

**Section 37 Bituminous Seals****Section 37  
Bituminous Seals****4-3701 General**

Section 37, “Bituminous Seals,” of the *Standard Specifications* covers seal coats and slurry seals.

Seal coats are either fog seals, an application of asphaltic emulsion with added water, or asphaltic emulsion and screenings (commonly known as “chip seals”).

Slurry seal is a mixture of graded fine aggregate, asphaltic emulsion, water, and set-control additives.

In addition to the bituminous seals provided for in the *Standard Specifications*, the special provisions may provide for hot-applied seal coat (polymer-modified asphalt), asphalt-rubber seal coat, parking lot seal coat, or asphalt rejuvenating agent. This section will discuss the duties of resident engineers and assistant resident engineers regarding seal coats and slurry seals.

For the most part, bituminous seals are used to maintain existing asphalt concrete pavement. Bituminous seals on new work are generally limited to fog seal on asphalt concrete dikes, miscellaneous areas, and shoulders.

Refer to “Tack Coats for Bituminous Seals,” in the *Tack Coat Guidelines* at the following web site:

<http://www.dot.ca.gov/hq/construc/>

**4-3702 Seal Coats**

The following covers the duties required throughout each phase of the project for seal coats.

**4-3702A Before Work Begins**

Before work begins, take the following steps:

- Review the contract to determine the type of bituminous seal required. Note the particular type of bituminous binder to be used, the requirements for aggregates, and any special details. Special details may include local agency requirements with regard to air quality and other environmental restrictions. Decide whether any conditions have changed from those upon which the design engineer based the requirements, and make any necessary changes.
- Verify the receipt and proper distribution of Form CEM-3101, “Notice of Materials to Be Used,” which lists seal coat materials.
- In accord with the State Contract Act, ensure the aggregate comes from a permitted source site that complies with the Surface Mining and Reclamation Act of 1975 (SMARA). Mining operations determined to be in compliance are listed on the AB 3098 SMARA Eligible List. You can obtain this list from the Division of Construction or the Department of Conservation’s web site:

[http://www.consrv.ca.gov/OMR/ab\\_3098\\_list/index.htm](http://www.consrv.ca.gov/OMR/ab_3098_list/index.htm)

**4-3701  
General****4-3702  
Seal Coats**

Also, see Section 7-103D, “Protection of Environmental Resources,” of the *Construction Manual* to determine if the proposed materials site is exempt from SMARA.

- Obtain initial samples of screenings and test them for all of the specified attributes. Advise the contractor of the test results, with particular reference to any deficiencies that must be corrected.
- Examine the surface to be sealed. Prepare a contract change order to provide for any necessary corrective action, such as sealing cracks and repairing failed areas. At this stage, a joint review with the maintenance region manager or area superintendent would be helpful.
- Review the project to ascertain all requirements for handling traffic. Review with the contractor the required traffic control system and traffic control devices.
- Decide on and advise the contractor of the exact application rates of screenings and bituminous binder that will be used.
- For fog seal, decide on the water amount to be added to asphaltic emulsion. The quantity to be added must be based on the judgement and experience of field personnel. Take into account the permeability of the surface to be sealed, climatic conditions anticipated at the time of application, traffic, and desired spread rate. Unless circumstances dictate less, use the maximum amount permitted. This approach makes it easier to obtain a correct and uniform spread, especially when lighter spread rates are used.
- Determine temperatures, and ensure that bituminous seals are not placed when the applicable atmospheric or pavement temperatures are below the minimums specified.
- Be prepared to receive the latest weather reports, and have a means established for making contact with the contractor’s authorized representative before 4:00 p.m. on the day before the intended workday. Note that the specification for notification of anticipated unsuitable weather conditions applies to both fog seals and chip seals. Prepare a contract change order, if it becomes necessary, to pay for standby time.
- Determine whether the surface to be sealed is clean and dry. Ensure the contractor cleans the surface to remove all loose particles of pavement, dirt, and other extraneous material.
- Examine distributor trucks, chip spreaders, rollers, and other equipment to ensure that specifications are met.

#### 4-3702B During the Course of Work

Once work begins, take the following steps:

- Obtain the required test report for each truckload of asphaltic emulsion. Compare the report with the specifications. Do not permit the emulsion to be used before testing unless a Certificate of Compliance accompanies it.
- Obtain samples of the asphaltic emulsion in accordance with the frequency tables in Section 6-1, “Sample Types and Frequencies,” of the *Construction Manual* (manual). For emulsion used in fog seals, it is preferable to take samples of the emulsion before adding water. If this approach is impractical, note on the sample form the amount of added water (that is, how many parts of water to how many parts of emulsion).
- From the delivered material, obtain samples and test them for sieve analysis and cleanness value in accordance with the frequency tables in Section 6-1 of this manual.

- Just before spreading, determine the temperature of the liquid asphalt or emulsion to ensure it falls within the specified range. Note such temperatures in the daily report and also, if volumetric measurements are to be used to determine pay quantities, on source documents.
- Obtain the weight slip for each load of liquid asphalt or emulsion. If the load has been hauled a long distance and job scales are available, it is good practice to weigh the load in using the job scales and, after spreading, to weigh the load out on these same scales.
- Unless the screenings are at the work site and ready to be applied, prohibit the contractor from spreading the emulsion.
- To check the spread rate for asphaltic emulsion, measure the volume in the distributor truck tank before and after spreading the asphaltic emulsion for the first few hundred meters. Then, calculate the rate for that distance. Calculate and record the overall daily spread rate in the daily report.
- Through observation, ensure the application of asphaltic emulsion is uniform, both transversely and longitudinally. If the spread does not appear to be uniform, order the correction of spreading equipment. If problems persist, perform the California Test 339, “Field Test for the Determination of Distributor Spread Rate” and before allowing the operation to continue, require corrective action.
- Require the contractor to keep the distributor truck close to the chip spreader. Good practice is to place screenings within 30 seconds after the bituminous binder has been spread. Screenings must be placed before setting or “breaking” of the asphaltic emulsion occurs. This setting or breaking is indicated by a change in color from brown to black.
- Determine whether screenings are damp at the time of application, as required in the specifications, and when necessary, order wetting.
- Observe the coat of screenings behind the chip spreader. If necessary, order an adjustment in the screening spread rate. The figure below shows the desirable relationship between the quantity of asphalt required to the size of the cover material.



Correct asphalt quantity, voids  
50% to 70% filled



Insufficient asphalt, screenings  
not firmly held



Excess asphalt submerges chips  
and causes bleeding

- If the chip spreader is moving excessively fast, chips will roll over as they come in contact with the emulsion. As a result, public traffic and roller tires will pick up the chips. If chips are being turned over, check behind the spreader and order a reduced speed.
- Ensure the contractor performs the rolling in the specified order and for the required number of coverages. Also, ensure the contractor does not spread the binder and screenings more than 760 m ahead of the completion of the initial rolling.
- Adjust the spread rate of screenings to prevent pickup by rollers or traffic. However, prohibit a higher spread rate than necessary. Excessive screenings will increase cost and the difficulty of cleanup operations.
- Ensure the contractor discontinues spreading bituminous binder sufficiently early in the shift to permit the termination of traffic control before darkness.
- Decide on the amount of water to be sprinkled on a fog seal that becomes tacky, and advise the contractor accordingly.
- Ensure the contractor performs brooming as specified. Before allowing uncontrolled traffic in adjacent lanes, ensure the removal of all loose chips. The most common cause of damage by loose chips results from vehicles in an adjacent lane throwing the chips. During brooming, ensure lanes adjacent to chip-sealed lanes remain free of loose screenings. During maintenance, order the seal coat to be swept as often as necessary to keep the surface free of loose screenings.
- Decide whether excess screenings should be salvaged and stockpiled or otherwise disposed of, and advise the contractor of the decision. Unless they are economically useful, screenings should not be salvaged.
- Observe the completed application of screenings and order immediate application of additional screenings or clean sand to cover any excess bituminous binder that rises to the surface.
- For processing any related damage claims, consult with the district claims officer when the following conditions exist:
  1. Damage has been caused by screenings or bituminous binder.
  2. The contract contains provisions for deducting funds from contract payments to pay for damage claims.

#### 4-3702C Measurement and Payment

For measurement and payment, do the following:

- Collect weight slips from each truck as it delivers screenings to the chip spreader. When screenings are stockpiled before spreading, obtain weight slips for trucks delivering screenings to stockpiles. Determine the weight of unused screenings remaining in stockpiles so that the weight of unused material may be deducted from the delivered weight. From the weight of screenings to be paid for, do not deduct the weight of excess screenings removed from the roadway and disposed of.
- Collect weight slips and “weigh-back” slips for trucks delivering asphaltic emulsion or liquid asphalt. When additional water is added to asphaltic emulsion, calculate the amount to be deducted from the original weight, using the ratio in the original mix of asphaltic emulsion to water.

## 4-3703 Slurry Seal

The following covers the duties required throughout each phase of the project for slurry seal.

## 4-3703 Slurry Seal

### 4-3703A Before Work Begins

Before work begins, take the following steps:

- Verify the receipt and proper distribution of Form CEM-3101, “Notice of Materials to Be Used,” which lists slurry seal materials.
- Receive and review the mix design and laboratory tests from the contractor. After determining that the design and test results conform to the requirements in Section 37-2.03, “Mix Design,” of the *Standard Specifications*, approve the mix design in a timely manner. Determine the percentage of asphalt binder to be used and notify the contractor.
- In accord with the State Contract Act, ensure the aggregate comes from a permitted site that complies with the Surface Mining and Reclamation Act of 1975 (SMARA). Mining operations determined to be in compliance are listed on the AB 3098 SMARA Eligible List. You can obtain this list from the Division of Construction or the Department of Conservation’s web site:

[http://www.consrv.ca.gov/OMR/ab\\_3098\\_list/index.htm](http://www.consrv.ca.gov/OMR/ab_3098_list/index.htm)

Also, see Section 7-103D, “Protection of Environmental Resources,” to determine if the proposed materials site is exempt from SMARA.

- Obtain initial samples of the aggregate, and test the samples for the specified attributes. Advise the contractor of the test results.
- Examine the surface to be sealed. Prepare a contract change order to provide for any necessary corrective action, such as sealing cracks and repairing failed areas. At this stage, a joint review with the maintenance region manager or area superintendent would be helpful.
- Examine the proposed mixing equipment to ensure compliance with the specifications. Mixer-spreader trucks must be calibrated for each material source in accordance with California Test 109, “Test for Weighing and Measuring Devices.” Request assistance from the district weights and measures coordinator for calibrating and checking the accuracy of weighing and metering devices.
- Discuss with the contractor the proposed operation, and determine the method for measuring the weight of aggregate and asphaltic emulsion.
- Determine whether the surface to be sealed is clean and dry. Ensure the contractor cleans the surface to remove all loose particles of pavement, dirt, and other extraneous material.
- Review the project to ascertain all requirements for handling traffic. Review with the contractor the required traffic control system and traffic control devices.
- Advise the contractor of the exact spread rate to be used.

### 4-3703B During the Course of Work

Once work begins, take the following steps:

- If required under the contract, ensure the pavement surface to be treated has been coated with the specified asphaltic emulsion. Advise the contractor of the exact application rate and water amount to be added.

- Obtain the required test report for each truckload of asphaltic emulsion. Compare the report with the specifications. Do not permit the emulsion to be used before testing unless a Certificate of Compliance accompanies it.
- Before mixing, take samples of the aggregate for testing.
- If the results of grading or sand equivalent tests fail to meet the specifications, order the removal of the slurry seal represented by the failing tests. When the contractor requests in writing that the material remain in place, decide whether to reject the represented material or to allow it to remain in place. If you allow the material to remain in place, your decision must be based on the results of a physical examination of the slurry seal. Look for evidence of bleeding, raveling, stripping, or other deficiencies. Notify the contractor in writing of your decision. Also, if you allow the material to remain in place, calculate the amount of material represented, and deduct the amount from future progress payments.
- Observe the mixing operation to ensure the ordered proportions are being used.
- To determine the bitumen ratio and uniformity of mixing, submit samples of the completed mix to the district laboratory. Place samples in tightly closed containers to prevent moisture loss before testing.
- Make the necessary measurements and calculations to ensure the contractor spreads the slurry seal at the ordered rate.
- Review the completed slurry seal to determine if it meets the requirements of Section 37-2.04, "Proportioning," of the *Standard Specifications*.
- As specified, order the contractor to protect fresh slurry seal from traffic damage. To protect the fresh slurry seal, sand may be applied to the surface at intersections and driveways as specified.

#### 4-3703C Measurement and Payment

For measurement and payment, do the following:

- The quantity of slurry seal to be paid for is the combined quantity of asphaltic emulsion and aggregate. Because of the type of equipment used and the nature of the slurry seal operation, it is usually impossible to weigh both components together. Separately determine the mass of asphaltic emulsion and aggregate, and add the two results together to determine the pay quantity.
- As necessary to determine pay quantities, collect weight tickets for aggregate and asphaltic emulsion. You may use properly sealed and calibrated metering devices to determine pay quantities. When converting volume measurements of asphaltic emulsion to mass, make the appropriate corrections for temperature.
- When slurry seal is allowed to remain in place even though it failed the grading or sand equivalent tests, make the appropriate administrative deduction.