75(64-22)20% "Top Mat, Dated 4/1/2020

Martin Marietta Materials, Inc.
1910 Rand Avenue
Colorado Springs, CO 80905

4/10/2020

Attn: Mr. David Chelgren

Re: Hot Mix Asphalt Mix Design

Grading: 3/4" NMAS
Method/Type: Superpave 75 Gyration
Aggregate: Red Canyon/Menzer/Parkdale/RAP
Plant Number(s): 16471, 16477
Mix Design Number: 2243
Product Number: 5493
Ticket Description: (3/4)SP75(64-22)20%

This letter represents the results of a hot mix asphalt mixture design by the Superpave Method, utilizing 75 Gyration at 1.25° in accordance with Colorado Department of Transportation Manual of Test Procedures and as outlined by Asphalt Institute Manual, Series No.2 (SP-2).

The Red Canyon/Menzer/Parkdale/RAP aggregates and Suncor PG 64-22 asphalt cement used in this mix design were proportioned in accordance with your request as detailed in the blend table of this design.

Properties of this mixture are:

Asphalt Content (%AC):	5.15	
Max. Theoretical Specific Gravity (Gmm):	2.461	(153.6 pcf)
Air Voids (%Va):	3.6	
Voids in Mineral Aggregate (%VMA):	14.2	
Voids Filled with Asphalt (%VFA):	74.8	
Tensile Strength Ratio, TSR (%):	94	
Hveem Stability:	40	

The aggregate blend sheet, mix design physical properties, mix design property curves, and combined aggregate properties are presented on the enclosed forms. All results contained herein as well as any supporting documentation submitted for aggregate and RAP components of this design are all obtained under the responsible charge of the Professional Engineer whose stamp is on this page. All materials used for this lab trial were obtained at the start of the design testing process. The process was completed upon final review by the Professional Engineer on the date at the top of this page.

Please do not hesitate to contact us with any questions concerning this report.

Sincerely,
Martin Marietta Materials, Inc. - Central Laboratory
An AASHTO Accredited Lab

Todd M. Genovese, P.E.
QC Manager - Rocky Mountain Division
Enclosures

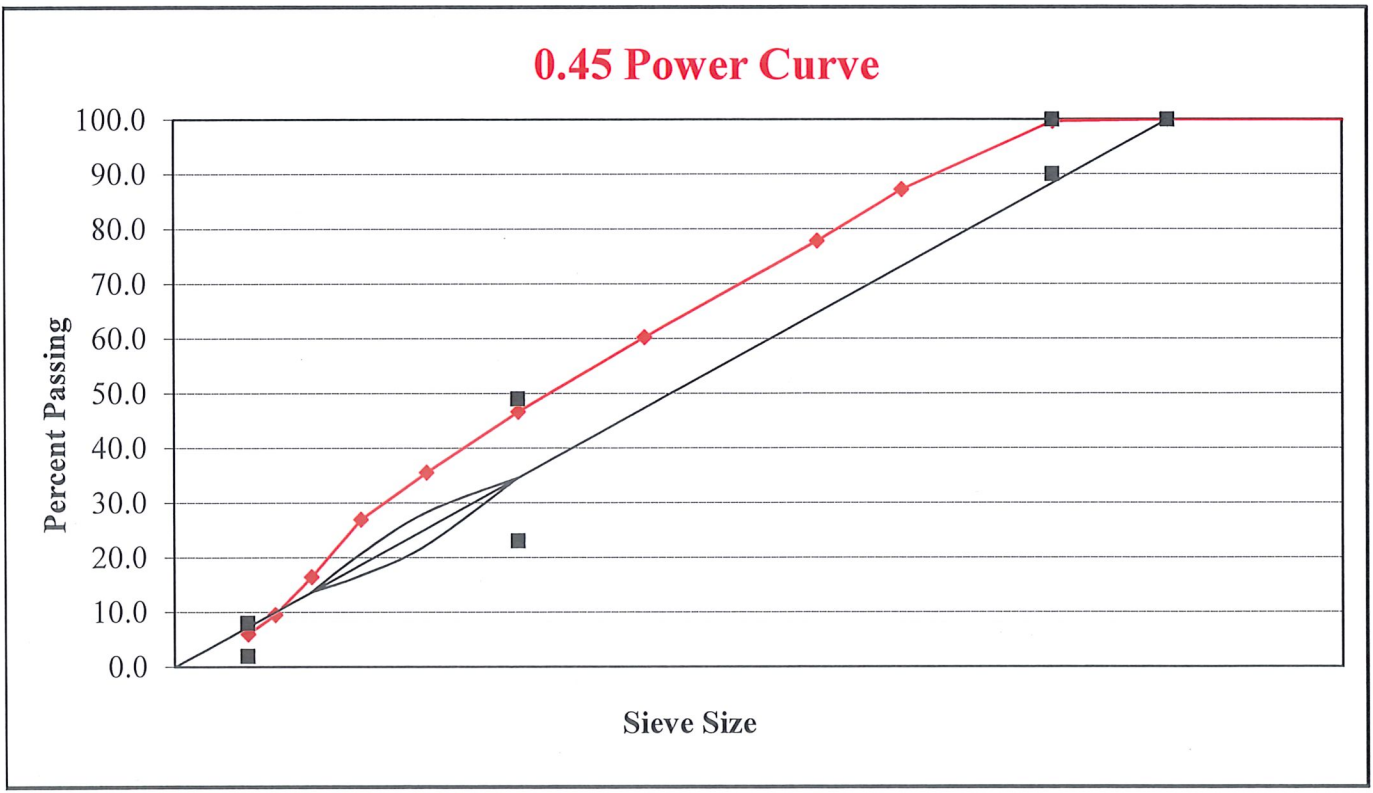




Date: 4/10/2020
Design Number: 2243
Grading: 3/4" NMAS
Design Type: Superpave 75 Gyration
Aggregate Source: Red Canyon/Menzer/Parkdale/RAP

Client: Southern Asphalt
Binder: PG 64-22
Supplier: Suncor
Specific Gravity: 1.037
Additive: Lime

% Material Used:	15%	14%	22%	10%	18%		20%	1%	100.0%	Design
Material Type:	No. 6 Rock	No. 7 Rock	Cl. 7 CF's	Crusher Fines	Washed Sand		Crushed RAP	Hydrated Lime	JMF	Control Points
Material Source:	RCQ	RCQ	RCQ	Menzer	Parkdale		COS	Lhoist		
1-1/2" (37.5 mm)	100	100	100	100	100		100	100	100	
1" (25.0 mm)	100	100	100	100	100		100	100	100	100
3/4" (19.0 mm)	98	100	100	100	100		100	100	100	90-100
1/2" (12.5 mm)	25	92	100	100	100		98	100	87	
3/8" (9.5 mm)	6	51	100	100	100		94	100	78	
#4 (4.75 mm)	5	7	77	83	97		74	100	60	
#8 (2.36 mm)	4	6	53	60	82		59	100	47	23-49
#16 (1.18 mm)	3	5	38	44	66		44	100	36	
#30 (600 µm)	3	4	27	32	50		34	100	27	
#50 (300 µm)	2	3	18	22	22		23	100	16	
#100 (150 µm)	2	2	12	13	6		15	95	10	
#200 (75 µm)	1.1	1.3	7.4	8.3	2.1		9.5	92.2	6.0	2.0-8.0
Bulk Specific Gravity	2.628	2.623	2.617	2.612	2.657		2.617	2.380	2.623	
App. Specific Gravity	2.687	2.687	2.696	2.686	2.727		2.658	2.380	2.687	
Percent Asphalt in Recycled Material							4.95			



HOT MIX ASPHALT MIX DESIGN PHYSICAL PROPERTIES

<i>Client:</i>	Southern Asphalt		
<i>Mix Grading:</i>	3/4" NMAS		
<i>Aggregate Source:</i>	Red Canyon/Menzer/Parkdale/RAP		
<i>Asphalt Cement Source:</i>	Suncor		
<i>Asphalt Cement Grade:</i>	PG 64-22	<i>Asphalt Cement Specific Gravity:</i> 1.037	
<i>Additive Type:</i>	Lime		
<i>Compaction Method:</i>	Superpave	75 Gyration	
<i>Lab Temperature Mixing (°F) =</i>	325	<i>Lab Compaction (°F) =</i> 300	

<i>Asphalt Content (%AC):</i>	4.5	5.0	5.5	6.0
<i>Bulk Specific Gravity (Gmb):</i>	2.332	2.366	2.387	2.395
<i>Max. Specific Gravity (Gmm):</i>	2.485	2.467	2.449	2.432
<i>Theoretical Max Unit Wt. (pcf):</i>	155.1	153.9	152.8	151.8
<i>Air Voids @ N-Design (%Va):</i>	6.2	4.1	2.5	1.5
<i>Voids in Mineral Aggregate (%VMA):</i>	15.1	14.3	14.0	14.2
<i>Voids Filled with Asphalt (%VFA):</i>	59.3	71.4	81.9	89.3
<i>Dust to Asphalt Ratio (D/A):</i>	1.3	1.1	1.0	0.9
<i>Hveem Stability:</i>	36	41	38	34
<i>Specimen Heights (mm):</i>	64.1	63.5	62.9	62.1

Properties at Optimum

Specifications

<i>Asphalt Content (%AC):</i>	5.15	
<i>Bulk Specific Gravity (Gmb):</i>	2.373	
<i>Max. Specific Gravity (Gmm):</i>	2.461	
<i>Theoretical Max Unit Wt. (pcf):</i>	153.6	
<i>Air Voids @ N-Design (%Va):</i>	3.6	3.5 to 4.5
<i>Voids in Mineral Aggregate (%VMA):</i>	14.2	13.6 min. @ 3.6 voids
<i>Voids Filled with Asphalt (%VFA):</i>	74.8	65-78
<i>Aggregate Effective Specific Gravity (Gse):</i>	2.659	
<i>Dust to Asphalt Ratio (D/A):</i>	1.08	0.6-1.2
<i>Hveem Stability:</i>	40	30 min.

Effect of Moisture on Hot Mix Asphalt

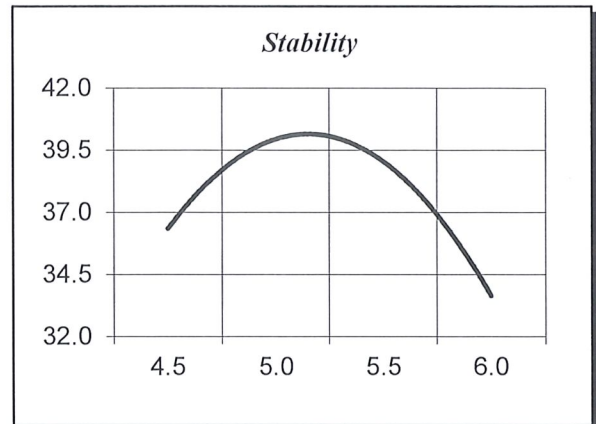
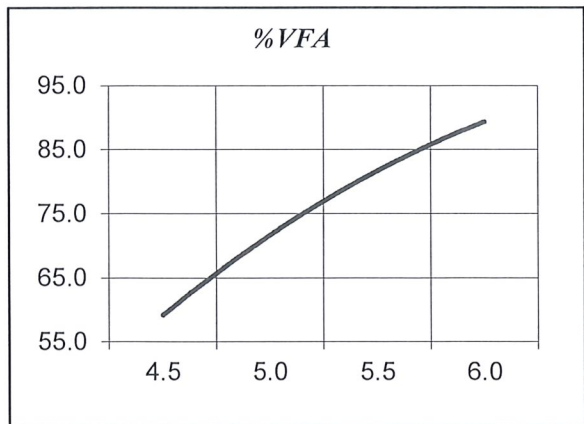
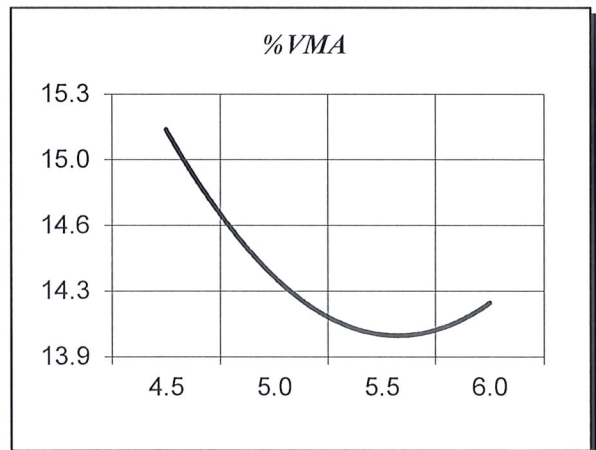
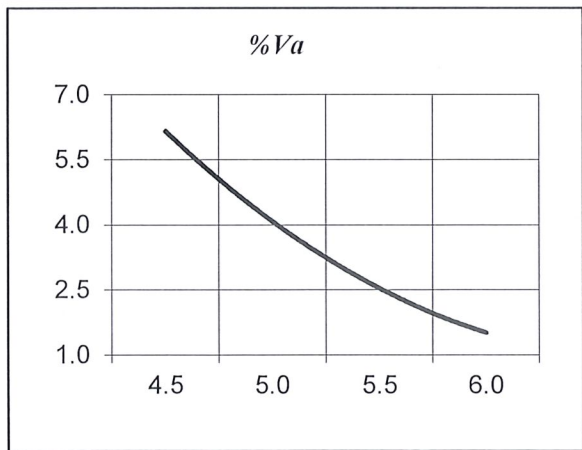
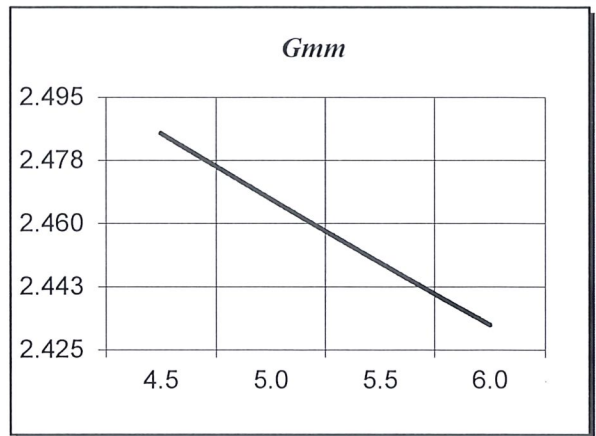
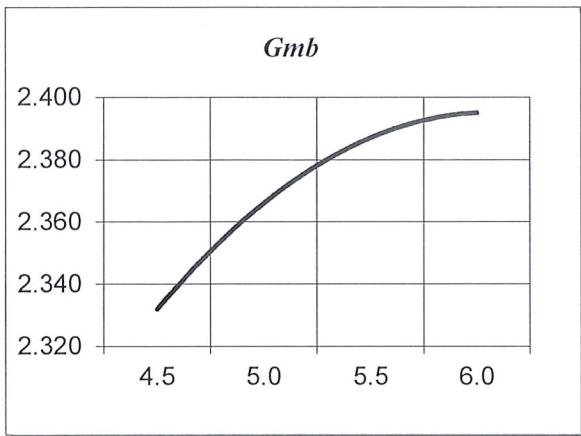
<i>Method:</i>	CDOT (CP-L 5109)	
<i>Asphalt Content (%):</i>	5.15	
<i>Additive Type:</i>	Lime	
<i>Air Voids (%):</i>	7.2	6 to 8
<i>Saturation (%):</i>	90.6	
<i>Indirect Tensile Strength (Wet) (psi):</i>	133	
<i>Indirect Tensile Strength (Dry) (psi):</i>	142	30 min.
<i>Tensile Strength Ratio (%):</i>	94	80 min.

Optimum properties are based on a best fit curve of all data points.

TEST PROPERTY CURVES

Client: Southern Asphalt
Grading: 3/4" NMA
Agg Source: Red Canyon/Menzer/Parkdale/RAP

Asphalt Content (%AC):	5.15
Bulk Specific Gravity (Gmb):	2.373
Max. Specific Gravity (Gmm):	2.461
Theoretical Max Unit Wt. (pcf):	153.6
Air Voids @ N-Design (%Va):	3.6
Voids in Mineral Aggregate (%VMA):	14.2
Voids Filled with Asphalt (%VFA):	74.8
Hveem Stability:	40



AGGREGATE PHYSICAL PROPERTIES
(does not include Lime or RAP)

Client: Southern Asphalt
Aggregate Source: Red Canyon/Menzer/Parkdale/RAP
Grading: 3/4" NMAS

		<i>Combined Blend</i>	<i>Specifications</i>
<i>Bulk Specific Gravity (Agg):</i>		2.629	
<i>Apparent Specific Gravity (Agg):</i>		2.698	
<i>Bulk Specific Gravity Plus #4 (Agg):</i>	<i>AASHTO (T 85)</i>	2.624	
<i>Bulk Specific Gravity Minus #4 (Agg):</i>	<i>CDOT (CP-L 4102)</i>	2.632	
<i>Combined Blend Absorption (Agg):</i>		0.98	
<i>L.A. Abrasion Plus #4 Material (%):</i>	<i>AASHTO (T 96)</i>	31	<i>45 max.</i>
<i>Sodium Sulfate Soundness (%):</i>	<i>ASTM (C 88)</i>	2.6	<i>12 max.</i>
<i>Fractured Faces (2 or more) (%):</i>	<i>CDOT (CP 45)</i>	98	<i>80 min.</i>
<i>Fine Aggregate Angularity, Method A:</i>	<i>AASHTO (T 304)</i>	48	<i>45 min.</i>
<i>Plasticity Index:</i>	<i>AASHTO (T 90)</i>	NP	<i>Non-plastic</i>
<i>Sand Equivalent:</i>	<i>ASTM (D 2419)</i>	62	<i>45 min.</i>
<i>Flat and Elongated Particles (%):</i>	<i>ASTM (D 4791)</i>	2	<i>10 max.</i>
<i>Adherent Fines (%):</i>	<i>ASTM (D 5711)</i>	0.24	<i>0.5 max.</i>
<i>Micro-Deval (%):</i>	<i>CDOT (CP-L 4211)</i>	13.4	<i>18% max.</i>



Martin Marietta Materials, Inc.
 1910 Rand Avenue
 Colorado Springs, CO 80905

4/1/2020

Attn: Mr. David Chelgren

Re: Hot Mix Asphalt Mix Design
 Grading: 1/2" NMAS
 Method/Type: Superpave 75 Gyration
 Aggregate: Red Canyon/Menzer/Parkdale/RAP
 Plant Number(s): 16471, 16477
 Mix Design Number: 1243
 Product Number: 5462
 Ticket Description: (1/2)SP75(64-22)20%

This letter represents the results of a hot mix asphalt mixture design by the Superpave Method, utilizing 75 Gyration at 1.25° in accordance with Colorado Department of Transportation Manual of Test Procedures and as outlined by Asphalt Institute Manual, Series No.2 (SP-2).

The Red Canyon/Menzer/Parkdale/RAP aggregates and Suncor PG 64-22 asphalt cement used in this mix design were proportioned in accordance with your request as detailed in the blend table of this design.

Properties of this mixture are:

Asphalt Content (%AC):	5.50	
Max. Theoretical Specific Gravity (Gmm):	2.448	(152.8 pcf)
Air Voids (%Va):	3.6	
Voids in Mineral Aggregate (%VMA):	15.0	
Voids Filled with Asphalt (%VFA):	75.8	
Tensile Strength Ratio, TSR (%):	92	
Hveem Stability:	36	

The aggregate blend sheet, mix design physical properties, mix design property curves, and combined aggregate properties are presented on the enclosed forms. All results contained herein as well as any supporting documentation submitted for aggregate and RAP components of this design are all obtained under the responsible charge of the Professional Engineer whose stamp is on this page. All materials used for this lab trial were obtained at the start of the design testing process. The process process was completed upon final review by the Professional Engineer on the date at the top of this page.

Please do not hesitate to contact us with any questions concerning this report.

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Todd M. Genovese, P.E.
 QC Manager - Rocky Mountain Division
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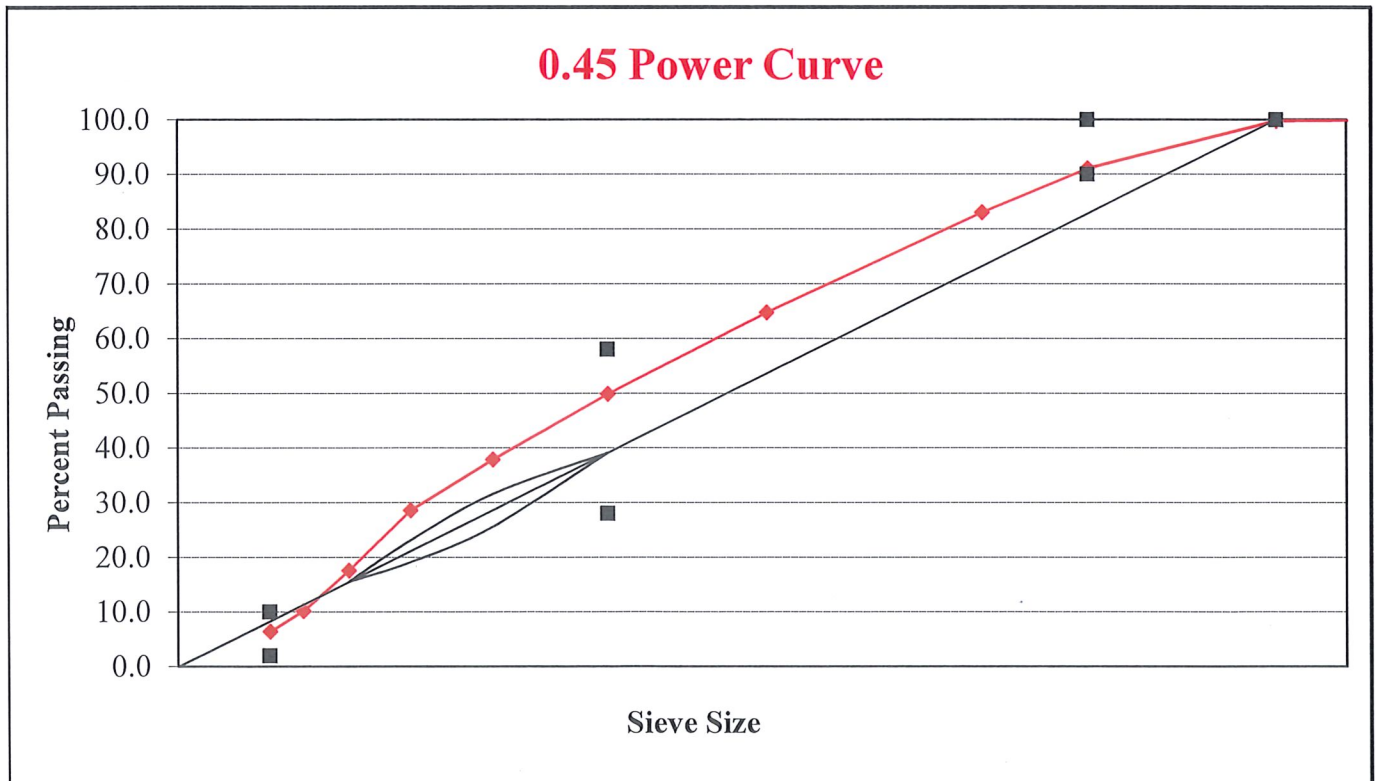




Date: 4/1/2020
Design Number: 1243
Grading: 1/2" NMAS
Design Type: Superpave 75 Gyration
Aggregate Source: Red Canyon/Menzer/Parkdale/RAP

Client: Southern Asphalt
Binder: PG 64-22
Supplier: Suncor
Specific Gravity: 1.037
Additive: Lime

% Material Used:	10%	13%	24%	14%	18%		20%	1%	100.0%	Design
Material Type:	No. 6 Rock	No. 7 Rock	Cl. 7 CF's	Crusher Fines	Washed Sand		Crushed RAP	Hydrated Lime	JMF	Control Points
Material Source:	RCQ	RCQ	RCQ	Menzer	Parkdale		COS	Lhoist		
1-1/2" (37.5 mm)	100	100	100	100	100		100	100	100	
1" (25.0 mm)	100	100	100	100	100		100	100	100	
3/4" (19.0 mm)	98	100	100	100	100		100	100	100	100
1/2" (12.5 mm)	25	92	100	100	100		98	100	91	90-100
3/8" (9.5 mm)	6	51	100	100	100		94	100	83	
#4 (4.75 mm)	5	7	77	83	97		74	100	65	
#8 (2.36 mm)	4	6	53	60	82		59	100	50	28-58
#16 (1.18 mm)	3	5	38	44	66		44	100	38	
#30 (600 µm)	3	4	27	32	50		34	100	29	
#50 (300 µm)	2	3	18	22	22		23	100	18	
#100 (150 µm)	2	2	12	13	6		15	95	10	
#200 (75 µm)	1.1	1.3	7.4	8.3	2.1		9.5	92.2	6.4	2.0-10.0
Bulk Specific Gravity	2.628	2.623	2.617	2.612	2.657		2.617	2.380	2.623	
App. Specific Gravity	2.687	2.687	2.696	2.686	2.727		2.658	2.380	2.687	
Percent Asphalt in Recycled Material							4.95			



HOT MIX ASPHALT MIX DESIGN PHYSICAL PROPERTIES

Client:	Southern Asphalt	
Mix Grading:	1/2" NMAS	
Aggregate Source:	Red Canyon/Menzer/Parkdale/RAP	
Asphalt Cement Source:	Suncor	
Asphalt Cement Grade:	PG 64-22	<i>Asphalt Cement Specific Gravity:</i> 1.037
Additive Type:	Lime	
Compaction Method:	Superpave 75 Gyration	
Lab Temperature Mixing (°F) =	325	Lab Compaction (°F) = 300

Asphalt Content (%AC):	4.8	5.3	5.8	6.3
Bulk Specific Gravity (Gmb):	2.316	2.350	2.370	2.379
Max. Specific Gravity (Gmm):	2.473	2.455	2.438	2.420
Theoretical Max Unit Wt. (pcf):	154.3	153.2	152.1	151.0
Air Voids @ N-Design (%Va):	6.3	4.3	2.8	1.7
Voids in Mineral Aggregate (%VMA):	15.9	15.1	14.9	15.0
Voids Filled with Asphalt (%VFA):	60.2	71.8	81.3	88.7
Dust to Asphalt Ratio (D/A):	1.3	1.1	1.0	0.9
Hveem Stability:	36	37	34	31
Specimen Heights (mm):	64.1	63.8	63.3	62.6

Properties at Optimum

Specifications

Asphalt Content (%AC):	5.50	
Bulk Specific Gravity (Gmb):	2.359	
Max. Specific Gravity (Gmm):	2.448	
Theoretical Max Unit Wt. (pcf):	152.8	
Air Voids @ N-Design (%Va):	3.6	3.5 to 4.5
Voids in Mineral Aggregate (%VMA):	15.0	14.6 min. @ 3.6 voids
Voids Filled with Asphalt (%VFA):	75.8	65-78
Aggregate Effective Specific Gravity (Gse):	2.659	
Dust to Asphalt Ratio (D/A):	1.08	0.6-1.2
Hveem Stability:	36	30 min.

Effect of Moisture on Hot Mix Asphalt

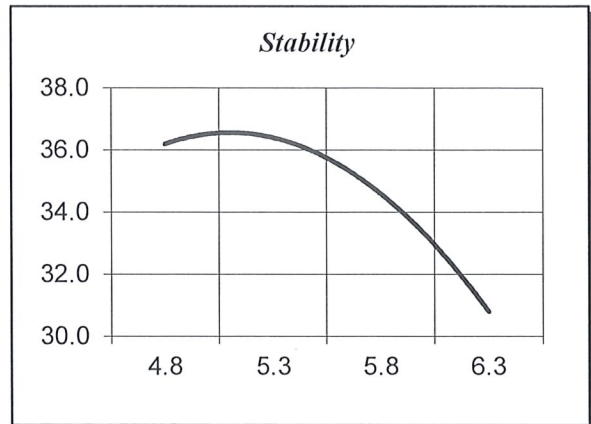
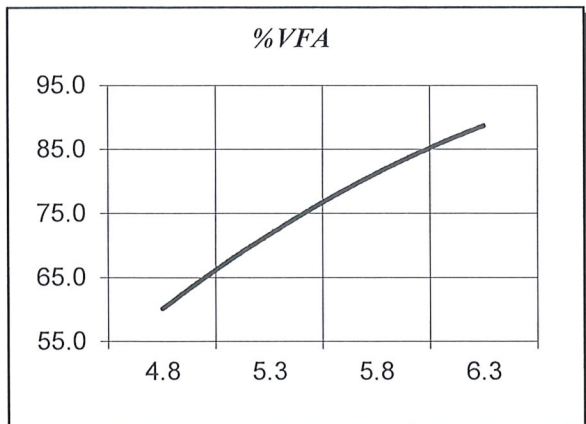
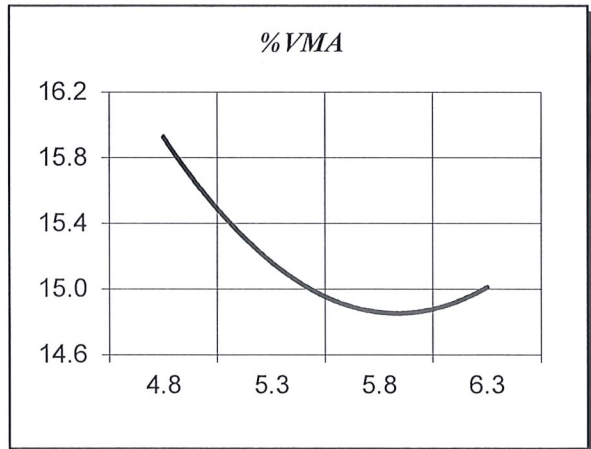
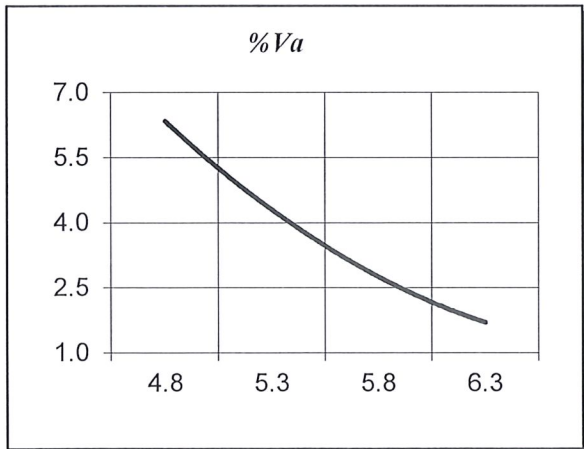
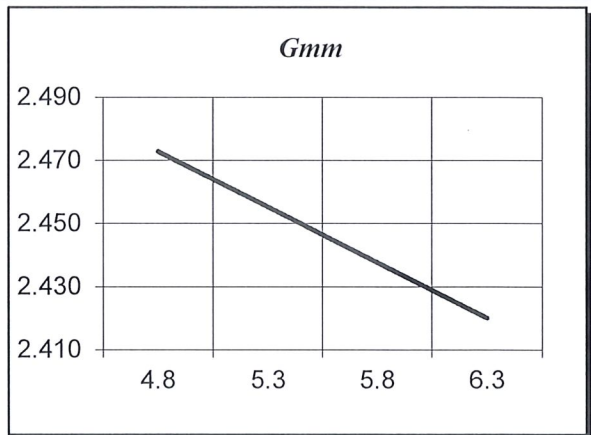
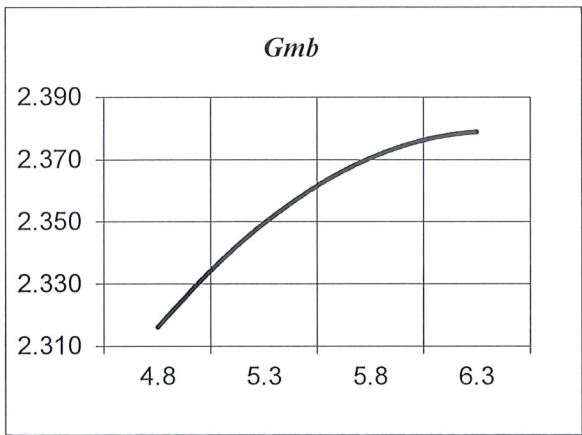
Method:	CDOT (CP-L 5109)	
Asphalt Content (%):	5.50	
Additive Type:	Lime	
Air Voids (%):	7.4	6 to 8
Saturation (%):	86.6	
Indirect Tensile Strength (Wet) (psi):	132	
Indirect Tensile Strength (Dry) (psi):	143	30 min.
Tensile Strength Ratio (%):	92	80 min.

Optimum properties are based on a best fit curve of all data points.

TEST PROPERTY CURVES

Client: Southern Asphalt
Grading: 1/2" NMAS
Agg Source: Red Canyon/Menzer/Parkdale/RAP

Asphalt Content (%AC): 5.50
Bulk Specific Gravity (Gmb): 2.359
Max. Specific Gravity (Gmm): 2.448
Theoretical Max Unit Wt. (pcf): 152.8
Air Voids @ N-Design (%Va): 3.6
Voids in Mineral Aggregate (%VMA): 15.0
Voids Filled with Asphalt (%VFA): 75.8
Hveem Stability: 36



AGGREGATE PHYSICAL PROPERTIES
(does not include Lime or RAP)

Client: Southern Asphalt
Aggregate Source: Red Canyon/Menzer/Parkdale/RAP
Grading: 1/2" NMAS

		<i>Combined Blend</i>	<i>Specifications</i>
<i>Bulk Specific Gravity (Agg):</i>		2.628	
<i>Apparent Specific Gravity (Agg):</i>		2.699	
<i>Bulk Specific Gravity Plus #4 (Agg):</i>	<i>AASHTO (T 85)</i>	2.623	
<i>Bulk Specific Gravity Minus #4 (Agg):</i>	<i>CDOT (CP-L 4102)</i>	2.630	
<i>Combined Blend Absorption (Agg):</i>		1.00	
<i>L.A. Abrasion Plus #4 Material (%):</i>	<i>AASHTO (T 96)</i>	31	<i>45 max.</i>
<i>Sodium Sulfate Soundness (%):</i>	<i>ASTM (C 88)</i>	2.7	<i>12 max.</i>
<i>Fractured Faces (2 or more) (%):</i>	<i>CDOT (CP 45)</i>	98	<i>80 min.</i>
<i>Fine Aggregate Angularity, Method A:</i>	<i>AASHTO (T 304)</i>	48	<i>45 min.</i>
<i>Plasticity Index:</i>	<i>AASHTO (T 90)</i>	NP	<i>Non-plastic</i>
<i>Sand Equivalent:</i>	<i>ASTM (D 2419)</i>	61	<i>45 min.</i>
<i>Flat and Elongated Particles (%):</i>	<i>ASTM (D 4791)</i>	1.9	<i>10 max.</i>
<i>Adherent Fines (%):</i>	<i>ASTM (D 5711)</i>	0.19	<i>0.5 max.</i>
<i>Micro-Deval (%):</i>	<i>CDOT (CP-L 4211)</i>	13.3	<i>18% max.</i>