

SURFACINGS AND PAVEMENTS
SECTION 37: BITUMINOUS SEALS
37-1 SEAL COATS

37-1.01 DESCRIPTION

- This work shall consist of an application or applications of asphaltic emulsion and screenings or an application of a mixture of asphaltic emulsion and added water.
- The Type of seal coat (fog, fine, medium fine, medium, coarse, or double) to be applied will be designated on the plans or specified in the special provisions.
- Fog seal coat shall consist of an application of a mixture of slow-setting type asphaltic emulsion and additional water. The water shall be added and mixed with the asphaltic emulsion (which contains up to 43 percent water) so that the resulting mixture will contain one part asphaltic emulsion and not more than one part added water. The exact quantity of added water will be determined by the Engineer.
- Fine, medium fine, medium and coarse seal coats shall consist of an application of asphaltic emulsion followed with an application of screenings. Double seal coat shall consist of an application of asphaltic emulsion followed with an application of screenings, and another application of asphaltic emulsion followed with another application of screenings.

37-1.02 MATERIALS

- Asphaltic emulsion shall conform to the provisions in Section 94, “Asphaltic Emulsions,” and shall be of the grade specified in the special provisions except that asphaltic emulsion for fog seal coat shall be any of the grades of slow-setting type asphaltic emulsion.
- Liquid asphalt for prime coat, if required, shall be of the grade specified in the special provisions, and shall conform to the provisions in Section 93. “Liquid Asphalts.”
- A 2-L sample of the asphaltic emulsion, as delivered to the project, will be taken in a plastic container from the spray bar of the distributor truck at mid-load.
- The size of screenings for the various types of seal coats shall conform to the following:

<u>Seal Coat Types</u>	<u>Size of Screenings</u>
Fine	6.3-mm x 2.00-mm
Medium fine	8.0-mm x 2.36-mm
Medium	9.5-mm x 3.35-mm
Coarse	12.5-mm x 4.75-mm
Double	
1 st application	12.5-mm x 4.75-mm
2 nd application	6.3-mm x 2.00-mm

- Screenings shall conform to the following requirements prior to depositing on the roadbed.
- Screenings shall consist of broken stone, crushed gravel of both. At least 90 percent by mass of the screenings shall consist of crushed particles as determined by California Test 205.

- Screenings shall be clean and free from dirt and other deleterious substances.
- The percentage composition by mass of screenings shall conform to one of the following gradings:

Percentage Passing				
Sieve	Coarse	Medium	Medium Fine	Fine
Sizes	<u>12.5mmx4.75mm</u>	<u>9.5mmx3.35-mm</u>	<u>8.0mmx2.36mm</u>	<u>6.3mmx2.00mm</u>
19.0-mm	100	-	-	-
12.5-mm	95-100	100	-	-
9.5-mm	50-80	90-100	100	100
4.75-mm	0-15	5-30	30-60	60-85
2.36-mm	0-5	0-10	0-15	0-25
1.18-mm	-	0-5	0-5	0-5
600-µm	-	-	0-3	0-3
75-µm	0-2	0-2	0-2	0-2

- Screenings shall also conform to the following quality requirements.

Tests	CA Test	Requirements
Los Angeles Rattler Loss at 100 Rev. (max.)	211	10%
Los Angeles Rattler Loss at 500 Rev. (max.)	211	40%
Film Stripping (max.)	302	25%
Cleanness Value (min)	227	80

- If the results of the aggregate grading for screenings does not meet the gradation specified, the seal coat represented by the test shall be removed. However, if requested in writing by the Contractor and approved by the Engineer, The seal coat may remain in place, and the Contractor shall pay to the State \$2.00 Per tonne for the screenings represented by the test and left in place.
- If the results of the Cleanness Value test for Screenings is below 80, the seal coat represented by the test shall be removed. However, if requested in writing by the Contractor and approved by the Engineer, seal coat containing screenings with a Cleanness Value below 80, but not less than 75, may remain in place. The Contractor shall pay to the State the following amount for the screenings Represented by the test and left in place.

<u>Cleanness Value</u>	<u>Payment to State</u>
80 or over	None
79	\$2.20 per tone
77	\$4.40 per tone
75	\$6.60 per tone

- When both the aggregate grading and the Cleanness Value for screenings do not conform to the requirements specified, both payments to the State shall apply. The Department may deduct these amounts from any moneys due, or that may become due, the Contractor under the contract. No single aggregate grading or Cleanness Value test shall represent more than 275 tonnes or one day's production, whichever is smaller.

- Samples for the aggregate grading and Cleanness Value tests will be taken from the conveyor belt of the spreader prior to application.

37-1.03 MAINTAINING TRAFFIC

- At locations where public traffic is being routed over a surface upon which a seal coat is to be applied, the seal coat shall not be applied to more than one-half the width of the traveled way at a time, and the remaining width shall be kept free of obstructions and open for use by public traffic until the seal coat first applied is ready for use by traffic.
 - The Contractor shall provide for the passage of public traffic through the work in conformance with the provisions in Sections 7-1.08, “Public Convenience” and 7-1.09, “Public Safety,” including the pilot cars, flaggers and equipment necessary to control traffic, as determined by the Engineer.
 - Pilot cars utilized by the Contractor or required by Section 37-1.07, “Finishing,” to convoy or otherwise control traffic shall have radio contact with other pilot cars and personnel in the work area. The maximum speed of the pilot cars conveying or controlling traffic through the traffic control zone shall be 25 km/h on 2-lane two-way roadways and 40 km/h on multilane divided and undivided roadways. Pilot cars shall only use traffic lanes open to public traffic.
 - On 2-lane two-way roadways, C6 “LOOSE GRAVEL” signs and W6 (35) speed advisory signs shall be furnished and placed adjacent to both sides of the traveled way where screenings are being spread on a traffic lane. The first C6 sign in each direction shall be placed where traffic first encounters loose screenings, regardless of which lane the screenings are being spread on. The W6 (35) signs need not be placed in those areas with posted speed limits of less than 40 MPH. The signs shall be placed at maximum 600-m intervals along each side of the traveled way and at public roads or streets entering the seal coat areas as directed by the Engineer.
 - On multilane roadways (freeways, expressways and multilane conventional highways) where screenings are being spread on a traffic lane, C6 “LOOSE GRAVEL” signs and W6 (35) speed advisory signs shall be furnished and placed adjacent on the outside edge of the traveled way nearest to the lane being worked on. The first C6 sign shall be placed where the screenings begin with respect to the direction of travel on that lane. The W6 (35) signs need not be placed in those areas with posted speed limits of less than 40 MPH. The signs shall be placed at maximum 600-m intervals along the edge of traveled way and at on –ramps, public roads or streets entering the seal coat area as directed by the Engineer.
 - The C6 and W6 signs shall be maintained in place at each location until final brooming of the seal coat surface at the location is complete. The C6 and W6 signs shall conform to the provisions for construction area signs in Section 12, “Construction Area Traffic Control Devices.” The signs may be set on temporary portable supports with the W6 below the C6 or on barricades with the W6 sign alternating with the C6 sign.

37-1.04 PREPARATION FOR SEAL COAT

- Immediately before applying the asphaltic emulsion, the surface to be sealed shall be clean and dry. Cleaning shall be performed by sweeping , flushing or other means necessary to remove all loose particles of paving, all dirt and all other extraneous extraneous material.

- When seal coats are to be applied to an untreated material, a prime coat consisting of liquid asphalt shall be applied to the material in place at a rate of from 0.90-to 1.5 L/m². The exact rate will be determined by the Engineer.

37-1.05 APPLYING ASPHALTIC EMULSION

• Asphaltic emulsion shall be applied in accordance with the provisions in Section 94, “Asphaltic Emulsions,” and the provisions specified in this Section 37-1.05.

- The application rate of fog seal coat (asphaltic emulsion and added water) shall be such that the original emulsion will be spread at a rate of 0.2- to 0.5-L/m². The exact rate of application will be determined by the Engineer.
- The application rates of asphaltic emulsion for the other types of seal coats shall be within the following ranges in liters per square meter. The exact rates will be determined by the Engineer.

<u>Seal Coat Types</u>	<u>Ranges</u>
Fine	0.7 to 1.4
Medium Fine	1.1 to 1.6
Medium	1.1 to 1.8
Coarse	1.4 to 1.8
Double	
1st application	0.9 to 1.6
2nd application	0.9 to 1.4

- Asphaltic emulsion at the time of application shall be between 55 °C and 80°C.
- Asphaltic emulsion shall not be applied when weather conditions are unsuitable. Seal coats requiring screenings shall not be applied until sufficient screenings are on hand to immediately cover the asphaltic emulsion, or when the atmospheric temperature is below 20°C or above 40°C, or when the pavement temperature is below 25°C. Fog seal coat shall not be applied when the atmospheric temperature is below 5°C.
- The Engineer will notify the Contractor, no later than 4:00 p.m., if it is anticipated that the next working day will not be suitable for the application of seal coat. This notice may be given on the day preceding the date the Contractor intends to begin work, any working day after the Contractor has begun work, and any day previously named by the Engineer as a day unsuitable for applying seal coat. When the Engineer has decided a day to be unsuitable by reason of expected low temperature or unsuitable weather conditions, the Contractor shall not apply any new seal coat. If maintenance of previously applied seal coat can be performed, the Contractor shall continue to perform the maintenance. These unsuitable days will not be counted as working days regardless of the actual weather conditions and the fact that seal coat maintenance work is performed by the Contractor.
- If the Contractor has not been notified by the Engineer of an anticipated unsuitable day and at the beginning of the work day the weather is unsuitable for the application of seal coats, but maintenance of previously applied seal coat can be performed, the Contractor shall not apply any seal coat. Binder and screenings brought to the project shall be returned, stored or disposed of as directed by the Engineer. The Contractor shall continue maintenance of previously applied seal

coat. The State will compensate the Contractor for show-up by paying for the direct cost of delivery and return, storage or disposal of the binder and screenings and for show-up time for workers who would have applied the seal coat but are not required for seal coat maintenance. The direct cost will be determined in conformance with the provisions in Section 9-1.03. "Force Account Payment," except there will be no markup allowance pursuant to Section 9-1.03A "Work Performed by Contractor." The day will be considered a nonworking day.

- The provisions for compensation for show-up on unsuitable days will not apply if the Contractor has not provided the Engineer with the name of an authorized representative and a means of communication for providing notice as provided herein.
- After the application of a fog seal coat, asphaltic emulsion that becomes tacky shall be sprinkled with water in the amount ordered and as directed by the Engineer.
- When more than one type of seal coat is to be applied, the fog seal coat shall be applied at least 4 days in advance of the application of an adjoining seal coat requiring screenings. The seal coat shall be applied in such a manner that the joint between 2 types will present a neat and uniform appearance true to the line shown on the typical cross section and established by the Engineer.
- Applying asphaltic emulsion shall be discontinued sufficiently early in the day to permit the termination of traffic control prior to darkness. Asphaltic emulsion shall be applied to only one designated traffic lane at a time, and the entire width of the lane shall be covered in one operation.
- Asphaltic emulsion shall not be applied a greater distance than can be immediately covered by screenings, unless otherwise permitted by the Engineer.
- The cut off of asphaltic emulsion shall be made on building paper or similar material spread over the surface. Paper shall also be placed over the treated surface for a sufficient length at the beginning of a spread to avoid spraying existing pavement or previously placed screenings and so that the nozzles are spreading properly when the uncovered surface is reached. The building paper shall then be removed and disposed of in a manner satisfactory to the Engineer.
- The distribution of asphaltic emulsion shall not vary more than 15 percent transversely from the average as determined by tests, nor more than 10 percent longitudinally from the specified rate of application as determined by California Test 339.

37-1.06 SPREADING SCREENINGS

- Screenings for seal coat shall be spread immediately following the application of the asphaltic emulsion. The spread rate of screening for the various types of seal coats shall be within the following ranges in kilograms per square meter. The exact rate will be determined by the Engineer. The completed spread shall be within 10 percent of the rate determined by the Engineer.

<u>Seal Coat Types</u>	<u>Ranges</u>
Fine	6.5 to 10.9
Medium fine	8.7 to 13.6
Medium	10.9 to 16.3
Coarse	12.5 to 16.3
Double	
1 st Application	12.5 to 16.3
2 nd Application	6.5 to 10.9

- Screenings shall be spread by means of a self-propelled chip spreader equipped with a mechanical device which will spread the screenings at a uniform rate over the full width of a traffic lane in one application. The joint between adjacent applications of screenings shall coincide with the line between designated traffic lanes.
- Operating the chip spreader at speed which cause the chips to roll over after striking the bituminous covered surface will not be permitted.
- The transverse cut off of screenings shall be complete and any excess screenings shall be removed from the surface prior to resuming operations.
- Stockpiling of screenings prior to placing will be permitted; however, any contamination resulting during storage or from reloading operations will be cause for rejection.
- Screening shall be surface damp at the time of application, but excess water on the aggregate surface will not be permitted. Screenings shall be redampened in the vehicles prior to delivery to the spreader when directed by the Engineer.
- Asphaltic emulsion shall be covered with screenings before setting or “breaking” of the asphaltic emulsion occurs.

37-1.07 FINISHING

- After the screening have been spread upon the asphaltic emulsion, piles, ridges or uneven distribution shall be carefully removed to ensure against permanent ridges, bumps or depressions in the completed surface. Additional screenings shall be spread in whatever quantities may be required to prevent picking up by the rollers of traffic, after which the surface shall be rolled.
- Rollers shall be pneumatic-tired type. A minimum of 2 pneumatic-tired rollers conforming to the provisions in Section 39-5.02, “Compacting Equipment,” shall be furnished.
- Initial rolling shall consist of one complete coverage and shall begin immediately behind the spreader. Asphaltic emulsion and screenings shall not be spread more than 760 meters ahead of completion of initial rolling operations . Secondary rolling shall begin immediately after completion of the initial rolling. The amount of secondary rolling shall be sufficient to adequately seat the screenings and in no case shall be less than 2 complete coverages.
- Unless otherwise provided in the special provisions or directed by the Engineer, seal coat surfaces shall be maintained, including the traffic control required for maintenance operations, for a period of 4 consecutive calendar days beginning on the day screenings are applied to the asphaltic emulsion. Maintenance of the surface shall include brooming and the distribution of screenings over the surface to absorb any free bituminous material , to cover any area deficient in cover coat material and to prevent formation of corrugations.

Clean sand may be used in lieu of screenings to cover any excess of asphaltic emulsion which comes to the surface. The use of roadside material for this purpose will not be permitted.

- Brooms for finishing and maintaining seal coat screenings shall be the self-propelled type. When brooming is required adjacent to curbs, gutters, dikes, berms, railings or other barriers which would prevent loose screenings from being swept completely off the roadway, the self-propelled brooms shall also be capable of removing the loose screenings from the surface during brooming. In addition to the self-propelled brooms required for maintaining previously placed screenings, at each location where screenings are to be spread, a minimum of 3 self-propelled brooms shall be available, prior to the start of spreading the screenings at a location.

- The surface of the seal coat shall be broomed as often as necessary during the 4 calendar day maintenance period to maintain the surface free of loose screenings. At the end of the 4 consecutive calendar day maintenance period, any excess screenings shall be removed from paved areas. Brooming of seal coat surfaces shall be performed in such a manner that the screenings set in the asphaltic emulsion will not be displaced.

- The exact time of brooming will be determined by the Engineer. As a minimum, brooming will be required at the following approximate times:

1. On 2-lane two-way roadways from 2 to 4 hours after traffic, controlled with pilot cars, has been routed on the seal coat.
2. On multilane roadways, from 2 to 4 hours after screenings have been placed.
3. In addition to previous brooming, immediately prior to opening any lane to public traffic, not controlled with pilot cars.
4. As a first order of work on the morning following applications of screenings, on any lane that has been open to public traffic, not controlled with pilot cars.
5. At the end of the 4 calendar day maintenance period.

- The following shall apply to seal coat operations on 2-lane two way roadways under one-way traffic control:

Upon completion of secondary rolling, public traffic shall be controlled with pilot cars and routed over the new seal coat for a period of from 2 to 4 hours. The exact time shall be as determined by the Engineer.

The Contractor shall schedule the operations such that seal coat is placed on both lanes of the traveled way each work shift, and such that one-way traffic control is discontinued before darkness. At the end of the work shift, the end of the seal coat on both lanes shall generally match.

- The following shall apply to seal coat operations on multilane roadways:

Initial brooming may begin after the screenings have been in place for a period of from 2 to 4 hours. When the initial brooming is not completed during the work shift in which the screenings were placed, the initial brooming

shall be completed as the first order of work at the beginning of the next work shift.

Public traffic shall be controlled with pilot cars and shall be routed on the new seal coat surface of a lane, for a minimum of 2 hours after completion of initial brooming and prior to opening the lane to traffic not controlled with pilot cars. When traffic is controlled with pilot cars, a maximum of one lane in the direction of travel shall be open to public traffic. Once traffic, controlled with pilot cars, is routed over the seal coat at a location, continuous control shall be maintained at that location until the seal coat placement and brooming on adjacent lanes to receive seal coat is completed.

- Excess screenings remaining on the surface after the first application of a “double” seal coat shall be removed prior to the second application of asphaltic emulsion.
- When directed by the Engineer, excess screenings shall be salvaged and stockpiled at designated locations.
- Excess screenings which in the opinion of the Engineer are not salvable and which interfere with drainage shall be removed and disposed of by the Contractor at the Contractor's expense. The removed screenings shall be disposed of in conformance with the provisions in Section 7-1.13, “Disposal of Material Outside the Highway Right of Way,” or along embankment slopes, or at other suitable locations if permitted by the Engineer.
- The completed surface shall present a uniform appearance and shall be free from ruts, humps, depressions or irregularities due to an uneven distributing of asphaltic emulsion or screenings.

37-1.08 MEASUREMENT

- Quantities of screenings to be paid for by the tonne will be determined in conformance with the provisions in Section 9-1.01. “Measurement of Quantities.”
- Quantities of liquid asphalt and asphaltic emulsion to be paid for will be determined in conformance with the provision in Section 93. “Liquid Asphalts,” and 94, “Asphaltic Emulsions,” respectively.

37-1.09 PAVEMENT

- Seal coat will be paid for at the contract price per tonne for screenings, and the contract price per tonne for asphaltic emulsion (polymer modified), and for liquid asphalt (prime coat), for whatever items are provided and involved. The prices shall include preparation for seal coat and furnishing and applying asphaltic emulsion and screenings.
- The above prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in applying seal coat, complete in place, including furnishing, placing, maintaining, and removing C6 AND W6 signs, when required, and temporary supports or barricades for the signs as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.
- Salvaging and stockpiling excess screenings will be paid for as extra work as provided in Section 4-1.03D.
- Water furnished and applied to tacky emulsion and for mixing with an asphaltic emulsion will not be paid for and full compensation therefore will be considered as included in the contract price paid for the asphaltic emulsion.

- When there is a contract item for traffic control system , full compensation for furnishing and using pilot cars to reduce the speed of traffic and convoy or otherwise control traffic, as specified, shall be considered as included in the contract lump sum price paid for traffic control system, and no separate payment will be made therefore. When there is no contract item for traffic control system, full compensation for furnishing and using the pilot cars shall be considered as included in the contact prices paid for the various items of seal coat work, and no separate payment will be made therefore.