Chapter 4 Construction Details

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Section 92 Asphalt Binders

4-9201 General

Asphalt binder and modified asphalt binder, as defined in Section 92, “Asphalt Binders,” of the *Standard Specifications,* are also referred to as asphalt or paving asphalt. Modified asphalt binder is asphalt binder that has been modified with polymers, crumb rubber, or both. Asphalt binder is used in hot mix asphalt, in asphalt-treated permeable base, as pre-coating for aggregate used in seal coats, and as a tack coat. Modified asphalt binder is used in rubberized hot mix asphalt. At normal ambient temperatures, asphalt is a solid and must be heated before it is mixed with aggregates or is applied as tack coat.

A contract’s special provisions may specify the type of asphalt to be used.

MS-22 Construction of Quality Asphalt Pavements and *MS-2 Asphalt Mix Design Methods*, both published by the Asphalt Institute, contain information on the uses of various types of asphalts and the design and production of hot mix asphalt.

4-9201A Performance Grade Asphalt

Performance-grade asphalts and performance-grade polymer-modified asphalts are selected to meet expected climatic conditions as well as traffic speed and volume adjustments. Performance-grade asphalt binders and performance-grade polymer-modified asphalt binders are tested to meet physical properties directly related to field performance of the pavement at extreme temperatures. These tests and specifications are designed to address three specific pavement distress modes: rutting, fatigue cracking, and low temperature cracking. An asphalt binder specified as performance grade PG 64-10 has the physical properties needed for field performance of pavement at an average 7-day maximum pavement temperature of 64 degrees Celsius and at a minimum pavement temperature of -10 degrees Celsius. The range on the Fahrenheit scale is 147.2 degrees and 14 degrees.

For “special conditions” including heavy truck and bus traffic (over 10 million equivalent single axle loads for 20 years), truck and bus stopping areas, truck and bus climbing and descending lanes, the performance-grade binder specified for the climate region may be “bumped” a grade in conformance with the policy for “special conditions” included in Design Information Bulletin 86, “Selecting Asphalt Binder Type.”

Performance-grade asphalt information, including a link to the Pavement Climate Regions map, is available on the Office of Asphalt Pavements website:

https://dot.ca.gov/programs/maintenance/pavement/asphalt-pavement

4-9201B Asphalt Rubber Binder

Only 2 performance-grade asphalt binder grades are used as the base binder for asphalt rubber binder (ARB). Typically, the ARB base binder chosen for a project will

be an asphalt grade less than what is specified for a Caltrans pavement climate region because of the additional binder stiffness provided by the crumb rubber modifier.

4-9202 Before Work Begins

Section 92, "Asphalt Binders," of the *Standard Specifications* requires the contractor to comply with the Asphalt Supplier Certification Program. Refer to Section 6-203C (1), "Asphalt," of this manual for additional information. Perform the following before work begins:

- Verify that Form DOT CEM-3101, "Notice of Materials to Be Used," includes asphalt. Refer to Section 6-202, "Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products," of this manual for additional information.
- Verify that the asphalt binder supplier is on the Caltrans approved supplier list for the specified binder type. The current Asphalt Supplier Certification Program list is available at:

  https://mets.dot.ca.gov/aml/AsphaltBindersList.php
- If the asphalt supplier is not on the Caltrans approved supplier list, notify the contractor that before use, asphalt binder samples must be taken from each truckload and tested in accordance with Section Q, "Requirements for Suppliers Supplying Asphalt Without a Certificate of Compliance," of the Program Guidelines for the Asphalt Supplier Certification Program.
- If asphalt rubber binder is used, verify the crumb rubber modifier is on the Authorized Materials List for crumb rubber modifier available at:

  https://dot.ca.gov/programs/engineering-services/authorized-materials-lists

Check that the equipment used to produce the asphalt rubber binder is authorized under the *Material Plant Quality Program.*

4-9202A Devices for Measuring Asphalt Volume

Check that the contractor properly equips delivery trucks, storage tanks, and hot mix asphalt plants with the specified devices for measuring asphalt volumes. Refer to the *Material Plant Quality Program Manual* for detailed requirements.

4-9202B Tack Coat

When asphalt is used for tack coat:

- Review *Tack Coat Guidelines* for information about application rates and general information. *Tack Coat Guidelines* are available at:

  https://dot.ca.gov/programs/construction/publications
- Check that the contractor will use a distributor truck that meets the requirements of Section 37-1.03B, "Equipment," of the *Standard Specifications*.

- When tack coat is a contract item, inform the contractor at the prepaving conference that measurement will be made by scale weights or, if the engineer allows, by volumetric measurement.
- Review the contract's measurement and payment clauses, and determine whether tack coat is included in other contract bid items or is paid separately.

4-9203 During the Course of Work

Sample and test asphalt, for the applicable type of work, at the frequencies shown in the tables under Section 6-1, "Sample Type and Frequencies," of this manual. Note that asphalt is included in several of the tables with differing sampling and testing frequencies. For asphalt acceptance sampling, the plant inspector and the hot mix asphalt paving inspector must be qualified in accordance with Appendix D, "Bituminous Materials," of California Test 125, "Method of Test for Sampling Highway Materials and Products Used in the Roadway Pavement Structure Sections." Refer to the *Independent Assurance Manual* for tester qualification and laboratory accreditation information.

Ship samples to Materials and Engineering Testing Services (METS) for acceptance testing, as shown in Section 6-1, and store the remaining samples in case additional acceptance testing is necessary.

The contractor may request that the engineer split acceptance samples. If requested, witness the contractor splitting samples into 4 parts. Test 1, provide 1 to the contractor, and store 2 for dispute resolution.

Section 39-2.01A(4)(i)(iv), "Dispute Resolution," of the *Standard Specifications* contains a dispute resolution process for hot mix asphalt. The dispute resolution process allows the contractor to dispute any acceptance test result within 5 days of receiving the result. It is important to split sample materials and for Caltrans to take possession of and store the split samples. If a dispute occurs, the independent third party laboratory uses split samples of disputed material for evaluation. To be used by the independent third party, split samples must be in the possession of and stored by Caltrans. Stored split samples may be discarded 5 days after the contractor has received the associated acceptance test result.

When asphalt rubber binder is used, make sure the contractor submits Form DOT CEM-4410, "Crumb Rubber Usage Report," monthly and at the end of the project. Follow guidance in Section 7-108, "Crumb Rubber Usage Reporting," of this manual.

4-9203A Plant Operations

The plant inspector takes the following steps related to asphalt used in hot mix asphalt:

- Checks that the asphalt binder supplier is on the Caltrans approved supplier list or that asphalt binder samples have been taken from each truckload and tested in accordance with Section Q, "Requirements For Suppliers Supplying Asphalt Without A Certificate of Compliance," of the Program Guidelines for the Asphalt Supplier Certification Program.

- Notifies the contractor and engineer immediately if asphalt binder testing has not been completed for a supplier not on the approved suppliers list.
- Unless the resident engineer approves, does not allow use of asphalt from a nonapproved supplier before receiving Caltrans test results.
- Verifies that certificates of compliance are received with each truckload of asphalt binder delivered to the plant. Confirms that the source of asphalt is the same source as shown on Form DOT CEM-3101, "Notice of Materials to Be Used," and for hot mix asphalt that the same source is shown on Form DOT CEM-3511, "Contractor Job Mix Formula Proposal."
- Notifies the resident engineer immediately if there appears to be a change in the source of asphalt binder.
- Witnesses the contractor obtaining split samples of asphalt binder.
- Checks that the contractor samples in accordance with California Test 125, "Method of Test for Sampling Highway Materials and Products Used in the Roadway Pavement Structure Sections."
- Verifies that the contractor samples asphalt at the frequency shown in Section 6-1, "Sample Type and Frequencies," of this manual in the presence of the engineer and makes sure the sample is in the possession of and stored by Caltrans for proper chain-of-custody control.
- Completes Form TL-0101, "Sample Identification Card," for each sample of asphalt binder taken, following the directions for this form and as directed in Section 6-2, "Acceptance of Manufactured or Fabricated Materials and Products," of this manual. Ships the samples to METS for testing as detailed in the section.

4-9203B Paving Operations

The paving inspector takes the following steps related to asphalt used as tack coat:

- Verifies that the asphalt supplier is on the Caltrans approved supplier list or that asphalt samples have been taken from each truckload and tested in accordance with the Asphalt Supplier Certification Program. Notifies the contractor and resident engineer immediately if asphalt binder testing has not been completed for a supplier not on the approved suppliers list.

  Unless the resident engineer approves, does not allow use of asphalt from a nonapproved supplier before receiving Caltrans test results.
- Verifies that the distributor truck used for tack coat complies with the requirements in Section 37-1.03B, "Equipment," of the *Standard Specifications*.
- When tack coat is a contract item, it is good practice to measure the volume and temperature of asphalt in the distributor truck before discharge and to make a volumetric and temperature measurement 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 asphalt.

- Checks that tack coat is applied properly by following the application section in *Tack Coat Guidelines*:

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

- Witnesses the contractor obtaining split samples of asphalt used as tack coat and verifies that the contractor samples in accordance with California Test 125, "Method of Test for Sampling Highway Materials and Products Used in the Roadway Pavement Structure Sections."
- Makes sure the contractor samples asphalt at the frequency shown in Section 6-1, "Sample Type and Frequencies," of this manual in the presence of the engineer and makes sure the sample is in the possession of and stored by Caltrans for proper chain-of-custody control.
- Completes Form TL-0101, "Sample Identification Card," for each sample of tack coat taken, following the directions for this form and as directed in Section 6-2, "Acceptance of Manufactured or Fabricated Materials and Products," of this manual. Ships the random samples to METS for testing as detailed in the section.
- Verifies that certificates of compliance are received with each truckload of tack coat used in the work. Confirms that the source of tack coat is the same source as shown on Form DOT CEM-3101, "Notice of Materials to Be Used."
- Notifies the resident engineer immediately if there appears to be a change in the source of tack coat.

4-9204 Quality Control

The resident engineer makes sure that the asphalt used in the work meets the specifications and that payment adjustments are made when required. The resident engineer performs the following quality assurance administration to assure asphalt quality.

4-9204A Acceptance Test Results

Make sure acceptance testing is performed at the minimum frequencies shown in Section 6-1, "Sample Type and Frequencies," of this manual. Record test results on Form DOT CEM-3701, "Test Result Summary," so that minimum acceptance testing frequency is easily verified and documented.

- If any acceptance test result is outside the specified limits listed in Section 92-1.02, "Materials," of the *Standard Specifications,* notify the contractor in writing that the material may be defective. Ask the contractor if corrective action has been taken based on quality control test data for the time period the acceptance sample was taken. Attach a copy of the test result indicating that material is outside specification limits.
- For hot mix asphalt, the contractor may dispute an acceptance test result within 5 days of receiving the test result by notifying the engineer in writing, in accordance with Section 39-2.01A(4)(i)(iv), "Dispute Resolution," of the *Standard*

Specifications. Try to resolve testing or sampling issues at the project level before involving an independent third party.

- If an acceptance test is outside the acceptance specification limits, verify that METS or Southern Regional Lab is testing the most recent acceptance sample for compliance with the specifications. When there are failing acceptance tests, do not follow minimum acceptance sample frequencies shown in Section 6-1, "Sample Type and Frequencies," of this manual for conducting the next acceptance test.

4-9204B Stop Production

- For hot mix asphalt, if 2 consecutive acceptance test results or any 3 acceptance test results for 1 day's production do not comply with the specifications, notify the contractor to stop hot mix asphalt production. Inform the contractor in writing that the material represented by the 2 out-of-specification acceptance tests is defective in accordance with Section 39-2.01A(4)(i), "Department Acceptance," of the *Standard Specifications*, and that the defective material is rejected and must be removed or remedied in accordance with Section 5-1.30, "Noncompliant and Unauthorized Work," of the *Standard Specifications*. Attach copies of the test results indicating that material is outside specification limits.
- When the work has been stopped because 2 consecutive acceptance test results do not comply with the specifications, require the contractor to:
  - Provide written documentation of corrective action taken to correct the cause of out-of-specification material.
  - Take samples in the engineer's presence, and split the samples into 4 parts. To avoid placing additional out-of-specification material, do not take samples on an active project.
  - Test 1 part of the split sample for compliance with the specifications to verify that the corrective action taken by contractor has corrected any problem. If both Caltrans' and contractor's test results are within specifications and are not significantly different, that is, test results are within multi-laboratory precision, the contractor has demonstrated compliance with the specifications and may resume production.
- As above, the contractor may dispute the second out-of-specification acceptance test result within 5 days of receiving the test result by notifying the engineer in writing in accordance with Section 39-2.01A(4)(i)(iv), "Dispute Resolution," of the *Standard Specifications*. Try to resolve testing or sampling issues at the project level before involving an independent third party.
- When 2 consecutive acceptance tests are outside the acceptance specification limits, notify METS to test all samples collected between the 2 out-of-specification acceptance tests. Start testing samples backward from the first out-of-specification acceptance test until the test result obtained is within specification limits. Notify the contractor in writing of additional acceptance tests results conducted to ascertain the extent of the defective material. Tell the

contractor that material represented by out-of-specification material is defective and rejected and must be removed or remedied in accordance with Section 5-1.30, "Noncompliant and Unauthorized Work," of the *Standard Specifications*.

- The contractor may notify the engineer in writing that defective material will be remedied or left in place at reduced compensation. Consult with the district materials engineer and the Pavement Program, Office of Asphalt Pavements about acceptance of the contractor-proposed remedy. Document material remediation or reduced pay by issuing a contractor-requested change order, including the action taken on final project materials certification. Refer to Section 6-106, "Project Materials Certification," of this manual for material certification and the requirement to list all nonconforming materials.

4-9204C Certificates of Compliance

For certificates of compliance for asphalt, each certificate of compliance must show:

- Name and location of supplier.
- Grade of the asphalt.
- The date and time of shipment.
- A unique shipment number, such as a bill of lading or manifest number.
- A statement confirming that the transport vehicle was checked in before loading and was found acceptable for the asphalt shipped.

The certificate of compliance must include the following wording:

"[*Supplier name*] hereby certifies that the asphalt product accompanying this certificate was produced in accordance with the California Department of Transportation's Asphalt Supplier Certification Program and that this product complies with all requirements of the applicable specifications for the asphalt product identified on this document. I certify by my signature that I have the authority to represent the supplier providing the accompanying asphalt product."

- Verify that the source and grade of asphalt used as asphalt binder or tack coat have not changed during the course of the work, except with engineer's approval.
- Verify that the appropriate number of certificates of compliance have been received to cover the quantities of asphalt binder and tack coat used in the work. Calculate the tons of asphalt binder required based on the percentage of binder in the hot mix asphalt placed, and compare the result with the amount covered by the certificates of compliance. For tack coat, summarize the daily tons used and compare to the amount covered by the certificates of compliance.
- Document action taken on final project materials certification if certificates of compliance are missing. Refer to Section 6-106, "Project Materials Certification," of this manual for material certification and the requirement to list all nonconforming materials.

4-9205 Payment

Payment clauses for asphalt are found in the sections covering the work in which asphalt is used. For details on asphalt measurement, review Section 92-1.04 "Payment," of the *Standard Specifications.*

- When making volumetric measurements of asphalt used as a tack coat, measure the temperature, and apply the proper factors for converting volume to mass.
- If applicable, when asphalt is used in hot mix asphalt and dispute resolution determines the contractor's test results are correct, Caltrans pays the independent third party testing costs. When the contractor's test results are correct, the resident engineer adjusts payment and contract time under Section 8-1.07, "Delays," of the *Standard Specifications*.

4-9205A Compensation Adjustments for Price Index Fluctuation

If the contractor did not opt out of payment adjustments for price index fluctuations at the time of bid, perform the following for asphalt binder and asphalt used as tack coat:

- Process a change order to allow for payment adjustments—increase and decrease—based on total estimated potential payment adjustment. Including both a positive and negative payment method allows the progress payment system to accept both positive and negative monthly payment adjustments.
- During each progress estimate, calculate the amount of paving asphalt used monthly in hot mix asphalt and tack coat. Segregate the quantity based on the calendar month it was placed.
- If the crude oil index for the current month fluctuates by more than 5 percent from the crude oil index for the month in which the bid opening occurred, calculate the asphalt payment adjustment, including the adjustment on the monthly estimate. A tool to assist in making the monthly adjustments is available on the Division of Construction's Hot Mix Asphalt Construction website:

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