STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

CONTRACTOR HOT MIX ASPHALT DESIGN DATA

CEM-3512 (NEW 3/2008)

ADA Notice

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The information provided in this form must be in accordance with Section 39, "Hot Mix Asphalt," of the *Standard Specifications* , and the California Test Method indicated. For Information concerning this form, contact the METS Office of Flexible Pavement Materials at (916) 227-7322.

HOT MIX ASPHALT PRODUCER NAME, ADRESS, AND PHONE NUMBER	HMA TYPE	DATE
Dutra Materials - San Rafael 1000 Point San Pedro Rd. San Rafael, CA 94901 (415) 459-7740	3/4" HMA Type A or B	March 1, 2021
	PRODUCER MIX IDENTIFICATION NUMBER L210071	

NAME OF QUALIFIED LABORATORY PREPARING THE MIX DESIGN: Pavement Engineering, Inc., Redding, CA

AGGREGATE GRADATION

Bin	5	4	3	2	1	Reclaimed Asphalt Pavement		Lime	Combined Gradiation (JMF TV)
Material Size	3/4"	1/2"	3/8"	Dust	Sand			—	—
Bin %	14	14	18	42	12	(JMF TV)			100
Sieve Size	% Passing								
2”	100	100	100	100	100				100
1½”	100	100	100	100	100				100
1”	100	100	100	100	100				100
¾”	82	100	100	100	100				97
½”	13	86	100	100	100				86
⅜”	4	27	92	100	100				75
No. 4	1	4	9	81	100				48
No. 8	1	3	2	45	100				32
No. 16	1	3	1	29	99				25
No. 30	1	2	1	21	86				20
No. 50	1	2	1	16	45				13
No. 100	1	1	1	12.0	3.0				5.9
No. 200	0.4	0.7	0.4	8.9	2.8				4.3

AGGREGATE SOURCES, CALIFORNIA MINE, AND SMARA IDENTIFICATION NUMBERS FOR EACH BIN

SMARA #: 91-21-0008

CONTRACTOR HOT MIX ASPHALT DESIGN DATA (Continued)

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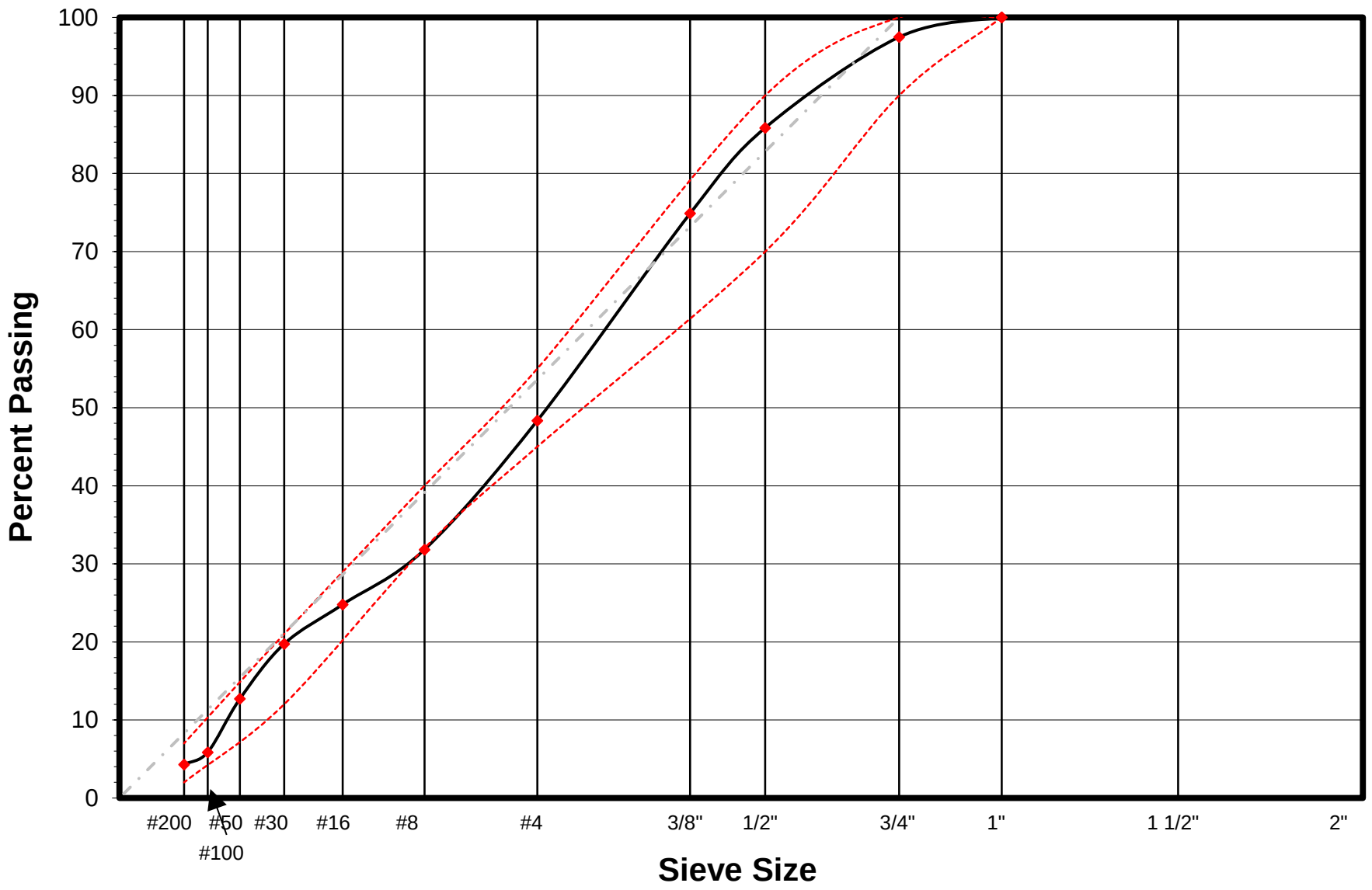
FHWA 0.45 Power Gradation Chart



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HMA TYPE	PRODUCER NAME	PRODUCER MIX IDENTIFICATION NUMBER	DATE
3/4" HMA Type A or B	Dutra Materials - San Rafael	L210071	March 1, 2021

AGGREGATE QUALITY *

Quality Characteristic/Property	Test Method	Test Result
Crushed particles, coarse aggregate One fractured face (%)	CT 205	100%
Crushed particles, coarse aggregate Two fractured faces (%)	CT 205	100%
Crushed particles, fine aggregate (Passing No. 4 sieve and retained on No. 8 sieve) One fractured face (%)	CT 205	100%
Los Angeles Rattler, Loss at 100 Rev. (%)	CT 211	3.6%
Los Angeles Rattler, Loss at 500 Rev. (%)	CT 211	17.6%
Sand equivalent	CT 217	63 | 62 | 62 Average: 62
Fine aggregate angularity (%)	AASHTO T 304 (Method A)	45.0
Flat and elongated particles (% by mass at 3:1)	ASTM D 4791	---
Flat and elongated particles (% by mass at 5:1)	ASTM D 4791	1%
Plasticity Index	CT 204	NP
Sodium sulfate soundness	CT 214	---
Cleanness Value	CT 227	
Fine aggregate Durability Index	CT 229	
Coarse aggregate Durability Index	CT 229	
K_c factor (Not mandatory until further notice)	CT 303	---
K_f factor (Not mandatory until further notice)	CT 303	---
Bulk specific gravity (oven dry) of coarse aggregate	CT 206	2.625
Absorption of coarse aggregate	CT 206	1.3%
Bulk specific gravity (SSD) of fine aggregate	CT 207	2.637
Bulk specific gravity (oven dry) of fine aggregate	LP-2	2.600
Absorption of fine aggregate	CT 207	1.4%
Apparent specific gravity of supplemental fines	CT 208/LP-2	
Bulk specific gravity of the aggregate blend	LP-2	2.613

* Aggregate must comply with the quality specifications before it is treated with lime.

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Reclaimed Asphalt Pavement (RAP) Aggregate Gradation, Asphalt Binder Content, and Theoretical Maximum Specific Gravity

HMA TYPE	PRODUCER NAME	PRODUCER MIX IDENTIFICATION NUMBER	DATE	RAP SOURCE
3/4" HMA Type A or B	Dutra Materials - San Rafael	L210071	March 1, 2021	

		ASTM D 2172 (Method B), CT 202, and CT 309 [1]				CT 382 and CT 202 [2]				Aggregate Gradation Correlation Factor [3]
		Sample 1	Sample 2	Sample 3	Average [4]	Sample 1	Sample 2	Sample 3	Average	
% Passing	2”									
	1½”									
	1”									
	¾”									
	½”									
	⅜”									
	No. 4									
	No. 8									
	No. 16									
	No. 30									
	No. 50									
	No. 100									
	No. 200									
Asphalt Binder Content						*Report Only*	*Report Only*	*Report Only*	*Report Only*	----
Maximum Specific Gravity						----	----	----	----	----

Note:

[1] A minimum of three samples are required. Determine the asphalt binder content of each RAP sample under ASTM D 2172, Method B. Perform a sieve analysis on each sample of recovered aggregate under CT 202, Appendix A. Determine the theoretical maximum specific gravity (Rice) of each RAP sample under CT 309, Section J.

[2] A minimum of 3 samples are required. Burn asphalt from each RAP sample in accordance with CT 382. Calculate and report asphalt binder content for information only. Perform a sieve analysis on each sample of recovered aggregate in accordance with CT 202, Appendix A for each ignition oven to be used for testing during production.

[3] The correlation factor for each sieve is determined by taking the average gradation of the ASTM D 2172 samples minus the average gradation of the CT 382 samples.

[4] Average aggregate gradation and asphalt binder content(ASTM D 2172 test results) used to calculate mix design batch weights.

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HMA TYPE	PRODUCER NAME	PRODUCER MIX IDENTIFICATION NUMBER	DATE
3/4" HMA Type A or B	Dutra Materials - San Rafael	L210071	March 1, 2021

ASPHALT BINDER [1, 2]

Asphalt binder supplier: Asphalt Binder: Valero (Benicia)

Asphalt binder grade: PG 64-10

Supplier recommended mixing temperature: 299 - 309 °F

Quality Characteristic	Test Method	Test Result
Specific gravity	AASHTO T 228	1.027
Dynamic Shear (RTFO residue), Test Temp. at 10 rad/s, 60°C	AASHTO T 315[3]	4.29

Note:

[1] Including base asphalt in asphalt rubber binder.

[2] Asphalt binder treated with liquid antistrip must comply with Section 92, "Asphalts," of the *Standard Specifications* for the grade specified.

[3] For use in CT 303.

ANTISTRIP ADDITIVES

Antistrip type:

Antistrip source:

Antistrip percentage (JMF TV): [1, 2]

Method of antistrip addition:

Quality Characteristics	Test Method	Test Result
Liquid antistrip (LAS) total amine value (min.)	ASTM D 2074	

Note:

[1] Liquid Antistrip must be between 0.5 and 1.0 percent by weight of asphalt binder.

[2] Combined lime ratio must be between 0.8 and 1.5 by weight of dry aggregate (may be reduced to 0.5 to 1.0 for OGFC).

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HMA TYPE	PRODUCER NAME	PRODUCER MIX IDENTIFICATION NUMBER	DATE
3/4" HMA Type A or B	Dutra Materials - San Rafael	L210071	March 1, 2021

Asphalt Rubber Binder

ASPHALT MODIFIER

Asphalt modifier supplier

Asphalt modifier percentage (2.0% - 6.0% by weight of asphalt binder)

Base asphalt and asphalt modifier percentage (78.0% - 82.0% by weight of asphalt rubber binder)

Quality Characteristics	Test Method	Test Result	Specification Limit
Viscosity, m^2/s (x 10-6) at 100°C	ASTM D445		19 to 36 (± 3)
Flash Point, CL.O.C., °C (min.)	ASTM D92		207
Asphaltenes, % by mass (max.)	ASTM D2007		0.1
Aromatics, % by mass (min.)	ASTM D2007		55

CRUMB RUBBER MODIFIER

Scrap tire CRM supplier

High natural CRM supplier

Scrap tire CRM percentage (73.0% - 77.0% by total weight of CRM)

High natural CRM percentage (23.0% - 27.0% by total weight of CRM)

Combined scrap tire and high natural CRM percentage (18.0% - 22.0% by weight of binder)

Quality Characteristic	**Test Method**	**Test Result**	**Specification Limits**
Scrap tire CRM gradation (% passing No. 8 sieve)	LP-10		100
High natural CRM gradation (% passing No. 10 sieve)	LP-10		100
Wire in CRM (% max.)	LP-10		0.01
Fabric in CRM (% max.)	LP-10		0.05
CRM particle length (inch max.)	----		3/16
CRM specific gravity	CT 208		1.1 - 1.2
Natural rubber content in high natural CRM (%)	ASTM D 297		40.0 - 48.0

ASPHALT RUBBER BINDER DESIGN AND PROFILE

Quality Characteristic	**Test Method**	**Minutes of Reaction [1]**							**Specification Limits**
		45	**60**	**90**	**120**	**240**	**360**	**1440**	
Cone penetration @ 77 °F, (0.10-mm)	ASTM D 217		---	---	---		---		25 - 70
Resilience @ 77 °F, % rebound (min.)	ASTM D 5329		---	---	---		---		18
Field softening point, °F	ASTM D 36		---	---	---		---		125 - 165
Viscosity, centipoises	LP-11								1,500 - 4,000

Reaction temperature from 1320 minutes to 1440 minutes:

[1] Six hours (360) minutes after CRM addition, reduce the oven temperature to 275 degrees F for a period of 16 hours. After the 16-hour cooldown (1320 minutes after CRM addition), reheat the binder to the reaction temperature expected during production (350 °F) for sampling and testing at 24 hours (1440 minutes).

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HMA TYPE	PRODUCER NAME	PRODUCER MIX IDENTIFICATION NUMBER	DATE
3/4" HMA Type A or B	Dutra Materials - San Rafael	L210071	March 1, 2021

APPROXIMATE BITUMEN RATIO (ABR)[1]

Property	Test Method	Test Results
Surface area of aggregate blend (ft^2/lb)	CT 303	23.1
Surface constant of aggregate blend, K_m	CT 303	
ABR	CT 303	
Corrected ABR [2]	CT 303	

Note:

[1] Not mandatory until further notice.

[2] Determine ABR using LP-9 if reclaimed asphalt pavement (RAP) is used.

HOT MIX ASPHALT DESIGN DATA

Quality Characteristic	Test Method	ABR (Corrected) - 0.5%	ABR (Corrected)
Asphalt binder content DWA (%)	CT 367	4.9	5.4
Briquette height (inches)	CT 304	2.52	2.50
Briquette bulk specific gravity	CT 308 (Method A)	2.339	2.357
Maximum specific gravity	CT 309	2.479	2.462
Air voids content (%)	CT 308(A) and CT 309	5.6	4.3
Voids in mineral aggregate (%)	LP-2	14.7	14.4
Effective specific gravity of RAP aggregate	LP-2	----	----
Voids filled with asphalt (%)	LP-3	61.5	70.4
Dust proportion	LP-4	1.0	0.9
Effective specific gravity of aggregate	LP-1/LP-4	2.664	2.663
Stabilometer value	CT 366	44	43
Modified stabilometer value	CT 366	----	----

Quality Characteristic	Test Method	ABR (Corrected) + 0.5%	ABR (Corrected) + 1.0%
Asphalt binder content DWA (%)	CT 367	5.9	6.4
Briquette height (inches)	CT 304	2.49	2.49
Briquette bulk specific gravity	CT 308 (Method A)	2.377	2.396
Maximum specific gravity	CT 309	2.445	2.427
Air voids content (%)	CT 308(A) and CT 309	2.8	1.3
Voids in mineral aggregate (%)	LP-2	14.1	13.8
Effective specific gravity of RAP aggregate	LP-2	----	----
Voids filled with asphalt (%)	LP-3	80.3	90.8
Dust proportion	LP-4	0.8	0.8
Effective specific gravity of aggregate	LP-1/LP-4	2.662	2.659
Stabilometer value	CT 366	42	40
Modified stabilometer value	CT 366	----	----

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HMA TYPE	PRODUCER NAME	PRODUCER MIX IDENTIFICATION NUMBER	DATE
3/4" HMA Type A or B	Dutra Materials - San Rafael	L210071	March 1, 2021

HOT MIX ASPHALT DESIGN DATA AT JOB MIX FORMULA [1]

Quality Characteristic	Test Method	Test Result			
Asphalt binder content DWA% (TWM)	CT 367	5.50 (5.20)			
Briquette bulk specific gravity	CT 308 (Method A)	2.361	2.359	2.357	*Average* 2.359
Maximum specific gravity	CT 309	2.458			
Air voids content (%)	CT 308 and CT 309	3.9	4.0	4.1	*Average* 4.0
Voids in mineral aggregate (%)	LP-2	14.3	14.4	14.5	*Average* 14.4
Effective specific gravity of RAP aggregate	LP-2	----			
Voids filled with asphalt (%)	LP-3	72.5	72.1	71.6	*Average* 72.1
Dust proportion	LP-4	0.9			
Effective specific gravity of aggregate	LP-4	2.662			
Stabilometer value	CT 366	44	43	43	*Average* 43
Modified stabilometer value	CT 366	----	----	----	*Average* ----
Surface abrasion (%)	CT 360	----	----	----	*Average* ----
Tensile strength ratio (TSR) untreated [2]	CT 371	----			
Tensile strength ratio (TSR) treated [2]	CT 371	----			

Note:

[1]For mix design, prepare three briquettes separately at the proposed JMF and test for compliance. Report the average of three tests. Prepare new briquettes and test if the range of stability for the three briquettes is more than 12 points.

[2]Attach Figure 1 from CT 371

Notes/Remarks:

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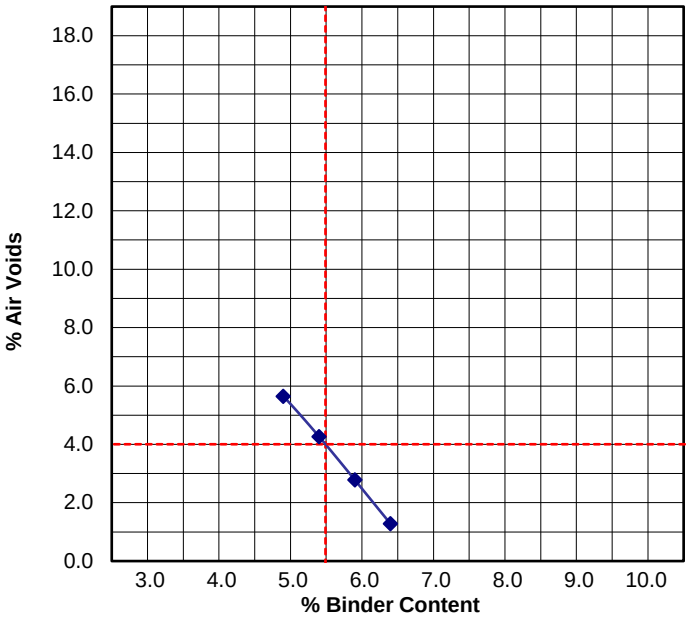
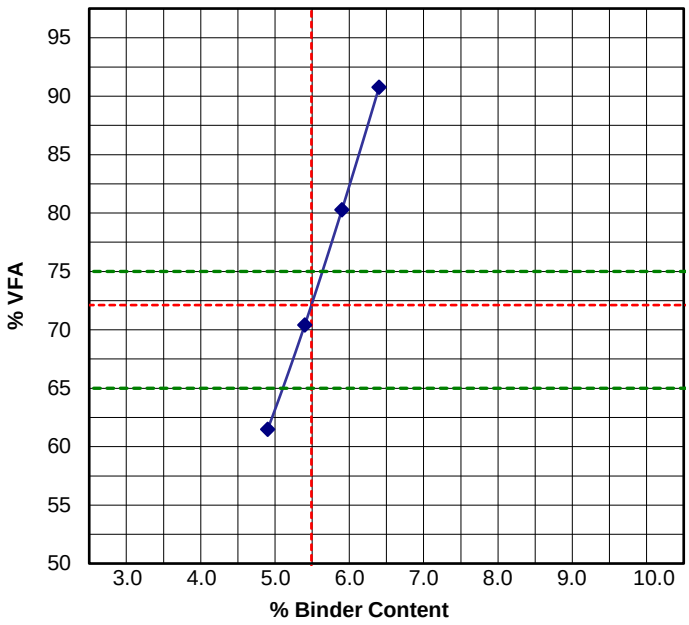
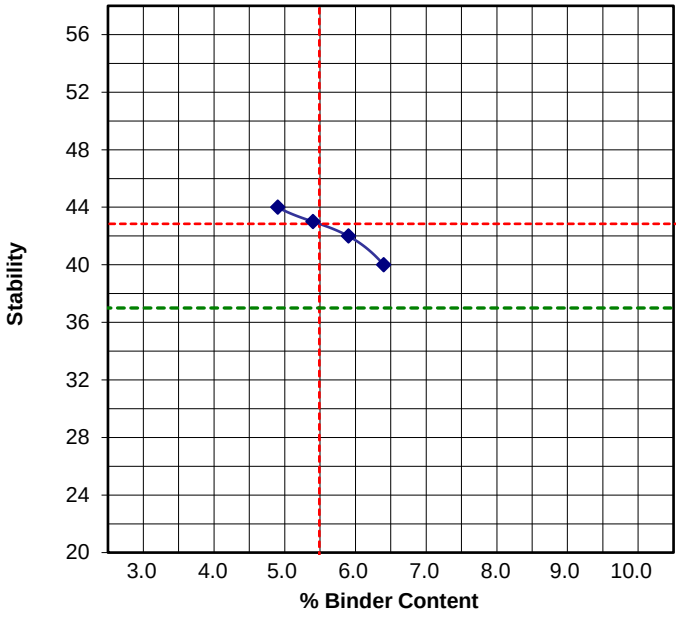
AIR VOIDS



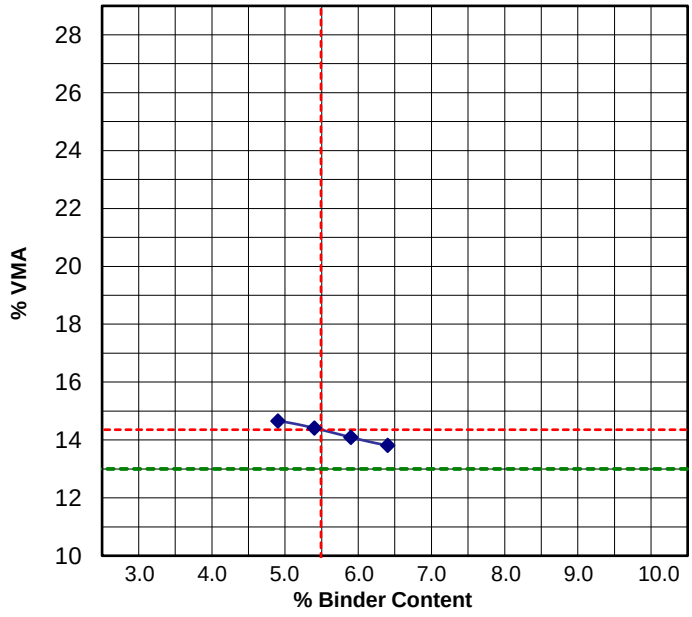
VOIDS FILLED WITH ASPHALT



STABILOMETER VALUE



VOIDS IN MINERAL AGGREGATE



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