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To be used with 2010 Standard Specifications

HOT MIX ASPHALT RECLAIMED ASPHALT PAVEMENT

02-22-13 Modified 6-23-13 with proposed July 2013 revisions Add to section 39-1.01B:

processed RAP: RAP that has been fractionated.

substitution rate: Amount of RAP aggregate substituted for virgin aggregate in percent.

binder replacement: Amount of RAP binder in OBC in percent.

surface course: Upper 0.2 feet of HMA exclusive of OGFC.

Replace the paragraphs in section 39-1.02F with:

39-1.02F(1) General

You may produce HMA Type A or B using RAP. HMA produced using RAP must comply with the specifications for HMA, except aggregate quality specifications do not apply to RAP. You may substitute RAP at a substitution rate not exceeding 25 percent of the aggregate blend. Do not use RAP in OGFC and RHMA-G.

Assign the substitution rate of RAP aggregate for virgin aggregate with the JMF submittal. The JMF must include the percent of RAP used.

Provide enough space for meeting RAP handling requirements at your facility. Provide a clean, graded, well-drained area for stockpiles. Prevent material contamination and segregation.

If RAP is from multiple sources, blend the RAP thoroughly and completely. RAP stockpiles must be homogeneous.

Isolate the processed RAP stockpiles from other materials. Store processed RAP in conical or longitudinal stockpiles. Processed RAP must not be agglomerated or be allowed to congeal in large stockpiles.

AASHTO T 324 (Modified) is AASHTO T 324, "Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA)," with the following parameters:

- 1. Target air voids must equal 7 ± 1 percent
- 2. Specimen height must be 60 mm ± 1mm
- 3. Number of test specimens must be 4
- 4. Test specimen must be a 6-inch gyratory compacted specimen
- 5. Test temperature must be set at:

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- 5.1 122 ± 2 degrees F for PG 58
- 5.2 131 ± 2 degrees F for PG 64
- 5.3 140 ± 2 degrees F for PG 70 and above
- 6. Measurements for impression must be taken at every 100 passes
- 7. Inflection point defined as the number of wheel passes at the intersection of the creep slope and the stripping slope
- 8. Testing shut off must be set at 25,000 passes

39-1.02F(2) Substitution Rate of 15 Percent or Less

For a RAP substitution rate of 15 percent or less, you may stockpile RAP during the entire project.

39-1.02F(3) Substitution Rate Greater than 15 Percent

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For a RAP substitution rate greater than 15 percent, fractionate RAP into 2 sizes, a coarse fraction RAP retained on 3/8-inch screen and a fine fraction RAP passing 3/8-inch screen.

Sample and test processed RAP at a minimum frequency of 1 sample per 1000 tons with a minimum of 6 samples for each processed RAP stockpile. The fractionation grading, asphalt binder content and specific gravity must meet the processed RAP quality characteristics. If a processed RAP stockpile is augmented, sample and test processed RAP quality characteristics at a minimum frequency of 1 sample per 500 tons of augmented RAP.

The processed RAP must meet the following grading requirements when tested under California Test 202. Total mechanical shaking time must be within 10 minutes ±15 seconds.

Sieve sizes	TV limits	Allowable tolerance
1/2"	100	
3/8"	97	TV + 3

Fractionation Quality Requirements

The processed RAP asphalt binder content must be within \pm 2.0 percent of the average processed RAP stockpile asphalt binder content when tested under ASTM D 2172, Method B. If a new processed RAP stockpile is required, the average binder content of the new processed RAP stockpile must be within \pm 2.0 percent of the average binder content of the original processed RAP stockpile.

The maximum specific gravity for processed RAP must be within ± 0.06 when tested under California Test 309 of the average maximum specific gravity reported on page 4 of your *Contractor Hot Mix Asphalt Design Data* form.

Replace items 7 and 8 in the 5th paragraph of section 39-1.03A with:

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- 7. Substitution rate by more than 5 percent if your assigned RAP substitution rate is 15 percent or less
- 8. Substitution rate by more than 3 percent if your assigned RAP substitution rate is greater than 15 percent

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- 9. Average binder content by more than 2 percent from the average binder content of the original processed RAP stockpile used in the mix design
- Maximum specific gravity of processed RAP by more than ±0.060 from the average maximum specific gravity of processed RAP reported on page 4 of your *Contractor Hot Mix Asphalt Design Data* form
- 11. Any material in the JMF

Replace the 1st paragraph of section 39-1.03B with:

02-22-13

Perform a mix design that produces HMA with the values for the quality characteristics shown in the following table:

Quality characteristic	Test	-	HMA ty	/pe
	method	A	В	RHMA-G
Air void content (%)	California	4.0	4.0	Section 39-1.03B
	Test 367			
Voids in mineral aggregate (% min.)	California			
No. 4 grading	Test 367	17.0	17.0	
3/8" grading		15.0	15.0	
1/2" grading		14.0	14.0	18.0–23.0
3/4" grading		13.0	13.0	18.0–23.0
Voids filled with asphalt (%)	California			Note a
No. 4 grading	Test 367	65.0–75.0	65.0–75.0	
3/8" grading		65.0–75.0	65.0–75.0	
1/2" grading		65.0–75.0	65.0–75.0	
3/4" grading		65.0–75.0	65.0–75.0	
Dust proportion	California			Note a
No. 4 and 3/8" gradings	Test 367	0.6–1.2	0.6–1.2	
1/2" and 3/4" gradings		0.6–1.2	0.6–1.2	
Stabilometer value (min.)	California			
No. 4 and 3/8" gradings	Test 366	30	30	
1/2" and 3/4" gradings		37	35	23

HMA Mix Design Requirements

^a Report this value in the JMF submittal.

For RAP substitution rate greater than 15 percent, the mix design must comply with the additional quality characteristics shown in the following table:

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Additional HMA Mix Design Requirements for RAP Substitution Rate Greater Than 15 Percent

Quality characteristic		HMA type		
		А	В	RHMA-G
Hamburg wheel track	AASHTO			
(minimum number of passes at 0.5	T 324			
inch average rut depth)	(Modified) ^a			
PG-58		10,000	10,000	
PG-64		15,000	15,000	
PG-70		20,000	20,000	
PG-76 or higher		25,000	25,000	
Hamburg wheel track	AASHTO			
(inflection point minimum number of	T 324			
passes) ^f	(Modified) ^a			
PG-58		10,000	10,000	
PG-64		10,000	10,000	
PG-70		12,500	12,500	
PG-76 or higher		15000	15000	
Moisture susceptibility	California	120	120	
(minimum dry strength, psi)	Test 371 ^a	120	120	
Moisture susceptibility	California	70	70	
(tensile strength ration, %)	Test 371 ^a	10	70	

^aTest plant produced HMA.

For HMA with RAP, the maximum binder replacement must be 25.0 percent of OBC for surface course and 40.0 percent of OBC for lower courses.

For HMA with a binder replacement less than or equal to 25 percent of OBC, you may request that the PG asphalt binder grade with upper and lower temperature classifications be reduced by 6 degrees C from the specified grade.

For HMA with a binder replacement greater than 25 percent but less than or equal to 40 percent of OBC, you must use a PG asphalt binder grade with upper and lower temperature classifications reduced by 6 degrees C from the specified grade.

Add after the last paragraph of section 39-1.03C:

02-22-13

For RAP substitution rate greater than 15 percent, submit with the JMF submittal:

- 1. California Test 371 tensile strength ratio and minimum dry strength test results
- 2. AASHTO T 324 (Modified) test results

For RAP substitution rate greater than 15 percent, submit California Test 371 and AASHTO T 324 (Modified) test results to the Engineer and to:

Moisture_Tests@dot.ca.gov

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Replace the 16th paragraph of section 39-1.03E with:

Except for RAP substitution rate greater than 15 percent, for any HMA produced under the QC/QA process the Department does not use California Test 371 test results for verification.

Replace the 2nd paragraph of section 39-1.04E with:

For RAP substitution rate of 15 percent or less, sample RAP once daily.

For RAP substitution rate of greater than 15 percent, sample processed RAP twice daily.

Perform QC testing for processed RAP aggregate gradation under California Test 367, appendix B, and submit the results with the combined aggregate gradation.

Add to section 39-1.08A:

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For RAP substitution rate of 15 percent or less, you may adjust the RAP by ±5 percent.

For RAP substitution greater than 15, you may adjust the RAP by ±3 percent.

For projects with Method or QC/QA Construction Process delete the following two sections for Standard Construction Process.

Replace the 1st paragraph of section 39-2.02B with:

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Perform sampling and testing at the specified frequency for the quality characteristics shown in the following table:

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Minimum Quality Control—Standard Construction Process

Minimum Quality Control—Standard Construction Process									
Quality	Test	Minimum							
characteristic	method	sampling and testing frequency	А	В	RHMA-G	OGFC			
Aggregate gradation ^a	California Test 202	1 per 750 tons and	JMF ± Tolerance ^b	JMF ± Tolerance ^b	JMF ± Tolerance ^b	JMF ± Tolerance ^b			
Sand equivalent (min) ^c	California Test 217	any remaining	47	42	47				
Asphalt binder content (%)	California Test 379 or 382	part at the end of the project	JMF±0.40	JMF±0.40	JMF ± 0.40	JMF ± 0.40			
HMA moisture content (%, max)	California Test 226 or 370	1 per 2,500 tons but not less than 1 per paving day	1.0	1.0	1.0	1.0			
Field compaction (% max. theoretical density) ^{d,e}	QC plan	2 per business day (min.)	91–97	91–97	91–97				
Stabilometer value (min) ^c	California Test 366	1 per 4,000 tons or 2							
No. 4 and 3/8" gradings		per 5 business	30	30					
1/2" and 3/4" gradings		days, whichever	37	35	23				
Air void content (%) ^{c, f}	California Test 367	is greater	4 ± 2	4 ± 2	$TV \pm 2$				
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants ^g	California Test 226 or 370	2 per day during production							

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Ouelity Test Minimum Control—Standard Construction Process									
Quality	Test	51							
characteristic	method	sampling							
		and testing	A	В	RHMA-G	OGFC			
	0.111	frequency							
Percent of	California								
crushed particles	Test 205								
coarse aggregate									
(%, min)									
One fractured			90	25		90			
face									
Two fractured			75		90	75			
faces									
Fine aggregate									
(%, min)									
(Passing no.									
4 sieve and									
retained on									
no. 8 sieve.)			70	00	70	00			
One fractured			70	20	70	90			
face									
Los Angeles	California								
Rattler (%, max)	Test 211								
Loss at 100			12		12	12			
rev.									
Loss at 500		As	45	50	40	40			
rev.									
Flat and	California	designated in the QC	Report only	Report only	Report only	Report only			
elongated	Test 235								
particles (%, max		plan. At							
by weight @ 5:1)		least once							
Fine aggregate	California	per project	45	45	45				
angularity (%,	Test 234								
min) ^h									
Voids filled with	California								
asphalt (%) ⁱ	Test 367								
No. 4 grading	1001001		65.0–75.0	65.0–75.0					
3/8" grading			65.0-75.0	65.0-75.0	Report only				
1/2" grading			65.0-75.0	65.0-75.0					
3/4" grading			65.0-75.0	65.0-75.0					
Voids in mineral	California		00.0 70.0	00.0 70.0					
	Test 367								
aggregate (% min) ⁱ	1031307								
,			17.0	17.0					
No. 4 grading			17.0 15.0	17.0 15.0					
3/8" grading									
1/2" grading			14.0	14.0	18.0-23.0				
3/4" grading	Colifornia		13.0	13.0	18.0–23.0				
Dust proportion	California		0010	0010					
No. 4 and 3/8"	Test 367		0.6-1.2	0.6-1.2					
gradings					Report only				
1/2" and 3/4"			0.6–1.2	0.6–1.2					
gradings			_						
	Minimum Q	uality Control	<u>—Standard C</u>	onstruction P	rocess				

Minimum Quality Control—Standard Construction Process

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Quality	Test	Minimum		HMA	type	
characteristic	method	sampling and testing frequency	А	В	RHMA-G	OGFC
Hamburg wheel track (minimum number of passes at 0.5 inch average rut depth) ^j PG-58 PG-64 PG-70 PG-76 or higher	AASHTO T 324 (Modified)	1 per 10,000 tons or 1 per project whichever is more	10,000 15,000 20,000 25,000	10,000 15,000 20,000 25,000		
Hamburg wheel track (inflection point minimum number of passes) ^j PG-58 PG-64 PG-70 PG-76 or higher	AASHTO T 324 (Modified)	1 per 10,000 tons or 1 per project whichever is more	10,000 10,000 12,500 15000	10,000 10,000 12,500 15000		
Moisture susceptibility (minimum dry strength, psi) ⁱ	California Test 371	For RAP ≥15% 1 per 10,000 tons or 1 per project whichever is greater	120	120		
Moisture susceptibility (tensile strength ration, %) ⁱ	California Test 371	For RAP ≥15% 1 per 10,000 tons or 1 per project whichever is greater	70	70		
Smoothness	Section 39-1.12		12-foot straight- edge, must grind, and Pl_0	12-foot straight- edge, must grind, and Pl ₀	12-foot straight- edge, must grind, and Pl ₀	12-foot straight- edge, must grind, and Pl_0

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Minimum Quality Control—Standard Construction Process

			etallada e		100000	
Quality	Test	Minimum		HMA	type	
characteristic	method	sampling and testing frequency	А	В	RHMA-G	OGFC
Asphalt rubber binder viscosity @ 375 °F, centipoises	Section 39-1.02D	Section 39-1.04C			1,500– 4,000	1,500– 4,000
Asphalt modifier	Section 39-1.02D	Section 39-1.04C			Section 39-1.02D	Section 39-1.02D
CRM	Section 39-1.02D	Section 39-1.04C			Section 39-1.02D	Section 39-1.02D

^a Determine combined aggregate gradation containing RAP under California Test 367.

^b The tolerances must comply with the allowable tolerances in section 39-1.02E.

^c Report the average of 3 tests from a single split sample.

^d Determine field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot.

2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

^e To determine field compaction use:

1. In-place density measurements using the method specified in your QC plan.

2. California Test 309 to determine the maximum theoretical density at the frequency specified in California Test 375, Part 5C.

^f Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

⁹ For adjusting the plant controller at the HMA plant.

^h The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

Report only.

¹Applies to RAP substitution rate greater than 15 percent.

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Replace the 1st paragraph of section 39-2.03A with:

02-22-13 The Department samples for acceptance testing and tests for the quality characteristics shown in the following table:

HMA Acceptance—Standard Construction Process Quality characteristic Test HMA type									
Qua	inty cha	racters	SUC	method	Δ	В		0050	
A			a		A		RHMA-G	OGFC	
Aggi	regate (gradatio	on On	California	JMF ±	JMF ±	JMF ±	JMF ±	
Sieve	3/4" X ^b	1/2"	3/8"	Test 202	tolerance ^c	tolerance ^c	tolerance ^c	tolerance ^c	
1/2"	X	V							
3/8"		Х	V						
No. 4	V	V	X						
No. 8	X X	X X	X X						
No. 200	X	X	X						
Sand equ	uivalent	(min) [°]		California	47	42	47		
		()		Test 217					
Asphalt b	oinder c	ontent	(%)	California	JMF±0.40	JMF±0.40	JMF ± 0.40	JMF ± 0.40	
			、 ,	Test 379					
				or 382					
HMA moi	isture c	ontent		California	1.0	1.0	1.0	1.0	
(%, max)				Test 226					
				or 370					
Field com			ax.	California	91–97	91–97	91–97		
theoretica			a	Test 375					
Stabilom				California					
	and 3/			Test 366	30	30			
1/2" a	and 3/4	gradi	ngs		37	35	23		
Air void c	content	(%) ^{u, g}		California	4 ± 2	4 ± 2	$TV \pm 2$		
·	<u> </u>			Test 367					
Percent of				California					
Coarse a	fracture		nin)	Test 205	00	25		00	
	fracture		-		90 75	25	90	90 75	
Fine aggi					75		90	75	
	sing no								
	ned on								
	fracture		000.)		70	20	70	90	
Los Ange			, max)	California					
•	at 100	•	, ,	Test 211	12		12	12	
Loss	at 500	rev.			45	50	40	40	
Fine agg	regate	angulai	ity (%,	California					
min) ^h				Test 234	45	45	45		
Flat and				California	Report	Report only	Report only	Report only	
(%, max				Test 235	only	Teport only	Teport only	Report only	
Voids fille			t (%) '	California					
	l gradin			Test 367	65.0–75.0	65.0–75.0			
	grading				65.0-75.0	65.0-75.0	Report only		
	grading				65.0-75.0	65.0-75.0			
3/4" (grading				65.0-75.0	65.0-75.0			
			HMA Ac	ceptance—S	tandard Con	struction Pro	cess		

HMA Acceptance—Standard Construction Process

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Quality characteristic	Test		HM	A type	
	method	A	В	RHMA-G	OGFC
Voids in mineral aggregate	California				
(% min) ¹	Test 367				
No. 4 grading		17.0	17.0		
3/8" grading		15.0	15.0		
1/2" grading		14.0	14.0	18.0–23.0	
3/4" grading		13.0	13.0	18.0–23.0	
Dust proportion '	California				
No. 4 and 3/8" gradings	Test 367	0.6-1.2	0.6-1.2	Report only	
1/2" and 3/4" gradings		0.6–1.2	0.6–1.2		
Hamburg wheel track	AASHTO				
(minimum number of passes at	T 324				
0.5 inch average rut depth) ¹	(Modified)				
PG-58		10,000	10,000		
PG-64		15,000	15,000		
PG-70		20,000	20,000		
PG-76 or higher		25,000	25,000		
Hamburg wheel track	AASHTO				
(inflection point minimum	T 324				
number of passes)	(Modified)				
PG-58		10,000	10,000		
PG-64		10,000	10,000		
PG-70		12,500	12,500		
PG-76 or higher		15000	15000		
Moisture susceptibility	California	120	120		
(minimum dry strength, psi) ^J	Test 371	120	120		
Moisture susceptibility	California	70	70		
(tensile strength ration, %) ^j	Test 371				
Smoothness	Section	12-foot	12-foot	12-foot	12-foot
	39-1.12	straight-	straight-	straight-	straight-
		edge,	edge, must	edge, must	edge and
		must	grind, and	grind, and	must grind
		grind, and	Pl ₀	Plo	
			0 // 00		0 11 65
Asphalt binder	Various	Section 92	Section 92	Section 92	Section 92
Asphalt rubber binder	Various			Section	Section
				92-	92-1.01D(2)
				1.01D(2)	and section
				and section	39-1.02D
A 1 1/2				39-1.02D	
Asphalt modifier	Various			Section	Section
				39-1.02D	39-1.02D
CRM	Various			Section	Section
^a The Engineer determines com				39-1.02D	39-1.02D

a The Engineer determines combined aggregate gradations containing RAP under California Test 367.

^b "X" denotes the sieves the Engineer tests for the specified aggregate gradation. ^c The tolerances must comply with the allowable tolerances in section 39-1.02E.

^d The Engineer reports the average of 3 tests from a single split sample. ^e The Engineer determines field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness 3/4-inch aggregate grading is used and the specified total paved is at least 0.15 foot.2.

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thickness is at least 0.20 foot.

^fTo determine field compaction, the Engineer uses:

1. California Test 308, Method A, to determine in-place density of each density core.

2. California Test 309 to determine the maximum theoretical density at the frequency specified

in California Test 375, Part 5C.

^gThe Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

^h The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

Report only.

^jApplies to RAP substitution rate greater than 15 percent.

Contract No. XX-XXXXX CCO No. XXX Attachment Page 13 of 23 For projects with Standard or QC/QA Construction Process delete the following section for Method Process.

Replace the 1st paragraph of section 39-3.02A with:

02-22-13 The Department samples for acceptance testing and tests for the quality characteristics shown in the following table:

Quality characteristic	Test		truction Proce	A type	
	method	Α	В	RHMA-G	OGFC
Aggregate gradation ^a	California	JMF ±	JMF ±	JMF ±	JMF ±
	Test 202	tolerance ^b	tolerance ^b	tolerance b	tolerance ^b
Sand equivalent (min) ^c	California	47	42	47	
	Test 217				
Asphalt binder content (%)	California	JMF±0.40	JMF±0.40	JMF ± 0.40	JMF ± 0.40
	Test 379				
	or 382				
HMA moisture content (%, max)	California	1.0	1.0	1.0	1.0
	Test 226				
	or 370				
Stabilometer value (min) ^c	California				
No. 4 and 3/8" gradings	Test 366	30	30		
1/2" and 3/4" gradings		37	35	23	
Percent of crushed particles	California				
Coarse aggregate (% min)	Test 205				
One fractured face		90	25		90
Two fractured faces		75		90	75
Fine aggregate (% min)					
(Passing no. 4 sieve and					
retained on no. 8 sieve.) One fractured face		70	20	70	90
Los Angeles Rattler (% max)	California	70	20	70	90
Loss at 100 rev.	Test 211	12		12	12
Loss at 500 rev.	1631211	45	50	40	40
Air void content (%) ^{c, d}	California				
	Test 367	4 ± 2	4 ± 2	$TV \pm 2$	
Fine aggregate angularity	California	45	45	45	
(% min) ^e	Test 234		45	45	
Flat and elongated particles	California	Report	Report only	Report only	Report only
(% max by weight @ 5:1)	Test 235	only	Troport only	Troport only	Troport only
Voids filled with asphalt	California				
(%) ^f	Test 367				
No. 4 grading		65.0-75.0	65.0-75.0	Report only	
3/8" grading		65.0-75.0	65.0-75.0		
1/2" grading		65.0-75.0	65.0-75.0		
3/4" grading	Colifornia	65.0–75.0	65.0–75.0		
Voids in mineral aggregate (% min) ^f	California				
. ,	Test 367	17.0	17.0		
No. 4 grading		17.0	17.0		
3/8" grading 1/2" grading		15.0	15.0	 18.0–23.0	
3/4" grading		14.0	14.0	18.0–23.0	
Sr4 graung		13.0	13.0	10.0-23.0	

HMA Acceptance—Method Construction Process

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HMA Acceptance—Method Construction Process

HMA Acceptance—Method Construction Process Quality characteristic Test HMA type HMA type								
	A	В	RHMA-G	OGFC				
California								
Test 367	0.6–1.2	0.6–1.2	Report only					
	0.6–1.2	0.6–1.2						
AASHTO								
T 324								
(Modified)								
, ,	10,000	10,000						
	15,000	15,000						
AASHTO	,	,						
T 324								
, ,	10.000	10.000						
California								
	120	120						
	70	70						
	12-foot	12-foot	12-foot	12-foot				
			straight-	straight-				
		•	•	edge and				
				must-grind				
Various			v	Section 92				
			Section	Section				
			92-	92-				
				1.01D(2)				
			• • •	and section				
				39-1.02D				
Various				Section				
				39-1.02D				
Various				Section				
			39-1.02D	39-1.02D				
	Test method California Test 367 AASHTO T 324	Test method A California Test 367 0.6–1.2 0.6–1.2 AASHTO T 324 (Modified) 10,000 15,000 20,000 25,000 AASHTO T 324 (Modified) 10,000 10,000 12,500 10,000 12,500 15000 California Test 371 120 California Test 371 70 Section 39-1.12 12-foot straight- edge and must-grind Various Section 92 Various	Test method HMA California Test 367 0.6–1.2 0.6–1.2 AASHTO T 324 (Modified) 0.6–1.2 0.6–1.2 AASHTO T 324 (Modified) 10,000 10,000 15,000 20,000 20,000 25,000 25,000 25,000 AASHTO T 324 (Modified) 10,000 10,000 AASHTO T 324 (Modified) 10,000 10,000 10,000 10,000 12,500 125,000 12,500 12,500 California Test 371 70 70 California Test 371 70 70 Section 39-1.12 12-foot straight- edge and must-grind straight- edge and must-grind Various Various	Test method HMA type A B RHMA-G California Test 367 0.6–1.2 0.6–1.2 0.6–1.2 0.6–1.2 Report only AASHTO T 324 (Modified) 10,000 10,000 California Test 371 120 12,500 California Test 371 70 70 Section 39-1.12 3traight- edge and must-grind straight- edge and must-grind straight- edge and must-grind straight- edge and must-grind Various Section 92 Section 92 Various Section 92- 1.01D(2) and section 39-1.02D Various Section Various Section				

^a The Engineer determines combined aggregate gradations containing RAP under California Test 367.

^b The tolerances must comply with the allowable tolerances in section 39-1.02E.

^c The Engineer reports the average of 3 tests from a single split sample.

^d The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

^e The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or

gravel.

[†]Report only.

^g Applies to RAP substitution rate greater than 15 percent.

For projects with Method or Standard Construction Process delete the following three sections for QC/QA Construction Process.

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Replace the 7th paragraph of section 39-4.02C with:

Except for RAP substitution rate of greater than 15 percent, the Department does not use results from California Test 371 to determine specification compliance.

Replace the 8th paragraph of section 39-4.02C with:

02-22-13

02-22-13

Comply with the values for the HMA quality characteristics and minimum random sampling and testing for quality control shown in the following table:

Quality		m Quality Co			ion Process	Lasation	Mari
Quality characteristic	Test method	Minimum		НМА Туре		Location of	Maxi-
characteristic	method	sampling and				sampling	mum report
		testing	A	В	RHMA-G	Sampling	-ing
		frequency	A	Б	KHIWA-G		time
		nequency					allow-
							ance
Aggregate	California		JMF ±	JMF ±	JMF ±	California	anoo
gradation ^a	Test 202		tolerance ^b	tolerance ^b	tolerance ^b	Test 125	
gradation	100(202		JMF±0.40	JMF±0.40	JMF ±0.40	Loose	
			0.000 ±0.10	01111 ±0.10		mix	
Asphalt	California					behind	
binder	Test 379					paver	
content (%)	or 382	1 per 750				See	24
. ,		tons				California	hours
						Test 125	
Field							
compaction							
(% max.	QC plan		92–96	92–96	91–96	QC plan	
theoretical							
density) ^{c,d}							
Aggregate							
moisture							
content at							
continuous							
mixing plants						Stock-	
and RAP	California	2 per day				piles or	
moisture	Test 226	during				cold feed	
content at	or 370	production				belts	
continuous							
mixing plants and batch							
mixing							
plants ^e							
Sand							
equivalent	California	1 per 750	47	42	47	California	_ 24
(min) ^f	Test 217	tons		· -		Test 125	hours
		1 per					
118.4.0		2,500 tons					
HMA	California	but					.
moisture	Test 226	not less	1.0	1.0	1.0		24
content	or 370	than 1 per				Loose	hours
(%,max)	•	paving				Mix	
		day				Behind	
Stabilometer		1 per				Paver	
value (min) ^f		4,000 tons				See California	
	California	or 2 per 5				Test 125	10
No. 4 and	California Test 366	business	30	30		1651120	48 hours
3/8" gradings	1621 200	days,					nours
1/2" and 3/4"		whichever	37	35	23		
gradings		in areator	1		1		
graungs		is greater m Quality Co	_				

Minimum Quality Control—QC/QA Construction Process

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Quality characteristic	Test method	Minimum sampling and		НМА Туре	Location of sampling	Maxi- mum report	
		testing frequency	A	В	RHMA-G		-ing time allow- ance
Air void content (%) ^{f,g}	California Test 367	1 per 4,000 tons or 2 per 5 business days, whichever is greater	4 ± 2	4 ± 2	TV ± 2	Loose Mix Behind Paver See California Test 125	48 hours
Percent of crushed particles coarse aggregate (% min.): One fractured face Two fractured faces	California Test 205		90 75	25 	 90	California Test 125	
Fine aggregate (% min) (Passing no. 4 sieve and retained on no. 8 sieve): One fractured face		As desig- nated in QC plan. At least once per project.	70	20	70		48 hours
Los Angeles Rattler (% max): Loss at 100 rev. Loss at 500 rev.	California Test 211		12 45	 50	12 40	California Test 125	
Fine aggregate angularity (% min) ^h	California Test 234		45	45	45	California Test 125	

Quality		m Quality Co			10111100033		Maul
Quality	Test	Minimum		НМА Туре	Location	Maxi-	
characteristic	method	sampling				of	mum
		and		_		sampling	report
		testing	A	В	RHMA-G		-ing
		frequency					time
							allow-
							ance
Flat and							
elongated							
particle	California		Report	Report	Report	California	
(% max by	Test 235		only	only	only	Test 125	
weight @			-	-	-		
5:1)							
Voids filled	California						
with asphalt	Test 367						
(%) ⁱ							
(,,,)					_		
No. 4 grading					Report		
3/8" grading			65.0–75.0	65.0–75.0	only		
1/2" grading			65.0-75.0	65.0-75.0			
3/4" grading			65.0-75.0	65.0-75.0			
5/4 grading			65.0-75.0	65.0-75.0			
Voids in	California		05.0-75.0	05.0-75.0			48
mineral	Test 367						hours
aggregate							
(% min.) [']							
No. 4 grading			47.0	47.0			
3/8" grading			17.0	17.0			
1/2" grading			15.0	15.0			
3/4" grading			14.0	14.0	18.0–23.0		
			13.0	13.0	18.0–23.0		
Dust	California						
proportion	Test 367						
					Report		
No. 4 and					only		
3/8" gradings			0.6–1.2	0.6–1.2	Only		
1/2" and 3/4"							
gradings			0.6–1.2	0.6–1.2			
Hamburg	AASHTO						
wheel track	T 324	1 per					
(minimum	(Modified)	10,000					
number of	、	tons or 1					
passes at 0.5		per project					
inch average		whichever					
rut depth) ^{ji}		is greater					
PG-58			10,000	10,000			
PG-64			15,000	15,000			
PG-04 PG-70			20,000	20,000			
PG-70 PG-76 or			20,000	20,000			
			25.000	25.000			
higher			25,000	25,000			

Minimum Quality Control—QC/QA Construction Process

Minimum Quality Control—QC/QA Construction Process									
Quality characteristic	Test method	Minimum sampling and		НМА Туре	Location of sampling	Maxi- mum report			
		testing frequency	A	В	RHMA-G		-ing time allow- ance		
Hamburg wheel track (inflection point minimum number of passes) ⁱ PG-58 PG-64 PG-70 PG-76 or higher	AASHTO T 324 (Modified)	1 per 10,000 tons or 1 per project whichever is greater	10,000 10,000 12,500 15000	10,000 10,000 12,500 15000					
Moisture susceptibility (minimum dry strength, psi) ^j	California Test 371	1 per 10,000 tons or 1 per project whichever is greater	120	120					
Moisture susceptibility (tensile strength ratio, %) ⁱ	California Test 371	1 per 10,000 tons or 1 per project whichever is greater	70	70	70				
Smoothness	Section 39-1.12		12-foot straight- edge, must- grind, and Pl ₀	12-foot straight- edge, must- grind, and Pl ₀	12-foot straight- edge, must- grind, and Pl ₀				
Asphalt rubber binder viscosity @ 375 °F, centipoises	Section 39-1.02D				1,500– 4,000	Section 39-1.02D	24 hours		
CRM	Section 39-1.02D				Section 39-1.02D	Section 39-1.02D	48 hours		

Minimum Quality Control—QC/QA Construction Process

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^a Determine combined aggregate gradation containing RAP under California Test 367.

^b The tolerances must comply with the allowable tolerances in section 39-1.02E.

^c Determines field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot.2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

^d To determine field compaction use:

1. In-place density measurements using the method specified in your QC plan.

2. California Test 309 to determine the maximum theoretical density at the frequency specified in California Test 375, Part 5C.

^e For adjusting the plant controller at the HMA plant.

^f Report the average of 3 tests from a single split sample.

⁹ Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

^h The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

Report only.

^jApplies to RAP substitution rate greater than 15 percent.

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Replace the 1st paragraph of section 39-4.04A with:

02-22-13

The Engineer samples for acceptance testing and tests for the following quality characteristics:

	T						uction Proce				
Index	Quality characteristic			stic	Weight	Test		HMA type	1		
(i)					-ing	method		-	5.044.0		
					factor		A	A B RH			
				1.	(w)						
	Aggregate gradation ^a										
		g	laualio								
	Sieve	3/4"	1/2"	3/8"							
1	1/2"	X ^b			0.05	California	JMF ± Tolerance ^c				
1	3/8"		Х		0.05	Test 202					
1	No. 4			Х	0.05						
2	No. 8	Х	Х	Х	0.10						
3	No. 200	Х	Х	Х	0.15						
4	Asphal	alt binder content (%)			0.30	California Test 379 or 382	JMF±0.40	JMF±0.40	JMF ± 0.40		
5	Field compaction (% max. theoretical density) ^{d, e} Sand equivalent (min) [†]			0.40	California Test 375	92–96	92–96	91–96			
					California Test 217	47	42	47			
	Stabilometer value (min) [†]					California					
	No. 4 and 3/8" gradings				Test 366	30	30				
	1/2" and 3/4" gradings Air void content (%) ^{f, g}				37	35	23				
				California Test 367	4 ± 2	4 ± 2	TV ± 2				
	Percent of crushed particles coarse aggregate (% min) One fractured face Two fractured faces Fine aggregate (% min) (Passing no. 4 sieve and retained on No. 8 sieve.)				California Test 205	90	25				
						75		90			
		One fractured face				70	20	70			
	HMA moisture content (%, max) Los Angeles Rattler (% max)				California Test 226 or 370	1.0	1.0	1.0			
					California Test 211						
		ss at 10					12		12		
		ss at 50				0.111	45	50	40		
	Fine ag (% min) ^h	_	-		California Test 234	45	45	45		
	Flat and elongated particle (% max by weight @ 5:1)					California Test 235	Report only	Report only	Report only		

HMA Acceptance—QC/QA Construction Process

HMA Acceptance—QC/QA Construction Process

Index	Quality characteristic Weight Test HMA					
(i)		-ing factor (w)	method	А	В	RHMA-G
	Voids in mineral aggregate (% min) ⁱ		California Test 367			
	No. 4 grading			17.0	17.0	
	3/8" grading			15.0	15.0	18.0–23.0
	1/2" grading			14.0 13.0	14.0 13.0	18.0–23.0
	3/4" grading Voids filled with asphalt (%)		California	13.0	13.0	
			Test 367			
	No. 4 grading			65.0–75.0	65.0–75.0	Report only
	3/8" grading			65.0–75.0	65.0–75.0	
	1/2" grading			65.0–75.0	65.0–75.0	
	3/4" grading			65.0–75.0	65.0–75.0	
	Dust proportion ¹ No. 4 and 3/8" gradings		California Test 367	0.6–1.2	0.6–1.2	Report only
	1/2" and 3/4" gradings		Test 307	0.6-1.2	0.6-1.2	Report only
	Hamburg Wheel Tracker		AASHTO	0.0 1.2	0.0 1.2	
	(minimum number of		T 324			
	passes at 0.5 inch average		(Modified)			
	rut depth) ¹					
	PG-58			10,000	10,000	
	PG-64 PG-70			15,000 20,000	15,000 20,000	
	PG-76 or higher			20,000	20,000 25,000	
	Hamburg Wheel Tracker		AASHTO	20,000	20,000	
	(inflection point minimum		T 324			
	number of passes) ⁱ		(Modified)			
	PG-58			10,000	10,000	
	PG-64			15,000	15,000	
	PG-70 PG-76 or higher			20,000 25,000	20,000 25,000	
	Moisture susceptibility		California		· · · ·	
	(minimum dry strength, psi) ^j		Test 371	120	120	
	Moisture susceptibility		California			
	(tensile strength ratio %) ^j		Test 371	70	70	70
	Smoothness		Section	12-foot	12-foot	12-foot
			39-1.12	straight-	straight-	straight-
				edge, must	edge, must grind, and	edge, must grind, and
				grind, and	PI_0	PI_0
					- •0	- 10

HMA Acceptance—QC/QA Construction Process

Index	Quality characteristic	Weight	Test		-	
(i)		-ing factor (w)	method	А	В	RHMA-G
	Asphalt binder		Various	Section 92	Section 92	Section 92
	Asphalt rubber binder		Various			Section 92-1.01D(2) and section 39-1.02D
	Asphalt modifier		Various			Section 39-1.02D
	CRM		Various			Section 39-1.02D

^a The Engineer determines combined aggregate gradations containing RAP under California Test 367.

^b "X" denotes the sieves the Engineer tests for the specified aggregate gradation.

 $^\circ$ The tolerances must comply with the allowable tolerances in section 39-1.02E.

^d The Engineer determines field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot and less than 0.20 foot.2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

^e To determine field compaction, the Engineer uses:

1. California Test 308, Method A, to determine in-place density of each density core.

2. California Test 309 to determine the maximum theoretical density at the frequency specified in California Test 375, Part 5C.

^f The Engineer reports the average of 3 tests from a single split sample.

⁹ The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

^h The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

Report only.

ⁱ Applies to RAP substitution rate greater than 15 percent.

For projects with either Method or Standard Construction Process Insert the following SSPs for moisture sensitivity treatment:

39-1.18 Hot Mix Asphalt Aggregate Lime Treatment – Dry Lime Method

39-1.19 Hot Mix Asphalt Aggregate Lime Treatment – Slurry Method

39-1.20 Liquid Antistrip Treatment