Replace section 39-1.23 with:

39-1.23 HOT MIX ASPHALT TYPE C

39-1.23A General

39-1.23A(1) Summary

Except when specified for Type C, the specifications for HMA Type A apply to HMA Type C.

Produce and place HMA Type C under the ___ construction process.

39-1.23A(2) Definitions

Reserved

39-1.23A(3) Submittals

Submit with the JMF submittal:

1. California Test 204 plasticity index results
2. California Test 371 tensile strength ratio results for untreated HMA Type C
3. California Test 371 tensile strength ratio results for treated HMA Type C if untreated HMA Type C tensile strength ratio is below 70

At JMF submittal, production start-up, and every 5,000 tons, submit the California Test 371 test results to the Engineer and to:

Moisture_Tests@dot.ca.gov

At production start-up and once during production, submit samples split from your HMA Type C production sample for California Test 371 to the Engineer and METS, Attention: Moisture Test.

39-1.23A(4) Quality Control and Assurance

For the mix design, determine the plasticity index of the aggregate blend under California Test 204. Choose an antistrip treatment and use the corresponding laboratory procedure for the mix design as shown in the following table:

Antistrip Treatment Lab Procedures for Mix Design

Antistrip treatment	California test
Plasticity index from 4 to 10 [a]	
Dry hydrated lime with marination	CT 304
Lime slurry with marination	CT 304
Plasticity index less than 4	
Liquid	CT 304
Dry hydrated lime without marination	CT 304
Dry hydrated lime with marination	CT 304
Lime slurry with marination	CT 304

[a] If the plasticity index is greater than 10, do not use that aggregate blend.

For the mix design, determine tensile strength ratio under California Test 371 on untreated HMA Type C. If the tensile strength ratio is less than 70:

1. Choose from the antistrip treatments specified based on plasticity index
2. Test treated HMA under California Test 371
3. Treat to a minimum tensile strength ratio of 70

On the first production day and every 5,000 tons, sample and test under California Test 371.

The Department does not use California Test 371 test results for JMF verification or to determine specification compliance.

Traveled way				
Intersections and ramp termini				

For the mix design, determine the optimum binder content (OBC) at ___ percent air void content.

Determine the proposed JMF for HMA Type C from a mix design that has the values for the quality characteristics shown in the following table:

HMA Type C Mix Design Requirements

Quality characteristic	Test method or lab procedure	Requirement	
Design air void content (%)		4.0	5.0
Air void content (%)[a]	CT 367	4.0	5.0
Voids in mineral aggregate (% min)[b]	CT 367		
1/2" grading		14.0	15.0
3/4" grading		13.0	14.0
1" grading			
with NMAS = 1"		12	13
with NMAS = 3/4"		13	14
Voids filled with asphalt (%)	CT 367		
1/2" grading		65.0–75.0	60.0–70.0
3/4" grading		65.0–75.0	60.0–70.0
1" grading		65.0–75.0	60.0–70.0
Dust proportion [c] (P200/Pbe)	CT 367	0.6–1.3	0.6–1.3
Stabilometer value (min) [d]	CT 366	37 [e] (Modified) 35 [f]	37 [e] (Modified) 35 [f]

[a] Calculate the air void content of each specimen using California Tests 309 and 367. Modify California Test 367, Paragraph C5, to use the exact air void content specified in the selection of OBC.
[b] Minimum VMA is dependent upon NMAS of JMF. NMAS is defined as one sieve size larger than the first sieve to retain more than 10 percent.
[c] Asphalt content based on dry weight of aggregate
[d] California Test 304, Part 2.13.
[e] Follow California Test 366: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply 12,600 lb leveling load; and perform stabilometer test at 140 °F.
[f] Modify California Test 366: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply additional 500 tamps at 500 psi; apply 12,600 lb leveling load; and perform stabilometer test at 140 °F.

Take 3 density cores for every 250 tons of HMA Type C from random locations the Engineer designates.

With the minimum quality control testing for the specified construction process, perform sampling and testing at the specified minimum frequency for the quality characteristics shown in the following table:

HMA Type C Minimum Quality Control

Quality characteristic	Test method	Minimum sampling and testing frequency	Requirement	
Asphalt binder content (%)	CT 379 or 382	1 per 750 tons and any remaining part	JMF ± 0.40	
Stabilometer Value(min) [a, b]	CT 366	1 per 4,000 tons or 1 per 2 business days, whichever is more	37 [c] (Modified) 35 [d]	
Air void content (%) [a, e]	CT 367		Design ± 2	
Percent of crushed particles [f] Coarse aggregate (% min) Two fractured faces Fine aggregate (Passing No. 4 sieve and retained on No. 8 sieve) (% min) One fractured face	CT 205	1 per 5,000 tons or 1 per 5 business days, whichever is more	 95 90	
Fine aggregate angularity (% min) [f, g]	CT 234		45	
Los Angeles Rattler [f] Loss at 100 rev. (% max) Loss at 500 rev. (% max)	CT 211	As necessary and designated in the QC plan. At least once per project	 12 40	
Flat and elongated particles [f] (% max by weight @ 5:1)	CT 235		10	
		Design air void content	4.0	5.0
Percent of maximum theoretical density (%) [h, i, j]	CT 375	1 per 750 tons or any single location, whichever is less	92–97	91–96
Voids in mineral aggregate (% min) 1/2" gradation 3/4" gradation 1" gradation [k] with NMAS = 1" with NMAS = 3/4"	CT 367	1 per 4,000 tons or 1 per 2 business days, whichever is more	 14 13 12 13	 15 14 13 14
Voids filled with asphalt (%) 1/2" gradation 3/4" gradation 1" gradation	CT 367		 65–75 65–75 65–75	 60–70 60–70 60–70
Dust proportion [l] (P200/Pbe)	CT 367	1 per 4,000 tons or 1 per 2 business days, whichever is more (Report Only)	0.6–1.3	0.6–1.3

[a] Report the average of 3 tests from a single split sample.
[b] If the stability range is more than 8 points, prepare and test new briquettes.
[c] Follow California Test 366: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply 12,600 lb. leveling load; and perform stabilometer test at 140 °F.
[d] Modify California Test 366: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply additional 500 tamps at 500 psi tamping pressure and 140 °F compaction temperature; apply 12,600 lb. leveling load; and perform stabilometer test at 140 °F.

[e] Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A. Determine theoretical maximum specific gravity under California Test 309. Calculate the air void content of each specimen using California Tests 309 and 367. Modify California Test 367, Paragraph C5, to use the design air void content specified.
[f] Aggregate must comply with the quality specifications before it is treated with lime. During lime treatment except for dry lime on damp aggregate treatment at continuous mixing plants, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Prepare and test 3 samples from a single split sample for aggregate quality at the frequency specified during lime treatment and report test results as the average of the 3 tests.
[g] Void if HMA contains less than 10 percent of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.
[h] Required if the specified paved thickness is at least 0.15 foot.
[i] Determine maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.
[j] For Standard construction process, take and average 3 cores per 250 tons of HMA placed.
[k] Minimum VMA dependent upon NMAS of JMF. NMAS is defined as one sieve size larger than the first sieve to retain more than 10 percent.
[l] Asphalt content based on dry weight of aggregate.

With the acceptance testing for the specified construction process, the Engineer samples and tests the quality characteristics for the values shown in the following table:

HMA Type C Acceptance

Quality characteristic	Test method	Requirement	
Asphalt binder content (%)	CT 379 or 382	JMF ± 0.40	
Stabilometer Value (min) [a, b]	CT 366	37 [c] (Modified) 35 [d]	
Air void content (%) [a, e]	CT 367	Design ± 2	
Percent of crushed particles [f] Coarse aggregate (% min) Two fractured faces Fine aggregate (Passing No. 4 sieve and retained on No. 8 sieve) (% min) One fractured face	CT 205	 95 90	
Fine aggregate angularity (% min) [f, g]	CT 234	45	
Los Angeles Rattler [f] Loss at 100 rev. (% max) Loss at 500 rev. (% max)	CT 211	 12 40	
Flat and elongated particles [f] (% max by weight @ 5:1)	CT 235	 10	
	Design air void content	4.0	5.0
Percent of maximum theoretical density (%) [h, i, j]	CT 375	92–97	91–96
Voids in mineral aggregate (% min) 1/2" gradation 3/4" gradation 1" gradation [k] with NMAS = 1" with NMAS = 3/4"	CT 367	 14 13 12 13	 15 14 13 14
Voids filled with asphalt (%) 1/2" gradation 3/4" gradation 1" gradation	CT 367	 65–75 65–75 65–75	 60–70 60–70 60–70
Dust proportion [l] (P200/Pbe)	CT 367	0.6–1.3 Report Only	

[a] The Engineer reports the average of 3 tests from a single split sample.

[b] If the stability range is more than 8 points, the Engineer prepares and tests new briquettes.

[c] The Engineer follows California Test 366: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply 12,600 lb. leveling load; and perform stabilometer test at 140 °F.

[d] Modify California Test 366: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply additional 500 tamps at 500 psi tamping pressure and 140 °F compaction temperature; apply 12,600 lb. leveling load; and perform stabilometer test at 140 °F.

[e] The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A. The Engineer determines theoretical maximum specific gravity under California Test 309. The Engineer calculates the air void content of each specimen using California Tests 309 and 367. The Engineer modifies California Test 367, Paragraph C5, to use the design air void content specified.

[f] Aggregate must comply with the quality specifications before it is treated with lime. During lime treatment, except for dry lime on damp aggregate treatment at continuous mixing plants; the Engineer samples coarse and fine aggregate from individual stockpiles, combines aggregate in the JMF proportions, and prepares and tests 3 samples from a single split sample for aggregate quality at the frequency specified during lime treatment and report test results as the average of the 3 tests.

[g] Void if HMA contains less than 10 percent of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

[h] Required if the specified paved thickness is at least 0.15 foot.

[i] Determine maximum theoretical density (California Test 309) at the frequency specified for Tes Maximum Density under California Test 375, Part 5.D.
[j] For Standard construction process, take and average 3 cores per 250 tons of HMA placed.
[k] Minimum VMA dependent upon NMAS of JMF. NMAS is defined as one sieve size larger than the first sieve to retain more than 10 percent.
[l] Asphalt content based on dry weight of aggregate.

The Engineer tests the 3 density cores you take from each 250 tons of HMA production. The Engineer determines the percent of maximum theoretical density for each density core by determining the density core's density and dividing by the maximum theoretical density. The Engineer determines the percent of maximum theoretical density for each 250 tons of HMA production by determining the average of the 3 density cores.

If the specified total paved thickness is at least 0.15 foot and any layer is less than 0.15 foot, the Engineer determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness.

For each 250 tons of HMA production, the Engineer determines a deduction for percent of maximum theoretical density using the factors for each average of 3 density cores as shown in the following table:

Reduced Payment Factors for Percent of Maximum Theoretical Density

HMA Type C percent of maximum theoretical density using the average of 3 cores	Reduced payment factor	HMA Type C percent of maximum theoretical density using the average of 3 cores	Reduced payment factor
92.0	0.0000	97.0	0.0000
91.9	0.0125	97.1	0.0125
91.8	0.0250	97.2	0.0250
91.7	0.0375	97.3	0.0375
91.6	0.0500	97.4	0.0500
91.5	0.0625	97.5	0.0625
91.4	0.0750	97.6	0.0750
91.3	0.0875	97.7	0.0875
91.2	0.1000	97.8	0.1000
91.1	0.1125	97.9	0.1125
91.0	0.1250	98.0	0.1250
90.9	0.1375	98.1	0.1375
90.8	0.1500	98.2	0.1500
90.7	0.1625	98.3	0.1625
90.6	0.1750	98.4	0.1750
90.5	0.1875	98.5	0.1875
90.4	0.2000	98.6	0.2000
90.3	0.2125	98.7	0.2125
90.2	0.2250	98.8	0.2250
90.1	0.2375	98.9	0.2375
90.0	0.2500	99.0	0.2500
< 90.0	Remove and replace	> 99.0	Remove and replace

For each 250 tons of HMA production, the Engineer determines a deduction for percent of maximum theoretical density using the factors for each average of 3 density cores shown in the following table:

Reduced Payment Factors for Percent of Maximum Theoretical Density

HMA Type C percent of maximum theoretical density using the average of 3 cores	Reduced payment factor	HMA Type C percent of maximum theoretical density using the average of 3 cores	Reduced payment factor
91.0	0.0000	96.0	0.0000
90.9	0.0125	96.1	0.0125
90.8	0.0250	96.2	0.0250
90.7	0.0375	96.3	0.0375
90.6	0.0500	96.4	0.0500
90.5	0.0625	96.5	0.0625
90.4	0.0750	96.6	0.0750
90.3	0.0875	96.7	0.0875
90.2	0.1000	96.8	0.1000
90.1	0.1125	96.9	0.1125
90.0	0.1250	97.0	0.1250
89.9	0.1375	97.1	0.1375
89.8	0.1500	97.2	0.1500
89.7	0.1625	97.3	0.1625
89.6	0.1750	97.4	0.1750
89.5	0.1875	97.5	0.1875
89.4	0.2000	97.6	0.2000
89.3	0.2125	97.7	0.2125
89.2	0.2250	97.8	0.2250
89.1	0.2375	97.9	0.2375
89.0	0.2500	98.0	0.2500
< 89.0	Remove and replace	> 98.0	Remove and replace

39-1.23B Materials

Asphalt binder used in HMA Type C must be _____.

Aggregate used in HMA Type C must comply with the __-inch HMA Type C gradation.

Choose a sieve size target value (TV) within each target value limit shown in the following table:

Aggregate Gradation
(Percentage Passing)
HMA Type C

1-inch HMA Type C

Sieve sizes	Target value limits	Allowable tolerance
1"	100	--
3/4"	88–93	TV ± 5
1/2"	72–85	TV ± 6
3/8"	55–70	TV ± 6
No. 4	35–52	TV ± 7
No. 8	22–40	TV ± 5
No. 30	8–24	TV ± 4
No. 50	5–18	TV ± 4
No. 200	3.0–7.0	TV ± 2

3/4-inch HMA Type C

Sieve sizes	Target value limits	Allowable tolerance
1"	100	--
3/4"	90–95	TV ± 5
1/2"	60–75	TV ± 6
No. 4	35–52	TV ± 7
No. 8	22–36	TV ± 5
No. 30	8–18	TV ± 4
No. 200	3.0–7.0	TV ± 2

1/2-inch HMA Type C

Sieve sizes	Target value limits	Allowable tolerance
3/4"	100	--
1/2"	90–98	TV ± 6
3/8"	64–84	TV ± 6
No. 4	42–57	TV ± 7
No. 8	29–39	TV ± 5
No. 30	13–19	TV ± 4
No. 200	3.0–7.0	TV ± 2

Before the addition of asphalt binder and lime treatment, aggregate for HMA Type C must have the quality characteristics shown in the following table:

HMA Type C Aggregate Quality

Quality characteristic	Test method	Requirement
Percent of crushed particles Coarse aggregate (% min) Two fractured faces Fine aggregate (Passing No. 4 sieve and retained on No. 8 sieve.) (% min) One fractured face	CT 205	 95 90
Los Angeles Rattler (% max) Loss at 100 rev. Loss at 500 rev.	CT 211	 12 40
Sand equivalent [a] (min)	CT 217	47
Fine aggregate angularity (% min)	CT 234	45
Flat and elongated particles (% max by weight @ 5:1)	CT 235	10

[a] Reported value must be the average of 3 tests from a single sample.

39-1.23C Construction

The 15th and 16th paragraphs of section 39-1.11<Transporting, Spreading, and Compacting> do not apply to HMA Type C.

Pave HMA Type C in maximum 0.20-foot thick compacted layers.

Pave HMA Type C in maximum 0.35-foot thick compacted layers.

Pave HMA Type C in maximum 0.45-foot thick compacted layers.