Section 37-2.06. Use for scrub seal.

For Design Guidance--proposed bid item codes:
376001 Rejuvenating Scrub Seal Coat

1

Replace Section 37-2.06 with:

37-2.06 REJUVENATING SCRUB SEAL COAT

37-2.06A(1) General

37-2.06A(1)(a) Summary

Section 37-2.06 includes specifications for applying seal coats using a polymer modified rejuvenating asphaltic emulsion and scrubbing the emulsion with a scrub broom to fill cracks and voids in the pavement.

2

Rejuvenating scrub seal coat includes:

1. Preparing pavement surface
2. Applying polymer modified rejuvenating asphaltic emulsion and scrubbing the emulsion sealer with a scrub broom.
3. Applying screening
4. Rolling the screenings
5. Sweeping and disposing of excess screenings

37-2.06A(1)(b) Definitions

3

Not Used

37-2.06A(1)(c) Submittals

4

Submit a 1/2-gallon sample of asphaltic emulsion in a plastic container from the emulsion supplier

At least 10 days before starting asphaltic emulsion seal coat application, submit the name of an authorized laboratory that will be performing asphaltic emulsion QC testing.

Submit a sample of asphaltic emulsion to the authorized laboratory and the Engineer. Each sample must be submitted in an insulated shipping container within 24 hours of sampling.

Within 7 days after taking samples, submit the authorized laboratory's test results for asphaltic emulsion.

Submit MSDS for each polymer modified rejuvenating asphaltic emulsion ingredient and the polymer modified rejuvenating asphaltic emulsion.

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~~At least 15 days before use, submit~~:

1. Two- ½ gallon~~Four~~ samples~~1-quart cans~~ of polymer modified rejuvenating asphaltic emulsion
2. Polymer modified rejuvenating asphaltic emulsion test results for specified tests from supplier of polymer modified rejuvenating asphaltic emulsion.

Comment [SD1]: Use standard PMCRS2h language for submittals

3. Rejuvenating agent test results for specified tests from the supplier of the polymer modified rejuvenating asphaltic emulsion.
4. 50 lb of screenings
5. Screenings test results for the followings:
   5.1. Gradation per California Test 202
   5.2. Los Angeles Rattler per California Test 211
   5.3. Film stripping per California Test 302
   5.4 Cleanness value per California Test 227
   5.5 Percent crushed particles per California Test 205

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At least 10 days before starting seal coat activities, submit the name of the quality control testing laboratory.

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For each delivery of polymer modified rejuvenating asphaltic emulsion to the job site, submit a certificate of compliance and a copy of the specified test results.

37-2.06A(1)(d) Quality Control and Assurance

37-2.06A(1)(d)(i) General

Within 3 business days of sampling, the authorized laboratory must test asphaltic emulsion for:

1. Viscosity under AASHTO T 59
2. Sieve test under AASHTO T 59
3. Demulsibility under AASHTO T 59
4. Elastic Recovery under AASHTO T 301

Circulate polymer modified asphaltic emulsion in the distributor truck before sampling. Take samples from the distributor truck at mid load or from a sampling tap or thief. Before taking samples, draw and dispose of 1 gallon. Take two 1/2-gallon samples in the presence of the Engineer.

~~8~~

Authorized Testing Laboratory for quality control testing must participate in the AASHTO Proficiency Sample Program.

9

Vialit Test Method for Aggregate in Chip Seals, French Chip modified as follows for field testing seal coat chip retention:

1. Use a 20 cm x 20 cm galvanized plate 2.0 mm thick and determine the tare weight of the galvanized plate.
2. Place the plate on the existing pavement surface before placing chip seal. After finish rolling the seal coat and initial surface sweeping, remove the specimen. Place the specimen in a plastic bag.
3. Cure and condition the specimen.
4. Weigh the test specimen and any loose chips in the sample bag.
5. Perform the Vialit test and reweight the test specimen.
6. Calculate the binder weight as follows:

   Binder weight = BAR (gallons/sq yd) X 0.0478 (sq yd) X SG_{PMRAE} (lbs per gallon)
   Where:
   BAR = emulsion residual application rate in gallons per square yard
   Plate dimension = 20 cm X 20 cm = 0.0478 sq yd
   SG_{PMRAE} = specific gravity of polymer modified rejuvenating asphaltic emulsion determined under ASSHTO T 228

7. Calculate the chip retention by weight as follows:

Percent retention = $[SW_{initial} - (BW + TW)] / [SW_{finial} - (BW + TW)]$
Where:
$SW_{initial}$ = initial specimen weight
SW_{finial} = final specimen weight
BW = binder weight
TW = tare weight

37-2.06A(1)(d)(ii) Quality Control

37-2.06A(1)(D)(ii)(A) Polymer Modified Rejuvenating Asphaltic Emulsion

10

For polymer modified rejuvenating asphaltic emulsion, the Authorized Testing Laboratory must perform quality control sampling and testing at the specified frequency and location for the following quality characteristics:

Polymer Modified Rejuvenatingon Asphaltic Emulsion

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling location	Maximum reporting time allowance
Test on emulsion				
Viscosity @122° F (SFS)	AASHTO T59	1 per 100 tons	Distributor truck	3 business days
Residue, w%, min	AASHTO T59			
pH	ASTM E70			
Sieve, w%, max	ASTM D244			
Oil distillate, w%, max	ASTM D244			
Storage Stability, 24 Hr 25°C, %, max	AASTO T59			
Test on Residue Recovered by Evaporation				
Viscosity @ 140°F, (P), max	ASTM D2171	1 per 100 tons	Distributor truck	3 business days
Penetration @ 39.2°F, min	ASTM D5			
MSCR[1]	AASHTO TP 70 MP 19, PG 64-22			
Elastic Recovery ~~on residue by evaporation~~, %, min[(2)]	~~AASHTO T59,~~ T301 [(2)]			

[(1)] Report only. Report "S", "H", "V", or "E" grade based on PG 64-22. Report once per project.
[(2)] Elastic Recovery @ 10° C (50° F): Hour glass sides, pull to 20 cm, hold 5 minutes then cut, let sit 1 hour.

37-2.06A(1)(d)(ii)(B) Screenings

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For screenings, the Authorized Testing Laboratory must perform sampling and testing at the specified frequency and location for the following quality characteristics.

Minimum Quality Control

Quality characteristic	Test method	Minimum sampling and testing frequency	Requirement	Location of sampling	Maximum reporting time allowance
Los Angeles Rattler Loss, %, max Loss at 100 revolutions Loss at 500 revolutions	California Test 211	1st day of production	 10 40	See California Test 125	48 hours
Film stripping,%, max	California Test 302	1st day of production	25	See California Test 125	48 hours
Percent crushed particles, %, min	California Test 205	1st day of production	95	See California Test 125	48 hours
Gradation, percentage passing	California Test 202	2 per day	Rejuvenating Scrub Seal Coat Screenings Gradation table under Materials	See California Test 125	24 hours
Cleanness value, min	California Test 227	2 per day	80	See California Test 125	24 hours

37-2.06A(1)(e)(ii)(C) Rejuvenating Scrub Seal Coat

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For rejuvenating scrub seal coat, the Authorized Testing Laboratory must perform sampling and testing at the specified frequency and location for the following quality characteristics:

Minimum Quality Control

Quality characteristic	Test method	Minimum sampling and testing frequency	Requirement	Location of sampling	Maximum reporting time allowance
Polymer modified rejuvenating asphaltic emulsion spread rate, gal/sq yd	California Test 339	2 per day	Target value ±0.03 gal/sq yd	Pavement surface	24 hours
Chip retention, %	Vialit test method for aggregate in chip seals, French chip	1st day of production	95	Screenings haul Truck	9648 hours
Chip retention, %	Vialit test method for aggregate in chip seals, French chip (Modified field test)	1 per day	Report Only	Pavement surface after chip application and rolling	9648 hours

Comment [SD2]: This test is not applicable to scrub seal

Comment [SD3]: Time constraint too tight for delivery to lab and curing of sample for testing.

Comment [SD4]: How do you run a field vialit when you are scrubbing? The broom will affect the test.

37-2.06A(1)(e)(ii)(D) Acceptance Criteria

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Rejuvenating scrub seal coat acceptance is based on:

1. Visual inspection for the following:
   1.1. Uniform surface texture throughout the work limits.

1.2. Raveling consists of the separation of the aggregate from the binder.
1.3. Flushing consists of the occurrence of a film of bituminous material on the surface of the rejuvenating scrub seal coat.
1.4 Streaking consists of alternating longitudinal bands of binder without uniform aggregate retention, approximately parallel with the lane line.

2. For polymer modified rejuvenating asphaltic emulsion acceptance is based on the Department's sampling and testing for compliance with the requirements for the quality characteristics shown in table titled Polymer Modified Rejuvenating Asphaltic Emulsion under Materials in this section.
3. For screenings acceptance is based on the Department's sampling and testing for compliance with the requirements shown in the table titled "Rejuvenating Scrub Seal Coat Acceptance Criteria Testing Screenings."

Rejuvenating Scrub Seal Coat Acceptance Criteria Testing Screenings

Quality Characteristic	Test Method	Requirements
Los Angeles Rattler Loss, %, max Loss at 100 revolutions Loss at 500 revolutions	California Test 211	 10 40
Gradation	California Test 202	Rejuvenating Scrub Seal Coat Screenings Gradation table under Materials
Film stripping,%, max	California Test 302	25
Cleanness value, min	California Test 227	780
Percent crushed particles, %, min	California Test 205	95

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If the screenings cleanness value is less than 780, remove the scrub seal represented by the test result or, if you request and the Engineer authorizes, the scrub seal containing screenings with a cleanness value less than 780 but greater than 568 may remain in place. The Department deducts payment for scrub seal with a screenings cleanness value between 568 and 780 that remains in place.

37-2.06B Materials

37-2.06B(1) General

15

Not Used

37-2.06B(2) Polymer Modified Rejuvenating Asphaltic Emulsion

16

Polymer modified rejuvenating asphaltic emulsion is made with polymer, rejuvenating agent and asphalt and must meet the requirements for the quality characteristics shown in the following table:

Polymer Modified Rejuvenating Asphaltic Emulsion

Quality characteristic	Test method	Requirements
Tests on Emulsion		
Viscosity @122° F (SFS)	AASHTO T59	50 - 350
Residue, w%, min	AASHTO T59	65
pH	ASTM E70	2.0-5.0
Sieve, w%, max	ASTM D244	0.1
Oil distillate, w%, max	ASTM D244	0.5
Storage Stability, 24 Hr 25°C, %, max	AASTO T59	1.0
Test on Residue Recovered by Evaporation Method CTM 331		
Viscosity @ 140°F, (P), max	ASTM D2171[3][4]	5000
Penetration @ 39.2°F, min	ASTM D5	40-70

Comment [SD5]: What are the actual performance criteria for these tests? Subjective not objective.

Caltrans consider using the old warranty language instead. Jack Van Kirk will supply the language

Consider performance testing for reflective cracking/sealing as part of final spec or development of NSSP.

The following criteria for identifying defective material placed by the Contractor shall apply to the asphalt-rubber seal coat during the warranty period:

A. Raveling consists of the separation of the aggregate from the binder, caused by wearing of the surface.
B. Flushing consists of the occurrence of a film of bituminous material on the surface of the asphalt-rubber seal coat which results in a coefficient of friction of less than 0.30, determined in conformance with the requirements in California Test 342.
C. Streaking consists of alternating longitudinal bands of binder without uniform aggregate retention, approximately parallel with the lane line.
D. Cracking consists of narrow breaks or fissures greater than ¼ inch occurring in the asphalt-rubber seal coat.

9

Areas in the asphalt-rubber seal coat of raveling, flushing or streaking that are greater than 1.5 ft^2, and cracking, shall be considered defective and shall be repaired. The final determination that an area is defective will be made by the Engineer.

10

Raveling and streaking shall be repaired by placement of an additional layer of asphalt-rubber seal coat over the defective area.

11

Areas of flushing to be repaired shall be removed to the full depth of the asphalt-rubber seal coat by grinding in conformance with the provisions in Section 42-2, "Grinding," of the Standard Specifications, for the length of the area determined to be defective, plus 6 feet on each end measured along the lane line. The width of the area to be repaired shall be one meter if the flushing occurs in one wheel path, or the width of the lane if the flushing occurs in both wheel paths. The area ground shall then be repaired by placing an additional layer of asphalt-rubber seal coat.

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If the area between 2 consecutive repairs, except repairs of pot holes and cracking, is less than 20 feet in length, measured along the lane line, that area shall also be repaired.

MSCR	AASHTO TP 70 MP 19, PG 64-22	Report Only[1]
Elastic Recovery ~~on residue by evaporation~~, %, min[2]	~~AASHTO T59,~~ T301 [2]	75

[1] Report only. Report "S", "H", "V", or "E" grade based on PG 64-22. Report once per project.

[2] Elastic Recovery @ 10° C (50° F): Hour glass sides, pull to 20 cm, hold 5 minutes then cut, let sit 1 hour.

[3] "If it is suspected that a sample may contain solid material, strain the melted sample into the container through a No. 50 (300-µm) sieve conforming to Specification E 11."

[4] Use an AI- 200 glass capillary tube to run the test. If the viscosity is 4000 or above use an AI 400 instead.

Comment [SD6]: Industry does not concur. 60 is recommended.

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Rejuvenating agent and asphalt and must meet the requirements for the quality characteristics shown in the following table:

Rejuvenating Agent

Quality characteristic	Test method	Requirements
Test on rejuvenating agent:		
Viscosity, 140F, CST	ASTM D2170	50-175
Flash point, F, COC, min	ASTM D92	380
Saturate, % by weight, max	ASTM D2007	30
Asphaltenes, max	ASTM D2007	1.0
Test on rejuvenating agent RTFOT Residue		
Weight change, %, max	ASTM D2872	6.5
Viscosity ratio, max	ASTM D2170	3

37-2.06B(3) Screenings

18. Insert the type of grading for rejuvenating seal coat or scrub seal screenings: Type A, Type B, or Type C.

Screenings for rejuvenating scrub seal coat must comply with the _____ grading.

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Screenings must have the gradation as determined under California Test 202 in the following table:

Rejuvenating Scrub Seal Coat Screenings Gradation

	Percentage passing		
Sieve sizes	Type A	Type B	Type C
1/2"	---	---	100
3/8"	100	100	90 - 100
No. 4	60 - 80	35 - 55	5 - 20
No. 8	0 - 15	0 - 10	0 - 7
No. 16	0 - 5	0 - 5	0 - 5
No. 30	0 - 4	0 - 4	0 - 4
No. 200	0 - 3	0 - 3	0 - 3

Comment [SD7]: Industry will accept current RSS (11-15-13) gradations Section 37-2.04 c (2)

20

Screenings must comply with the quality characteristics requirements shown in the following table:

Quality characteristics	Test method	Requirements
Los Angles rattler, %, max	California Test 211	Section 37-2.01B
Film stripping, %, max	California Test 302	Section 37-2.01B
Cleanness value, min	California Test 227	780
Percentage of crushed particles, %,min	California Test 205	95

37-2.06B(4) Rejuvenating Scrub Seal Coat

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The Authorized Testing Laboratory must conduct testing using the proposed polymer modified rejuvenating asphaltic emulsion and aggregate for compliance with the design requirements shown in the following table:

Quality characteristic	Test method	Requirement
Chip retention, %	Vialit test method for aggregate in chip seals, French chip	95

22

For the Vialit test, the polymer modified rejuvenating asphaltic emulsion must be placed within the placement temperature range.

37-2.06C Construction

37-2.06C(1) General

23. Insert the maximum length of seal coat activities and minimum distance between seal coat application locations. Delete if the project is entirely 2-lane, 2-way roadway and insert Not Used.

Limit rejuvenating scrub seal coat activities to a maximum length of ___ miles at any one location, including pilot-car-assisted traffic control. The minimum space between successive seal coat operations on the lanes in the same direction of travel must be _____ miles.

37-2.06C(2) Equipment

24

The emulsion scrub broom must be:

1. Constructed of metal and meet the following dimensions or requirements:
   - 1.1. Have a main rigid body frame with a minimum of 6 feet 9 inches wide and 8 feet deep and a maximum of 8 feet wide and 10 feet deep, and:
     - 1.1.1. The nearest and furthest members, paralleling the back of the spreader truck, and diagonal members must be equipped with street broom.
     - 1.1.2. The leading member and the trailing member must have broom heads angled at 10-15 degrees off the centerline of the supporting member.
     - 1.1.3. The diagonal member must have broom heads attached in line with the centerline of the supporting member.
   - 1.2. Each individual street broom attached to the scrub broom assembly must be:
     - 1.2.2. 3 ½" wide x 6 ½" high x 16" long
     - 1.2.1. Have stiff nylon bristles that are maintained at a minimum height of 5 inches.
   - 1.3. Be equipped with a minimum of 2- hinged wing assemblies attached to the main body not to exceed 5 feet in total per side, with diagonals and equipped with street brooms.
2. Attached to and pulled by the distributor truck.
3. Equipped with the means to mechanically raise and lower the broom off and onto the road surface at designated points of completion and start up.

4. Towable in the elevated position to the next area of construction.
5. Weighted correctly such that it does not squeegee the emulsion sealer off the roadway surface.

25

Distributor truck must have the following features:

1. Heating unit
2. Pumps that spray modified asphalt binder within 0.03 gal/sq yd of the specified rate
3. Fully circulating spray bar that applies emulsion uniformly
4. Tachometer
5. Pressure gages
6. Volume measuring devices
7. Thermometer

37-2.06C(3) Applying Emulsion

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Apply polymer modified rejuvenating asphaltic emulsion with distributor truck to the areas to receive scrub seal coat within rate range shown in the following table:

Type	Range
A	0.20-0.26 gal/sq yd
B	0.25-0.32 gal/sq yd
C	0.28-0.38 gal/sq yd

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The exact rate of application will be determined by the Engineer.

28

Apply polymer modified rejuvenating asphaltic emulsion at a minimum temperature of 1340 degrees F.

29

Apply polymer modified polymer modified rejuvenating asphaltic emulsion and immediately broom the emulsion to fill cracks and voids with the emulsion scrub broom. Maintain a neat and uniform line at the edge of the limits of the scrub seal application.

37-2.06C(4) Spreading Screenings

30

Spread screenings evenly using a mechanical spreader within rate range shown in the following table:

Type	Range
A	18–24 lbs/sq yd
B	23–27 lbs/sq yd
C	25–31 lbs/sq yd

31

The screening spread rate must be adjusted so that no bleed through occurs during rolling. The exact spread rate will be determined by the Engineer.

37-2.06D Payment

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The Department deducts the amounts shown on the following table for scrub seal with noncompliant screenings left in place:

Cleanness value	Deduction
675-780	$2.20 per ton
670-675	$4.40 per ton
568-670	$6.60 per ton