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:

02-22-13

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:

02-22-13

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.

06-23-13

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:

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

06-23-13

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.

Fractionation Quality Requirements

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

The processed RAP asphalt binder content must be within ± 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 ± 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:

02-22-13

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

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
10. 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:

HMA Mix Design Requirements

Quality characteristic	Test method	HMA type		
		A	B	RHMA-G
Air void content (%)	California Test 367	4.0	4.0	Section 39-1.03B
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

[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:

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

Quality characteristic	Test method	HMA type		
		A	B	RHMA-G
Hamburg wheel track (minimum number of passes at 0.5 inch average rut depth)	AASHTO T 324 (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 (inflection point minimum number of passes)[f]	AASHTO T 324 (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 (minimum dry strength, psi)	California Test 371[a]	120	120	--
Moisture susceptibility (tensile strength ration, %)	California Test 371[a]	70	70	--

[a]Test 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

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

02-22-13

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:

02-22-13

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:

02-22-13

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:

02-22-13

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

Minimum Quality Control—Standard Construction Process

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA type			
			A	B	RHMA-G	OGFC
Aggregate gradation[a]	California Test 202	1 per 750 tons and any remaining part at the end of the project	JMF ± Tolerance[b]	JMF ± Tolerance[b]	JMF ± Tolerance[b]	JMF ± Tolerance[b]
Sand equivalent (min)[c]	California Test 217		47	42	47	--
Asphalt binder content (%)	California Test 379 or 382		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 per 5 business days, whichever is greater				
No. 4 and 3/8" gradings			30	30	--	--
1/2" and 3/4" gradings			37	35	23	--
Air void content (%)[c, f]	California Test 367		4 ± 2	4 ± 2	TV ± 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	--	--	--	--

Minimum Quality Control—Standard Construction Process

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA type			
			A	B	RHMA-G	OGFC
Percent of crushed particles coarse aggregate (%, min)	California Test 205	As designated in the QC plan. At least once per project				
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 Test 211					
Loss at 100 rev.			12	--	12	12
Loss at 500 rev.			45	50	40	40
Flat and elongated particles (%, max by weight @ 5:1)	California Test 235		Report only	Report only	Report only	Report only
Fine aggregate angularity (%, min)[h]	California Test 234		45	45	45	--
Voids filled with asphalt (%)[i]	California 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		
Voids in mineral aggregate (% min)[i]	California 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[l]	California Test 367					
No. 4 and 3/8" gradings			0.6-1.2	0.6-1.2	Report only	--
1/2" and 3/4" gradings			0.6–1.2	0.6–1.2		

Minimum Quality Control—Standard Construction Process

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA type			
			A	B	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)[j]	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, %)[j]	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 PI_0	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge, must grind, and PI_0

Minimum Quality Control—Standard Construction Process

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA type			
			A	B	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.
[g] 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.
[i] Report only.
[j] Applies to RAP substitution rate greater than 15 percent.

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 method	HMA type			
					A	B	RHMA-G	OGFC
Aggregate gradation [a]				California Test 202	JMF ± tolerance [c]	JMF ± tolerance [c]	JMF ± tolerance [c]	JMF ± tolerance [c]
Sieve	3/4"	1/2"	3/8"					
1/2"	X [b]							
3/8"		X						
No. 4			X					
No. 8	X	X	X					
No. 200	X	X	X					
Sand equivalent (min) [d]				California Test 217	47	42	47	--
Asphalt binder content (%)				California Test 379 or 382	JMF±0.40	JMF±0.40	JMF ± 0.40	JMF ± 0.40
HMA moisture content (%, max)				California Test 226 or 370	1.0	1.0	1.0	1.0
Field compaction (% max. theoretical density) [e, f]				California Test 375	91–97	91–97	91–97	--
Stabilometer value (min) [d,]				California Test 366				
No. 4 and 3/8" gradings					30	30	--	--
1/2" and 3/4" gradings					37	35	23	--
Air void content (%) [d, g]				California Test 367	4 ± 2	4 ± 2	TV ± 2	--
Percent of crushed particles				California Test 205				
Coarse aggregate (%, min)								
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 Test 211				
Loss at 100 rev.					12	--	12	12
Loss at 500 rev.					45	50	40	40
Fine aggregate angularity (%, min) [h]				California Test 234	45	45	45	--
Flat and elongated particles (%, max by weight @ 5:1)				California Test 235	Report only	Report only	Report only	Report only
Voids filled with asphalt (%) [i]				California Test 367				
No. 4 grading					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		

HMA Acceptance—Standard Construction Process

Quality characteristic	Test method	HMA type			
		A	B	RHMA-G	OGFC
Voids in mineral aggregate (% min) [i]	California 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 [i]	California Test 367				
No. 4 and 3/8" gradings		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 (minimum number of passes at 0.5 inch average rut depth)[j]	AASHTO T 324 (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 (inflection point minimum number of passes)[j]	AASHTO T 324 (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 (minimum dry strength, psi)[j]	California Test 371	120	120	--	--
Moisture susceptibility (tensile strength ration, %)[j]	California Test 371	70	70	--	--
Smoothness	Section 39-1.12	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge and must grind
Asphalt binder	Various	Section 92	Section 92	Section 92	Section 92
Asphalt rubber binder	Various	--	--	Section 92-1.01D(2) and section 39-1.02D	Section 92-1.01D(2) and section 39-1.02D
Asphalt modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D
CRM	Various	--	--	Section 39-1.02D	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.
[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 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.

[f] 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.

[g] 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.

[i] Report only.

[j] Applies to RAP substitution rate greater than 15 percent.

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:

HMA Acceptance—Method Construction Process

Quality characteristic	Test method	HMA type			
		A	B	RHMA-G	OGFC
Aggregate gradation [a]	California Test 202	JMF ± tolerance [b]	JMF ± tolerance [b]	JMF ± tolerance [b]	JMF ± tolerance [b]
Sand equivalent (min) [c]	California Test 217	47	42	47	--
Asphalt binder content (%)	California Test 379 or 382	JMF±0.40	JMF±0.40	JMF ± 0.40	JMF ± 0.40
HMA moisture content (%, max)	California Test 226 or 370	1.0	1.0	1.0	1.0
Stabilometer value (min) [c]	California Test 366				
No. 4 and 3/8" gradings		30	30	--	--
1/2" and 3/4" gradings		37	35	23	--
Percent of crushed particles	California Test 205				
Coarse aggregate (% min)					
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 Test 211				
Loss at 100 rev.		12	--	12	12
Loss at 500 rev.		45	50	40	40
Air void content (%) [c, d]	California Test 367	4 ± 2	4 ± 2	TV ± 2	--
Fine aggregate angularity (% min)[e]	California Test 234	45	45	45	--
Flat and elongated particles (% max by weight @ 5:1)	California Test 235	Report only	Report only	Report only	Report only
Voids filled with asphalt (%) [f]	California 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		
Voids in mineral aggregate (% min) [f]	California 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	

HMA Acceptance—Method Construction Process

Quality characteristic	Test method	HMA type			
		A	B	RHMA-G	OGFC
Dust proportion [f] No. 4 and 3/8" gradings 1/2" and 3/4" gradings	California Test 367	 0.6–1.2 0.6–1.2	 0.6–1.2 0.6–1.2	Report only	--
Hamburg wheel track (minimum number of passes at 0.5 inch average rut depth)[g] PG-58 PG-64 PG-70 PG-76 or higher	AASHTO T 324 (Modified)	 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)[g] PG-58 PG-64 PG-70 PG-76 or higher	AASHTO T 324 (Modified)	 10,000 10,000 12,500 15000	 10,000 10,000 12,500 15000	--	--
Moisture susceptibility (minimum dry strength, psi)[g]	California Test 371	120	120	--	--
Moisture susceptibility (tensile strength ration, %)[g]	California Test 371	70	70	--	--
Smoothness	Section 39-1.12	12-foot straight-edge and must-grind	12-foot straight-edge and must-grind	12-foot straight-edge and must-grind	12-foot straight-edge and must-grind
Asphalt binder	Various	Section 92	Section 92	Section 92	Section 92
Asphalt rubber binder	Various	--	--	Section 92-1.01D(2) and section 39-1.02D	Section 92-1.01D(2) and section 39-1.02D
Asphalt modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D
CRM	Various	--	--	Section 39-1.02D	Section 39-1.02D

[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.
[f] 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.

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

02-22-13

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

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

Minimum Quality Control—QC/QA Construction Process

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA Type			Location of sampling	Maximum reporting time allowance
			A	B	RHMA-G		
Aggregate gradation[a]	California Test 202	1 per 750 tons	JMF ± tolerance [b]	JMF ± tolerance [b]	JMF ± tolerance [b]	California Test 125	24 hours
Asphalt binder content (%)	California Test 379 or 382		JMF±0.40	JMF±0.40	JMF ±0.40	Loose mix behind paver See California Test 125	
Field compaction (% max. theoretical density)[c,d]	QC plan		92–96	92–96	91–96	QC plan	
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants[e]	California Test 226 or 370	2 per day during production	--	--	--	Stockpiles or cold feed belts	--
Sand equivalent (min)[f]	California Test 217	1 per 750 tons	47	42	47	California Test 125	24 hours
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	Loose Mix Behind Paver See California Test 125	24 hours
Stabilometer value (min)[f] No. 4 and 3/8" gradings 1/2" and 3/4" gradings	California Test 366	1 per 4,000 tons or 2 per 5 business days, whichever is greater	 30 37	 30 35	 -- 23		48 hours

Minimum Quality Control—QC/QA Construction Process

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA Type			Location of sampling	Maximum reporting time allowance
			A	B	RHMA-G		
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.):	California Test 205	As designated in QC plan. At least once per project.				California Test 125	48 hours
One fractured face			90	25	--		
Two fractured faces			75	--	90		
Fine aggregate (% min) (Passing no. 4 sieve and retained on no. 8 sieve): One fractured face			70	20	70		
Los Angeles Rattler (% max):	California Test 211					California Test 125	
Loss at 100 rev.			12	--	12		
Loss at 500 rev.			45	50	40		
Fine aggregate angularity (% min)[h]	California Test 234		45	45	45	California Test 125	

Minimum Quality Control—QC/QA Construction Process

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA Type			Location of sampling	Maximum reporting time allowance
			A	B	RHMA-G		
Flat and elongated particle (% max by weight @ 5:1)	California Test 235		Report only	Report only	Report only	California Test 125	48 hours
Voids filled with asphalt (%)[i] No. 4 grading 3/8" grading 1/2" grading 3/4" grading	California Test 367		 65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	 65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	Report only		
Voids in mineral aggregate (% min.)[i] No. 4 grading 3/8" grading 1/2" grading 3/4" grading	California Test 367		 17.0 15.0 14.0 13.0	 17.0 15.0 14.0 13.0	 -- -- 18.0–23.0 18.0–23.0		
Dust proportion[i] No. 4 and 3/8" gradings 1/2" and 3/4" gradings	California Test 367		 0.6–1.2 0.6–1.2	 0.6–1.2 0.6–1.2	Report only		
Hamburg wheel track (minimum number of passes at 0.5 inch average rut depth)[ii] 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 15,000 20,000 25,000	 10,000 15,000 20,000 25,000	--	--	

Minimum Quality Control—QC/QA Construction Process

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA Type			Location of sampling	Maximum reporting time allowance
			A	B	RHMA-G		
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 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, %)[j]	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 PI_0	12-foot straight-edge, must-grind, and PI_0	12-foot straight-edge, must-grind, and PI_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

[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.
[g] 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.
[i] Report only.
[j] Applies to RAP substitution rate greater than 15 percent.

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:

HMA Acceptance—QC/QA Construction Process

Index (i)	Quality characteristic				Weighting factor (w)	Test method	HMA type		
							A	B	RHMA-G
		Aggregate gradation [a]							
	Sieve	3/4"	1/2"	3/8"					
1	1/2"	X [b]	--	--	0.05	California Test 202	JMF ± Tolerance [c]		
1	3/8"	--	X	--	0.05				
1	No. 4	--	--	X	0.05				
2	No. 8	X	X	X	0.10				
3	No. 200	X	X	X	0.15				
4	Asphalt 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]				0.40	California Test 375	92–96	92–96	91–96
	Sand equivalent (min) [f]					California Test 217	47	42	47
	Stabilometer value (min) [f] No. 4 and 3/8" gradings 1/2" and 3/4" gradings					California Test 366	 30 37	 30 35	 -- 23
	Air void content (%) [f, g]					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.) One fractured face					California Test 205	 90 75 70	 25 -- 20	 -- 90 70
	HMA moisture content (%, max)					California Test 226 or 370	1.0	1.0	1.0
	Los Angeles Rattler (% max) Loss at 100 rev. Loss at 500 rev.					California Test 211	 12 45	 -- 50	 12 40
	Fine aggregate angularity (% 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

Index (i)	Quality characteristic	Weight-ing factor (w)	Test method	HMA type		
				A	B	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	14.0	18.0–23.0
	3/4" grading			13.0	13.0	
	Voids filled with asphalt (%) [i]		California 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 [i]		California Test 367			
	No. 4 and 3/8" gradings			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 Tracker (minimum number of passes at 0.5 inch average rut depth) [j]		AASHTO T 324 (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 Tracker (inflection point minimum number of passes) [j]		AASHTO T 324 (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	
	Moisture susceptibility (minimum dry strength, psi) [j]		California Test 371	120	120	--
	Moisture susceptibility (tensile strength ratio %) [j]		California Test 371	70	70	70
	Smoothness		Section 39-1.12	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge, must grind, and PI_0	12-foot straight-edge, must grind, and PI_0

HMA Acceptance—QC/QA Construction Process

Index (i)	Quality characteristic	Weight-ing factor (w)	Test method	HMA type		
				A	B	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.
[c] 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.
[g] 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.
[i] Report only.
[j] 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