

Section 94 Asphaltic Emulsions

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Section 94 Asphaltic Emulsions

4-9401 General

Asphaltic emulsions are described in Section 94, “Asphaltic Emulsions,” of the *Standard Specifications*. They are used for seal coats and tack coat. Asphaltic emulsions are also used for other purposes, such as curing seals for lime stabilization and cement-treated base and for coating the surface of cement-treated permeable base to facilitate measuring the thickness of concrete pavement.

In addition to the specifications for asphaltic emulsions in Section 94, of the *Standard Specifications*, refer to the requirements for asphaltic emulsions in other sections of the *Standard Specifications*—Sections 18, “Dust Palliatives”; 24, “Stabilized Soils”; 27, “Cement Treated Bases”; 37, “Seal Coats”; 39, “Asphalt Concrete”; 54, “Waterproofing”; 66, “Corrugated Metal Pipe,” and 86, “General,” — covering work in which asphaltic emulsions are used.

Asphaltic emulsions are composed of a bituminous material uniformly emulsified with water and an emulsifying or a stabilizing agent. When asphaltic emulsions are used as a tack coat for asphalt concrete, the application rate is specified in terms of a residual rate. The residual rate is the amount of bituminous material that remains on the pavement after water and emulsifying or stabilizing agents evaporate; it is not the application rate from the distributor truck.

Slow setting and quick setting asphaltic emulsions used as a tack coat can be diluted up to 1 part added water to 1 part original emulsion. Dilution allows the material to be sprayed at a higher rate, promoting uniform coverage while still maintaining minimum residual rates. Rapid setting emulsions and polymer modified emulsions cannot be diluted.

Asphaltic emulsions, diluted or undiluted, used as a tack coat are typically applied at a rate of 0.05 to 0.15 gallons per square yard. Spray rates closer to 0.10 gallons per square yard promote uniform coverage.

For more information, refer to the Division of Construction’s *Tack Coat Guidelines* and the “Minimum Spray Application Rates of Original Undiluted and Diluted Emulsions” table at:

<https://dot.ca.gov/programs/construction/hot-mix-asphalt-construction>

4-9402 Before Work Begins

Before work begins, take the following steps:

- Verify that Form CEM-3101, “Notice of Materials to Be Used,” includes asphaltic emulsion. Refer to Section 6-202, “Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products,” of this manual for additional information.

- Examine the distributor truck to determine whether it meets the specified requirements.
- Dilution should be done by the manufacturer, not the contractor.
- Make sure the contractor properly equips delivery trucks, storage tanks, and spreading equipment with specified devices for measuring volumes of asphaltic emulsion.
- If the polymer content of polymer modified asphaltic emulsion is determined under California Test 401, "Method of Test for Latex Concentration in Asphalt Emulsions," verify that the contractor has submitted a sample to Materials Engineering and Testing Services.

4-9403 During the Course of Work

During the work, take the following steps:

- If asphaltic emulsion is used before Caltrans' sampling and testing is complete, obtain a certificate of compliance containing the specified information.
- Verify the receipt of a safety data sheet for each shipment of asphaltic emulsion to the job site.
- Check the temperature of the asphaltic emulsion to verify that it is within the specified range when applied.
- Before asphaltic emulsion is applied, check that the surface to be treated is clean and dry.
- Make sure that asphaltic emulsion is not sprayed outside designated areas and that bituminous material does not drip from distribution equipment.
- Sample asphaltic emulsion in accordance with Table 6-1.12, "Materials Acceptance Sampling and Testing Requirements: Bituminous Seals," Table 6-1.13, "Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete," and the instructions in Section 6-203C, "Materials Accepted on the Basis of a Certificate of Compliance," of this manual. If water has been added to the asphaltic emulsion, note on Form TL-0101, "Sample Identification Card," the ratio of added water to the total mixture.
- Use Form CEM-3701 "Test Result Summary," to record the dates that samples were taken, shipped to the laboratory, test result was received from lab, and test result notification was sent to contractor. Ship samples within 1 business day when the laboratory is within 50 miles, or within 2 business days when the laboratory is farther than 50 miles.

For asphaltic emulsion used as a tack coat, determine the following:

- RRm—the minimum residual rate of the tack coat specified in Section 39, "Asphalt Concrete," of the *Standard Specifications*. Note the different residual rates required for the various hot mix asphalt types and open graded friction courses.

- PRDm—the minimum percent residue by distillation, for the type of undiluted asphaltic emulsion used, specified in Section 94, “Asphaltic Emulsions,” of the *Standard Specifications*.
- POE—the diluted emulsions “percent original emulsion.” For example:
 - If the emulsion was diluted with 1 part added water to 4 parts original emulsion, the “percent original emulsion” is 4/5 original emulsion, or 80 percent original emulsion. This is commonly referred to as (1:4) or 80/20.
 - If the emulsion has not been diluted, the “percent original emulsion” is 100 percent.
- Determine the minimum spray application rate of the emulsion based on its delivered state; diluted or undiluted. Use the table, “Minimum Tack Coat Spry Rates” at:

<https://dot.ca.gov/programs/construction/hot-mix-asphalt-construction>

Or perform your own calculations:

minimum spray application rate (gal/sq yd) = $RRm / [(PRDm/100) \times (POE/100)]$

Example:

Assume the following:

- New hot mix asphalt is placed over planed pavement.
- Contractor’s distributor truck shows up with SS1h (slow setting, grade 1) emulsion that has been diluted with 1 part water to 4 parts original emulsion (that is; 1:4, or an 80/20).
- The diluted emulsion is now only 80 percent original emulsion.

Using these assumptions, calculate the minimum spray applications rate as follows:

1. From Section 39-2.01C(3)(f), “Tack Coat,” of the *Standard Specifications*, $RRm = 0.05$ gal/sq yd.
 2. From Section 94-1.02B, “Slow-Setting Anionic Asphaltic Emulsions,” of the *Standard Specifications*, under Grade SS1h, $PRDm = 57$.
 3. From the given information for this example, $POE = 80$.
 4. Minimum spray application rate = $0.05 / [(57/100) \times (80/100)] = 0.1096$ gal/sq yd.
 5. Rounded to the nearest 0.01 gal/sq yd, the minimum spray application rate is 0.11 gal/sq yd.
- Document that the contractor’s planned spray rate is not less than the minimum spray application rate for the diluted or undiluted emulsion in the daily report.
 - Check the application rate of asphaltic emulsion to verify the designated rate. After the first few hundred feet of application, check the initial spread rate. The frequency for checking the spread rate will depend on the accuracy and

consistency of the first few checks. Record the spot-check results and the overall daily spread rate in the daily report.

4-9404 Quality Control

If the contractor uses the asphaltic emulsion before the sampling and testing is complete, check that the contractor submits a certificate of compliance for each shipment to the job site.

Refer to the requirements for asphaltic emulsions in other sections of the *Standard Specifications* and the corresponding sections of this manual in which asphaltic emulsions are used.

4-9405 Payment

Asphaltic emulsion is paid for as a separate bid item, unless specified as included as part of a separate item of work. Asphaltic emulsion is subject to adjustment under Section 9-1.07, "Payment Adjustments for Price Index Fluctuations," of the *Standard Specifications*.

Obtain weighmaster certificates for deliveries of asphaltic emulsion. The specifications require the weighmaster certificates to break out the weight of water used to dilute the asphaltic emulsion. If weighmaster certificates are based on asphaltic emulsion that has been diluted, do not include the weight of the added water in the payment quantity. Pay only for the weight of the original undiluted emulsion covered by a certificate of compliance. Refer to Section 9-1.02B, "Weighing Equipment and Procedures," of the *Standard Specifications*.

It is a good practice, before the asphaltic emulsion is discharged, to measure the volume in the distributor and to make this volumetric measurement again whenever a partial load leaves the work. These actions result in a good check against scale weights, and the second measurement may be used if the contractor fails to submit a weighmaster certificate for the unused asphaltic emulsion.

When the specifications provide for water to be mixed with asphaltic emulsion, it is necessary to determine the weight of asphaltic emulsion without the added water. Delivery weighmaster certificates will show the weight of the emulsion before water was added and the total weight of asphaltic emulsion with added water.

When making volumetric measurements, measure the temperature and apply the proper factors for converting volume to weight.

In a partial load using volumetric measurements, the procedure for determining the weight of asphaltic emulsion with added water is as follows:

- Measure the volume and temperature of the mixture in the partial load. Calculate the volume of emulsion in the original load at the temperature of the partial load. Convert tons of added water in the original load to gallons.
- Based on the final temperature reading, calculate the ratio of the volume of asphaltic emulsion to the total volume in the original load.
- Calculate the volume, at 60 degrees Fahrenheit of emulsion in the partial load.

- Determine the weight of emulsion remaining in the partial load.

Example:

Assume the following:

- Weighmaster certificate shows 10 tons of emulsion and 5 tons of added water. (Total = 15 tons) Temperature at the time of weighing was 131 degrees F.
- 534 gallons of emulsion with added water remain in the partial load. At the time of measuring, the temperature of the mixture is 131 degrees F.

Using these assumptions, calculate as follows:

1. Volume of emulsion at 131 degrees F in the original load:
 $10 \text{ tons} \times 240 \text{ gal/ton at } 60 \text{ degrees F} \div 0.98225 \text{ (refer to the conversion table in Section 94-1.04, "Payment," of the } Standard \text{ Specifications)} = 2,443 \text{ gal}$
2. Volume of added water in the original load:
 $(5 \text{ tons} \times 2,000 \text{ lb}) / 8.33 \text{ lb/gal} = 1,200 \text{ gal}$
3. Ratio of volume of emulsion at 131 degrees F to total volume in the original load: $2,443 / (2,443 + 1,200) = 0.671$
4. Volume at 60 degrees F of emulsion in the partial load:
 $0.671 \times 534 \times 0.98225 = 352 \text{ gal}$
5. Weight of emulsion in partial load:
 $352 \div 240 = 1.46 \text{ tons}$
6. Emulsion used on the project:
 $10.00 - 1.46 = 8.54 \text{ tons}$