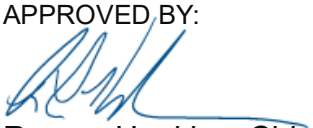
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

# MANUAL CHANGE TRANSMITTAL		NO. **24-4**
TITLE: Department of Transportation *Construction Manual*	APPROVED BY:  Ramon Hopkins, Chief Division of Construction	DATE ISSUED: **5-23-2024**
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The purpose of this manual change transmittal is to announce updates and corrections to the Caltrans *Construction Manual.* Please note the updates, and print new sections for your manual as needed. Updated sections are published on http://www.dot.ca.gov/hq/construc/constmanual/ and are indicated by the date listed in the right-hand column on that page. Content changes, not including edits for clarity, are enumerated:

MCT 24-3 [5/23/2024]

Section 4-37, "Seal Coats"
Section 4-3702B, "During the Course of Work," of the *Construction Manual* has been updated to reflect changes to Section 37-2.01A(4)(b)(iii), "Chip Seals" of the *Standard Specifications*, which requires use of ASTM D2995 for testing the quality characteristic of the binder application rate. CT 339 is no longer in use.

Section 6-1, "Sample Types and Frequencies"
Section 6-107, Table 6-1.12. and Table 6-1.13. of the *Construction Manual* have been updated to reflect changes to Section 37-2.01A(4)(b)(iii), "Chip Seals" of the *Standard Specifications*, which requires use of ASTM D2995 for assessing the asphaltic emulsion spread rate for flush coats. CT 339 is no longer in use.

Chapter 4 Construction Details

Section 37 Seal Coats

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Section 37 Seal Coats

4-3701 General

This section provides guidelines for inspecting work for applying bituminous seals as specified under Section 37, “Seal Coats,” of the *Standard Specifications*, which includes chip seals, slurry seals, micro-surfacing, fog seals, flush coats, parking area seals, and crack treatments.

Chip seal is an application of bituminous material followed by a layer of aggregate screenings, for example, chips, and rolling. Chip seals include: asphaltic emulsion chip seals, polymer modified asphaltic emulsion chip seals, scrub seals, asphalt rubber binder chip seals, stress absorbing membrane interlayers (SAMI), and modified asphalt binder chip seals.

Asphaltic emulsion chip seals and polymer modified asphaltic emulsion chip seals placed in two layers are referred to as double chip seals.

Chip seals that use a hot asphalt binder, for example, asphalt rubber binder chip seal and modified asphalt binder, are often referred to as “hot applied chip seal.” Chip seals that use an emulsion are often referred to as a “cold applied chip seal.” Hot applied chip seals can be placed at night.

Scrub seal is a more advanced and aggressive multi-step chip seal process that uses a specialized emulsion as an asphalt concrete rejuvenator and chip binder in conjunction with a mechanized scrub broom that forces the optimum amount of emulsion into existing pavement surface cracks.

SAMI is a chip seal in which a modified binder, such as asphalt rubber, is applied at a much higher rate than used for a conventional chip seal. A SAMI is placed beneath a new overlay to retard reflection cracking.

Slurry seal is an application of a slurry mixture of water, asphaltic emulsion or polymer modified asphaltic emulsion, fine aggregate, and set-control additives applied to a pavement surface. Slurry seals are applied with a specialized vehicle with separate compartments for the ingredients and an on-board mixer. The slurry mixture flows onto the pavement within the confines of a distributor box attached to the rear of the vehicle. The box distributes the slurry mixture over the pavement to the approximate thickness of the largest aggregate (1/4- to 3/8-inch). Workers with squeegees assist in spreading the mixture, correcting areas not properly covered, and preventing the mixture from flowing to areas that are not intended to be covered. Slurry seals can only be applied in one layer.

Micro-surfacing is similar to a slurry seal except it requires a more advanced polymer modified asphaltic emulsion, a more durable fine aggregate, and a chemical additive. The major difference between slurry seal and micro-surfacing is in how they break or harden. Slurry seal relies on evaporation of the water in the asphaltic emulsion. The chemical additive in a micro-surfacing allows it to break without

relying on sun or heat for evaporation. The hardening rate of a micro-surfacing allows it to be used where a slurry seal cannot be used. Micro-surfacing is applied with more advanced equipment than a slurry seal. It can be applied thicker than the largest aggregate and applied in multiple layers to address surface irregularities including rutting.

Fog seal is an application of a diluted slow-setting asphaltic emulsion or quick setting asphaltic emulsion applied over the existing pavement or a chip seal.

Flush coat is the application of a fog seal followed by the application of sand. To eliminate further aggregate loss and improve durability, flush coats are always specified to be placed over chip seals and SAMIs before opening pavement to traffic.

Parking area seal is the application of a mixture of asphaltic emulsion, aggregate, polymer, and water to parking areas.

Crack treatment is the cleaning, preparation, and sealing of existing cracks in asphalt concrete pavement.

Bituminous seals are primarily used to maintain existing asphalt concrete pavement. Bituminous seals on new work are generally limited to fog seal on areas of hot mix asphalt that have been ground for smoothness corrections, asphalt concrete dikes, miscellaneous areas, and shoulders.

4-3702 Chip Seals

The following covers the duties required throughout each phase of the project for chip seals.

4-3702A Before Work Begins

Before work begins, take the following steps:

- A minimum of 15 days before starting placement of chip seal, make sure the contractor submits:
  1. Samples of the uncoated aggregate
  2. Depending on the type of chip seal, samples of asphaltic emulsion, polymer modified asphaltic emulsion, or asphalt rubber binder
  3. Binder data for asphaltic emulsion, polymer modified asphaltic emulsion, asphalt binder or asphalt rubber binder
  4. Contractor’s aggregate test results
  5. Contractor’s Vialit test for aggregate retention in chip seals test results
- Test the uncoated aggregate, asphaltic emulsion, polymer modified asphaltic emulsion, or asphalt rubber binder asphalt binder for all of the quality characteristics. Advise the contractor of test results.
- A minimum of 10 days before starting chip seal activities, make sure the contractor submits the names of proposed authorized laboratories for quality

control testing. Authorize the laboratories based on the requirements of Section 37-1.01D, "Quality Assurance," of the *Standard Specifications*.

- A minimum of 10 days before the preconstruction meeting, make sure the contractor submits a list of participants in the preconstruction meeting, including the participants' names, employer, title, and role in the production and placement of the chip seal.
- Hold the preconstruction meeting a minimum of 5 days before the start of the chip seal work. At the preconstruction meeting discuss the contractor's quality control program and method for performing each element of work affecting material quality including:
  - Frequency of quality control sampling and testing that meets or exceeds specification requirements listed in the quality control sections of the *Standard Specifications*.
  - Time and frequency of submitting test results.
  - Responsibilities of quality control laboratories.
- Verify that the contractor posts "No Parking—Tow Away" signs a minimum of 24 hours before placing chip seal if chip seal affects public parking.
- Examine the surface to be sealed. Prepare a change order to provide for any necessary corrective action such as sealing cracks and repairing failed areas. At this stage, a review with the maintenance region manager or area superintendent would be helpful.
- A minimum of 7 days before starting placement of the chip seal, make sure contractor submits a written list of areas deemed defective, for example, those that have rutting in excess of 3/8 inch or are exhibiting flushing. Provide a written response indicating your agreement or disagreement with each of the areas. Caltrans' acceptance does not apply to areas where you agree the existing pavement is defective before placement of the chip seal.
- When the chip seal includes pre-coated aggregate, verify that the contractor's central mixing plant has been authorized under Caltrans' Material Plant Quality Program (MPQP). For additional information refer to Section 3-902E, "Weighing Equipment and Procedures," of this manual.
- Review the contract to determine the type of seal coat required. Note the particular type of bituminous binder to be used, and the requirements for aggregates. Decide whether any conditions have changed from those upon which the design engineer based the requirements, and propose any necessary changes.
- For asphalt rubber seal coats, verify that the contractor has submitted the permits issued by the local air quality agency for asphalt rubber binder field blending and application equipment.
- If an air quality permit is not required by the local air quality agency for producing asphalt rubber binder or spray applying asphalt rubber binder, verify that the

contractor submits verification from the local air quality agency that an air quality permit is not required for the contract.

- Verify that Form CEM-3101, “Notice of Materials to Be Used,” includes seal coat materials. Refer to Section 6-202, “Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products,” of this manual for additional information.
- Make sure the aggregate material source complies with Section 7-103H (2), “Surface Mining and Reclamation Act,” of this manual.
- Review the project to determine all requirements for handling traffic. Review required traffic control system and traffic control devices with the contractor.
- Make sure contractor submits an aggregate spread rate and bituminous binder spread rate. Review the spread rates and authorize if rates are within the specified allowable range.
- For the type of chip seal specified, review the contract documents to determine the specifications related to weather; the success of a chip seal is highly dependent on weather related conditions. Following are limits that may apply to the specified type of chip seal:
  - Minimum ambient air temperature during placement
  - Maximum ambient air temperature during placement
  - Minimum pavement surface temperature during placement
  - Maximum pavement surface temperature during placement
  - Minimum ambient air temperatures for the first 24 hours after placement
  - Placement within 24 hours of rain
  - Placement within 24 hours of forecast rain
  - Placement within 24 hours of freezing temperatures
  - Pavement dampness during placement
  - High wind conditions during placement
- Review the latest weather reports, daily weather forecasts, existing pavement surface temperatures, and ambient air temperatures during the planned shift hours. Document these conditions in your daily report. 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 and discuss conditions forecast for the following workday. Strive to reach mutual agreement on whether work should proceed the following workday. Provide a nonworking day for those days when weather prevents work from proceeding.
- Determine whether the surface to be sealed is clean and dry. Make sure 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 make sure specifications are met.

4-3702B During the Course of Work

Once work begins, take the following steps:

- Review the weather reports, daily weather forecasts, existing pavement surface temperatures, and ambient air temperatures during the shift hours. Document these conditions on your daily report.
- For the type of chip seal specified, review the contract documents to determine the specifications related to weather. Make sure the contractor places chip seal only under specified weather conditions.
- 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.
- Make sure both acceptance testing and reporting to the contractor are performed at frequencies listed in Chapter 6-1, “Sample Types and Frequencies,” of this manual.
- For chip seals that use a crumb rubber modifier, verify that the contractor submits a Form CEM-4410, “Crumb Rubber Usage Report,” monthly and at the end of the project.
- Obtain samples of the asphaltic emulsion in accordance with the frequency tables in Section 6-1, “Sample Types and Frequencies,” of this 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 how many parts of water were added to how many parts of emulsion.
- From the delivered aggregate 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 verify that it falls within the specified range. Note such temperatures in the daily report and on source documents, if volumetric measurements are to be used to determine pay quantities.
- Just before spreading, review contractor’s proposed aggregate and bituminous material spread rates against previously authorized spread rates. If different, but within the contract required range of spread rates, document the contractor’s reasoning in the daily report and re-authorize the spread rates.
- For diluted asphaltic emulsion, determine the required spray rate necessary to achieve the residual rate. Refer to Section 4-9403, “During the Course of Work,” of this manual for an example of how to determine the spray rate required to achieve a specified residual binder rate. Compare to and document the contractor’s equipment spray rate setting in the daily report.

- Obtain the weighmaster certificate 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, read the tank gauge on the distributor truck and record. Apply materials at the established width and rate for 1,000 feet, or less, if necessary. Monitor the mat over 1,000 feet watching for ridging, plugged tips, and chip density. Read the tank gauge at the end of the 1,000 feet. Calculate and record the overall daily spread rate in the daily report.

Through observation, check that 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 ASTM D2995, "Standard Practice for Estimating Application Rate and Residual Application Rate of Bituminous Distributors," 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; 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 quantity of asphalt and void required to correctly embed the aggregate.

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.

- Make sure the contractor does not spread the binder and screenings more than 2,500 feet ahead of the initial rolling.
- Check that the contractor performs the rolling in the specified order and required number of roller coverages.
- Verify that the contractor adjusts 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.
- Make sure the contractor discontinues spreading bituminous binder sufficiently early in the shift to permit the termination of traffic control before darkness.
- Check that the contractor performs brooming as specified. Before allowing uncontrolled traffic in adjacent lanes, verify 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, check that lanes adjacent to chip-sealed lanes remain free of loose screenings. Make sure the contractor maintains the chip seal surface for 4 consecutive days after the day aggregate is applied. 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.
- Review the completed chip seal to determine if it meets the requirements of Section 37-2.01A(4)(c), “Department Acceptance,” of the *Standard Specifications*.
- For processing any related damage claims, consult with the district claims officer when the following conditions exist:
    - Damage has been caused by screenings or bituminous binder.
    - The contract contains provisions for deducting funds from contract payments to pay for damage claims.

4-3702C Level of Inspection

Suggested levels of field inspection for typical chip seal activities are:

- Intermittent inspection of sampling and testing of materials.
- Benchmark inspection of equipment to check that it conforms to the specifications.

- Intermittent inspection to verify “No Parking—Tow Away” signs are posted 24 hours before chip seal if affecting public parking.
- Intermittent inspection of existing ambient and pavement temperatures.
- Benchmark inspection of existing facilities, such as valve covers or grates, to make sure all are covered and referenced to relocate after placing chip seal.
- Benchmark inspection of surface preparation of existing pavement surface.
- Intermittent inspection of certificates of compliance for each delivery of asphaltic emulsion or asphalt binder.
- Intermittent inspection of binder application to assure uniformity of application and spread rate.
- Intermittent inspection of aggregate spreading operation to verify uniform application within 10 percent of pre-determined rate.
- Intermittent inspection of finishing operations to verify repair of any ridges, bumps, streaks, or depressions in existing surface.
- Intermittent inspection to verify that required sweeping is performed the day of the chip seal.
- Intermittent inspection to make sure chip sealed areas are maintained for 4 consecutive days and excess aggregate is removed after 4 consecutive days.
- Benchmark inspection of the completed surface to assure it meets the requirements for visual acceptance.
- Benchmark inspection 10 days after completion of maintenance sweeping of the chip seal, to verify that permanent traffic stripes and pavement markings are complete.

4-3702D Quality Control

Guidance for quality control activities included in this section is summarized as follows:

- For chip seals, verify that the contractor performs the quality control sampling and testing at the specified frequency, and reporting within the specified time frame.
- Make sure the contractor submits a copy of the American Association of State Highway and Transportation Officials (AASHTO) accreditation for the laboratory performing the testing of the aggregate screenings and asphaltic emulsion or asphalt binder.
- Verify that the contractor’s authorized laboratory performs the required quality control material sampling and testing at the specified frequency.
- Verify that the contractor submits quality control test results within the specified reporting time.

4-3702E Payment

For measurement and payment, do the following:

- Withhold 50 percent of the estimated value of chip seal work if the contractor fails to place permanent traffic stripes and pavement markings within the specified time.
- Collect weighmaster certificates from each truck as it delivers screenings to the chip spreader. When screenings are stockpiled before spreading, obtain weighmaster certificates 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 weighmaster certificates 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.

For compensation adjustment for price index fluctuations for asphaltic emulsion, refer to Section 9-1.07, "Payment Adjustments for Price Index Fluctuations," of the *Standard Specifications* and perform the following:

- Verify that the contractor has not opted out of payment adjustments for price index fluctuation at the time of bid.
- Process a change order to allow for payment increases and decreases.
- Calculate on a monthly the amount of asphalt used in asphaltic emulsion or polymer modified emulsion including flush coat.
- Calculate a paving asphalt adjustment if the California Statewide Crude Oil Index for the current month has fluctuated more than the specified amount from the same index for the month the bid opening occurred. Include the asphalt price adjustment in the monthly estimate.

4-3703 Slurry Seal

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

4-3703A Before Work Begins

Before work begins, take the following steps:

- A minimum of 10 days before starting slurry seal activities, verify that the contractor submits the names of proposed authorized laboratories for quality control testing. Authorize the laboratories based on the requirements of Section 37-1.01D, "Quality Assurance," of the *Standard Specifications*. Authorized laboratories must be able to perform International Slurry Surfacing Association tests and mix design.

- A minimum of 15 days before starting placement of slurry seal, verify that the contractor submits:
  1. Samples of the aggregate.
  2. Samples of asphaltic emulsion or polymer modified asphaltic emulsion.
  3. Asphaltic emulsion or polymer modified asphaltic emulsion data.
  4. Contractor's aggregate test results.
- A minimum of 10 days before the preconstruction meeting, make sure the contractor submits a list of participants in the preconstruction meeting, including the participants' names, employer, titles, and roles in the production and placement of the chip seal. Hold the preconstruction meeting a minimum of 5 days before the start of the chip seal work.
- Hold the preconstruction meeting a minimum of 5 days before the start of the slurry seal. At the preconstruction meeting, discuss the contractor's quality control program and method for performing each element of work affecting material quality. The following items should be discussed:
  1. Frequency of quality control sampling and testing that meets or exceeds specification requirements listed Section 37-1.01D, "Quality Assurance," of the *Standard Specifications*.
  2. Time and frequency of submitting test results.
  3. Responsibilities of quality control laboratories.
- Verify that Form CEM-3101, "Notice of Materials to Be Used," includes slurry seal materials. Refer to Section 6-202, "Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products," of this manual for additional information.
- A minimum of 10 days before starting slurry seal, check that the contractor submits laboratory report of test results and the proposed mix design signed by an authorized laboratory.
- Review the mix design and laboratory tests from the contractor. After determining that the mix design and test results conform to the requirements in Section 37-3.02B(5), "Slurry Seal Mix Design," of the *Standard Specifications*, authorize the mix design.
- Verify that the aggregate material source complies with Section 7-103H (2), "Surface Mining and Reclamation Act," of this manual.
- Obtain the name of the laboratory authorized to perform International Slurry Surfacing Association tests and mix design.
- Obtain initial samples of the aggregate and test the aggregate for the specified quality characteristics. Advise the contractor of the test results.
- Examine the surface to be sealed. Prepare a 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 assure compliance with the specifications. Mixer-spreader trucks must be calibrated for each material source in accordance with the Caltrans *MPQP*. 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.
- Review weather reports, daily weather forecasts, existing pavement surface temperatures, and ambient air temperatures during the planned shift hours. Document the temperatures in the daily report. Review existing and forecast conditions to make sure slurry seals are placed when:
  1. The pavement and air temperatures are at least 50 degrees Fahrenheit or more.
  2. The expected high temperature within the 24 hours following placement will be at least 65 degrees Fahrenheit and not below 36 degrees Fahrenheit.
  3. Rain is not imminent.
- Have a means established for making contact with the contractor's authorized representative near the end of the work shift on the day before the intended workday and discuss conditions forecast for the following workday. Strive to reach mutual agreement whether planned work should proceed for the following workday. Agree on a nonworking day when weather prevents work from proceeding.
- Determine whether the surface to be sealed is clean and dry. Make sure the contractor cleans the surface to remove all loose particles of pavement, dirt, and other extraneous material.
- Review the project to determine all requirements for handling traffic. Review with the contractor the required traffic control system and traffic control devices.
- Review the contractor's proposed application rates.
- Verify that contractor covers valve and monument covers, grates, and other exposed facilities within the area of application using plastic or oil-resistant construction paper secured by tape or adhesive to the facility being covered. Reference the covered facilities with enough control points to relocate the facilities after application of the slurry seal.
- Verify that contractor posts "No Parking—Tow Away" signing a minimum of 24 hours before placing chip seal if chip seal affects public parking.

4-3703B During the Course of Work

Once work begins, take the following steps:

- Verify that both acceptance testing and reporting to the contractor are performed at frequencies listed in Section 6-1, “Sample Types and Frequencies,” of this manual.
- If required under the contract, make sure 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 deduction based on the amount of material represented by the failing test result, and deduct the amount from future progress payments.
- Observe the mixing operation to make sure 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 verify that the contractor spreads the slurry seal at the ordered rate.
- As specified, ask 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.
- Review the completed slurry seal to determine if it meets the requirements of Section 37-3.01A(4)(c), “Department Acceptance,” of the *Standard Specifications*.

4-3703C Level of Inspection

Suggested levels of field inspection for typical slurry seal activities are:

- Intermittent inspection to verify that slurry seal ingredients are proportioned in compliance with the authorized mix design.
- Benchmark inspection to verify that truck mounted spreader or continuous self-loading mixer spreader have been calibrated and comply with the *MPQP*.

- Intermittent inspection to check that when truck mounted spreaders are used, a minimum of two operational spreaders are at the job site during placement.
- Intermittent inspection including sampling and testing of materials.
- Intermittent inspection to verify that “No Parking—Tow Away” signs are posted 24 hours before slurry seal application if public parking will be affected.
- Benchmark inspection of existing surface immediately before placing slurry seal to make sure it meets the surface preparation requirements.
- Benchmark inspection to verify that all existing facilities are covered and referenced before placement of slurry seal.
- Intermittent inspection of existing ambient temperature, pavement temperature, and 24-hour weather forecasts for imminent rain or temperatures below 36 degrees Fahrenheit.
- Intermittent inspection to check that each delivery of asphaltic emulsion or polymer modified asphaltic emulsion has a certificate of compliance.
- Intermittent inspection to make sure that within 4 hours of placement, slurry seal has set enough to allow traffic on it without exhibiting distress.
- Intermittent inspection of the completed slurry seal application to make sure irregularities such as scratch or tear marks do not exceed allowable amount.
- Benchmark inspection of the completed surface to verify that it meets the requirements for visual acceptance.
- Intermittent inspection to verify that slurry seal areas are swept 24 hours after placement without damaging the surface, and that sweeping continues for the 4 days afterward, unless deemed not necessary by the engineer.
- Benchmark inspection of slurry seal area 15 days after placement to make sure any areas with bleeding, raveling, separation, or other distresses are repaired.

4-3703D Quality Control

Guidance for quality control activities for slurry seals is summarized as follows:

- For slurry seals, check that the contractor performs the quality control sampling and testing at the specified frequency and reporting within the specified time frame.
- Verify that the contractor submits a copy of the AASHTO accreditation for the laboratory performing the testing of the aggregate and asphaltic emulsion.
- Verify that the contractor’s authorized laboratory performs the required quality control material sampling and testing at the specified frequency.
- Make sure contractor submits quality control test results within the specified maximum reporting time.

4-3703E 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 to determine the pay quantity.
- As necessary to determine pay quantities, collect weighmaster certificates for aggregate and asphaltic emulsion. 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.

For compensation adjustment for price index fluctuations for slurry seal refer to Section 9-1.07, "Payment Adjustments for Price Index Fluctuations," of the *Standard Specifications* and perform the following:

- Verify that the contractor has not opted out of payment adjustments for price index fluctuation at the time of bid.
- Process a change order to allow for payment increases and decreases.
- Calculate on a monthly basis the amount of asphalt used in slurry seal polymer modified emulsion.
- Calculate a paving asphalt adjustment if the California Statewide Crude Oil Index for the current month has fluctuated more than the specified amount from the same index for the month the bid opening occurred. Include the asphalt price adjustment in the monthly estimate.

4-3704 Micro-Surfacing

The following sections cover the duties required throughout each phase of the project for micro-surfacing.

4-3704A Before Work Begins

Before work begins, take the following steps:

- A minimum of 10 days before starting micro-surfacing activities, make sure the contractor submits the names of proposed authorized laboratories for quality control testing. Authorize the laboratories based on the requirements of Section 37-1.01D, "Quality Assurance," of the *Standard Specifications*.
- A minimum of 15 days before starting placement of micro-surfacing, make sure the contractor submits:
  - Samples of the aggregate.
  - Samples of polymer modified asphaltic emulsion.
  - Polymer modified asphaltic emulsion data.
  - Contractor's aggregate test results.

- A minimum of 10 days before the preconstruction meeting, verify that contractor submits a list of participants in the preconstruction meeting, including the participants' names, employer, title, and role in the production and placement of the micro-surfacing.
- Hold the preconstruction meeting a minimum of 5 days before the start of the micro-surfacing work. At the preconstruction meeting discuss the contractor's quality control program and method for performing each element of work affecting material quality. The following items should be discussed:
    - Frequency of quality control sampling and testing that meets or exceeds specification requirements listed in the quality control sections of the *Standard Specifications*.
    - Time and frequency of submitting test results.
    - Responsibilities of quality control laboratories.
- Verify that Form CEM-3101, "Notice of Materials to Be Used," includes micro-surfacing materials. Refer to Section 6-202, "Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products," of this manual for additional information.
- Obtain the name of the laboratory authorized to perform International Slurry Surfacing Association tests for mix design.
- Review the mix design and laboratory tests submitted by the contractor before start of the placement. The mix design report should include comparison of each material's test result to the specification requirements. If the mix design and test results conform to the requirements in Section 37-3.03B(5), "Micro-Surfacing Mix Designs" of the *Standard Specifications*, authorize the mix design.
- Verify that the aggregate material source complies with Section 7-103H (2), "Surface Mining and Reclamation Act," of this manual.
- Obtain the name of the authorized laboratory in charge of laboratory report and mix design testing.
- Obtain initial samples of the aggregate, and test for the specified quality characteristics. Advise the contractor of the test results.
- Obtain the name of the contractor's authorized representative responsible for communicating about unsuitable weather that prevents micro-surfacing operations.
- Examine the surface to be sealed. Prepare a 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 verify compliance with the specifications. Mixer-spreader trucks must be calibrated for each material source in accordance with the Caltrans *MPQP*. Verify equipment *MPQP* certification or

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. Make sure 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.

4-3704B During the Course of Work

Once work begins, take the following steps:

- Verify that both acceptance testing and reporting to the contractor are performed at frequencies listed in Section 6-1, “Sample Types and Frequencies,” of this manual.
- Obtain the required test report for each truckload of micro-surfacing 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 micro-surfacing 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. A decision to allow the material to remain in place must be based on the results of a physical examination of the micro-surfacing. Look for evidence of bleeding, raveling, stripping, or other deficiencies. Notify the contractor in writing of the decision. Also, if the material is allowed to remain in place, calculate the deduction based on the amount of material represented by the test result, and deduct the amount from future progress payments.
- Observe the mixing operation to make sure 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 make sure the contractor spreads the micro-surfacing at the ordered rate.
- Review the completed micro-surfacing to determine if it meets the requirements of Section 37-3.03A(4)(c), “Department Acceptance,” of the *Standard Specifications*.

4-3704C Level of Inspection

Suggested levels of field inspection for typical micro-surfacing activities are:

- Benchmark inspection to verify that a required test strip is constructed if the micro-surfacing placement will require more than 1 day to complete.
- Intermittent inspection to verify that micro-surfacing ingredients are proportioned in compliance with the authorized mix design.
- Benchmark inspection to check that truck mounted spreader or continuous self-loading mixer spreader have been calibrated and comply with the *MPQP*.
- Intermittent inspection to make sure that when truck mounted spreaders are used, that a minimum of two operational spreaders are at the job site during placement.
- Intermittent inspection including sampling and testing of materials.
- Intermittent inspection to verify that “No Parking—Tow Away” signs are posted 24 hours before micro-surfacing if public parking will be affected.
- Intermittent inspection of existing surface immediately before placement of micro-surfacing to assure it meets the surface preparation requirements.
- If there is a bid item for tack coat, benchmark inspection to verify that tack coat is applied at the authorized rate for micro-surfacing.
- Benchmark inspection to make sure all existing facilities are covered and referenced before placement of micro-surfacing.
- Intermittent inspection of existing ambient temperature, pavement temperature, and 24-hour weather forecasts of imminent rain or temperatures below 36 degrees Fahrenheit.
- Intermittent inspection to verify that all deliveries of micro-surfacing emulsion have a certificate of compliance.
- Intermittent inspection to assure that within 2 hours of placement, micro-surfacing has set enough to allow traffic on it without exhibiting distress.
- Benchmark inspection of the completed surface to make sure it meets the requirements for visual acceptance.
- Intermittent inspection to verify that micro-surfacing areas are swept 24 hours after placement without damaging the surface, and that sweeping continues for the 4 days after, unless deemed not necessary by the engineer.
- Benchmark inspection of slurry seal area 15 days after placement to make sure any areas with bleeding, raveling, separation, or other distresses are repaired.

4-3704D Quality Control

Guidance for quality control activities for micro-surfacing are summarized as follows:

- For micro-surfacing, make sure the contractor performs the quality control sampling and testing at the specified frequency and reports results within the specified time frame.
- Verify that the contractor submits a copy of the AASHTO accreditation for the laboratory performing the testing of the aggregate and asphaltic emulsion.
- Check that the contractor's authorized laboratory performs the required quality control material sampling and testing at the specified frequency.
- Verify that contractor submits quality control test results within the specified maximum reporting time.

4-3704E Payment

For measurement and payment, do the following:

- The quantity of micro-surfacing 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 micro-surfacing operation, it is usually impossible to weigh both components together. Separately determine the mass of asphaltic emulsion and aggregate, and add the two results to determine the pay quantity.
- As necessary to determine pay quantities, collect weighmaster certificates 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 micro-surfacing is allowed to remain in place even though it failed the grading or sand equivalent tests, make the appropriate administrative deduction.

For compensation adjustment for price index fluctuations for micro-surfacing seal refer to Section 9-1.07, "Payment Adjustments for Price Index Fluctuations," of the *Standard Specifications* and perform the following:

- Verify that the contractor has not opted out of payment adjustments for price index fluctuation at the time of bid.
- Process a change order to allow for payment increases and decreases.
- Calculate on a monthly basis the amount of asphalt used in micro-surfacing emulsion.
- Calculate a paving asphalt adjustment if the California Statewide Crude Oil Index for the current month has fluctuated more than the specified amount from the same index for the month the bid opening occurred. Include the asphalt price adjustment in the monthly estimate.

4-3705 Fog Seals and Flush Coats

The following sections cover the duties required throughout each phase of the project for fog seals and flush coats.

4-3705A Before Work Begins

- A minimum of 10 days before starting fog seal or flush coat activities, make sure the contractor submits the names of proposed authorized laboratories for quality control testing. Authorize the laboratories based on the requirements of Section 37-1.01D, "Quality Assurance," of the *Standard Specifications*.
- A minimum of 15 days before starting placement of fog seal, check that the contractor submits either items 1 and 2 for fog seals or items 1 through 4 for flush coats:
  1. Samples of asphaltic emulsion.
  2. Asphaltic emulsion supplier, type and grade of asphaltic emulsion and copies of specified test results for asphaltic emulsion.
  3. Proposed target *x* values for sand gradation.
  4. Gradation test results for sand.
- A minimum of 10 days before the preconstruction meeting, make sure the contractor submits a list of participants in the preconstruction meeting, including the participants' names, employer, title, and role in the production and placement of the fog seal or flush coat.
- Hold the preconstruction meeting a minimum of 5 days before the start of the fog seal or flush coat. At the preconstruction meeting discuss the contractor's quality control program and method for performing each element of work affecting material quality. The following items should be discussed:
  - Frequency of quality control sampling and testing that meets or exceeds specification requirements listed in the quality control sections of the *Standard Specifications*
  - Time and frequency of submitting test results
  - Responsibilities of quality control laboratories

4-3705B During the Course of Work

- Verify that both acceptance testing and reporting to the contractor are performed at frequencies listed in Section 6-1, "Sample Types and Frequencies," of this manual.
- Review weather reports, daily weather forecasts, existing pavement surface temperatures, and ambient air temperatures during the shift hours. Document conditions in the daily report.
- Verify that "No Parking—Tow Away" signs are posted 24 hours before placement of fog seal or flush coat if public parking will be affected.
- Review the contract documents to determine the specifications related to weather. Make sure the contractor places fog seal or flush coat only under specified weather conditions.

- For fog seal or flush coat, the contractor decides the grade of slow setting or quick setting emulsion and on the dilution rate. The quantity of water added for dilution must be based on the judgment and experience of field personnel, but in all cases must result in a residual rate within the specified range. When determining the application rate, take into account the permeability of the surface to be sealed, climatic conditions anticipated at the time of application, traffic, cross slope and profile grade. Based on the delivered state of the asphaltic emulsion binder (diluted or undiluted), determine the spray rates required to achieve both the specified minimum and maximum residual rates. Verify that the contractor sprays within that range of rates. Refer to Section 4-9403, "During the Course of Work," of this manual for examples of how to determine the spray rate required to achieve a specified residual rate.
- For flush coat, authorize contactor's sand application rate when it falls within the specified range.
- For flush coat, make sure contractor spreads sand using a mechanical device immediately after application of the emulsion using a mechanical device that spreads at a uniform rate over the full width of a traffic lane in a single application.
- For flush coat, make sure contractor sweeps loose sand material remaining on the surface 24 hours after application.
- Review the completed fog seal to determine if it meets the requirements of Section 37-4.02A(4)(c), "Department Acceptance," of the *Standard Specifications*.
- Review the completed flush coat to determine if it meets the requirements of Section 37-4.03A(4)(c), "Department Acceptance," of the *Standard Specifications*.

4-3705C Level of Inspection

Suggested levels of field inspection for typical fog seal and flush coat activities are:

- Intermittent inspection including sampling and testing of materials.
- Intermittent inspection to verify that "No Parking—Tow Away" signs are posted 24 hours before application of fog seal or flush coat if public parking is affected.
- Benchmark inspection of existing surface immediately before placement of fog seal or flush coat to assure it meets the surface preparation requirements.
- Intermittent inspection of existing temperature and weather conditions to make sure placement of fog seal or flush coat occurs only above minimum pavement and ambient temperature requirements.
- Intermittent inspection to assure fog seal or flush coat placement does not occur within 24 hours of rain, or within 24 hours of predicted rain or freezing temperatures.

- Intermittent inspection of certificates of compliance for each delivery of asphaltic emulsion.
- Intermittent inspection to verify that asphaltic emulsion for fog seal or flush coat is applied within the specified residual range and asphaltic emulsion for fog seal is not diluted with more than 1 part water to 1 part original emulsion.
- Intermittent inspection to assure asphaltic emulsion for fog seal or flush coat is applied with uniform coverage.
- Intermittent inspection to check that sand for flush coat is applied within the specified range and immediately after application of asphaltic emulsion.
- Benchmark inspection to make sure loose sand is swept from flush coat areas 24 hours after application.
- Benchmark inspection of the completed surface to check that it meets the requirements for visual acceptance.

4-3705D Quality Control

Guidance for quality control activities for fog seal and flush coat are summarized as follows:

- For fog seal and flush coat, make sure the contractor performs the quality control sampling and testing at the specified frequency and reports results within the specified time frame.
- Verify that the contractor submits a copy of the AASHTO accreditation for the laboratory performing the testing of the aggregate and asphaltic emulsion.
- Verify that the contractor's authorized laboratory performs the required quality control material sampling and testing at the specified frequency.
- Check that the contractor submits quality control test results within the specified maximum reporting time.

4-3705E Payment

- For flush coats, collect weighmaster certificates from each delivery of sand. Determine the weight of unused sand so that the weight of unused material may be deducted from the delivered weight. For the weight of sand to be paid for, do not deduct the weight of sand swept from the roadway.
- For fog seals and flush coats, collect weighmaster certificates and "weigh-back" slips for trucks delivering asphaltic emulsion. 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.
- For flush coats, collect weighmaster certificates from each delivery of sand. Determine the weight of unused sand remaining in stockpiles so that the weight of unused material may be deducted from the delivered weight. From the weight of sand to be paid for, do not deduct the weight of excess screenings removed from the roadway and disposed of.

For compensation adjustment for price index fluctuations of asphaltic emulsion, refer to Section 9-1.07, "Payment Adjustments for Price Index Fluctuations," of the *Standard Specifications* and perform the following:

- Verify that the contractor has not opted out of payment adjustments for price index fluctuation at the time of bid.
- Process a change order to allow for payment increases and decreases.
- Calculate on a monthly basis the amount of asphalt used in asphaltic emulsion or polymer modified emulsion including flush coat.
- Calculate a paving asphalt adjustment if the California Statewide Crude Oil Index for the current month has fluctuated more than the specified amount from the same index for the month the bid opening occurred. Include the asphalt price adjustment in the monthly estimate.

4-3706 Parking Area Seal

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

4-3706A Before Work Begins

Before work begins, take the following steps:

- A minimum of 15 days before starting parking area seal, make sure contractor submits a 20-pound sample of the aggregate to be used.
- A minimum of 10 days before starting parking area seal, make sure the contractor submits:
    1. The name of proposed laboratory to perform mix design.
    2. For both new and substitute mix designs, laboratory report of test results and proposed mix design. Verify that the report of test results includes the specific materials to be used and shows a comparison of test results and specifications.
    3. Check that the mix design report includes the quantity of water that may be added at the job site.
    4. Manufacturer's data for oil seal and polymer.
    5. Verify that the test reports are signed by an authorized laboratory.
- A minimum of 10 days before the preconstruction meeting, make sure the contractor submits a list of participants in the preconstruction meeting, including the participants' names, employer, title, and role in the production and placement of the parking area seal.
- Hold the preconstruction meeting a minimum of 5 days before the start of the parking area seal. At the preconstruction meeting, discuss the contractor's quality control program and method for performing each element of work affecting material quality. The following items should be discussed:

1. Frequency of quality control sampling and testing that meets or exceeds specification requirements listed in the quality control sections of the *Standard Specifications*.
2. Time and frequency of submitting test results.
3. Responsibilities of quality control laboratories.

- Obtain the name of the authorized laboratory in charge of testing at least 10 days before the start of the placement.
- Obtain initial samples of the aggregate samples 15 days before starting the placement.
- Obtain test results and mix design at least 7 days before the placement.
- Review the mix design and laboratory tests submitted by the contractor before start of the placement. The mix design report should include comparison of each material's test result to the specification requirements. If the mix design and test results conform to the requirements in Section 37-5.02, "Materials" of the *Standard Specifications*, authorize the mix design.
- Verify that Form CEM-3101, "Notice of Materials to Be Used," includes seal materials. Refer to Section 6-202, "Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products," of this manual for additional information.
- Examine the surface to be sealed. Prepare a 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.
- 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. Make sure the contractor cleans the surface to remove all loose particles of pavement, dirt, and other extraneous material.
- Verify that all the utility inlets are covered with heavy paper or roofing felt adhered to the surface of the inlet.
- Review the project to ascertain all requirements for handling traffic. Review with the contractor the required traffic control system and traffic control devices.

4-3706B During the Course of Work

During the course of work, take the following steps:

- Obtain the required test report for each truckload of parking area seal. Compare the report with the specifications. Do not permit the seal to be used before testing unless a certificate of compliance accompanies it.
- Check that the pavement surface to be treated has been dampened.

- Verify that a certificate of compliance accompanies each load of parking area seal.
- To determine the bitumen ratio and uniformity of mixing, submit samples of the undiluted parking area seal material to the district laboratory. Place samples in tightly closed containers to prevent moisture loss before testing.
- Verify that acceptance testing and reporting to the contractor are performed at frequencies listed in Section 6-1, “Sample Types and Frequencies,” of this manual.

4-3706C Level of Inspection

Suggested levels of field inspection for parking area seal activities are:

- Benchmark inspection to verify that parking area seal mixture conforms to the approved mix design.
- Intermittent inspection including sampling and testing of materials.
- Intermittent inspection to verify that “No Parking—Tow Away” signs are posted 24 hours before application of parking area seal if public parking will be affected.
- Intermittent inspection to assure that any irrigation systems adjacent the parking area seal have been shut off for 24 hours after placement of the seal.
- Intermittent inspection of existing surface immediately before placement of parking area seal to assure it meets the surface preparation requirements, including the sealing of any oil and grease spots that remain after cleaning.
- Intermittent inspection of certificates of compliance for each delivery of asphaltic emulsion used in the parking area seal mixture.
- Intermittent inspection to check that parking area seal is applied uniformly and smoothly, and free of ridges or uncoated areas.
- Intermittent inspection to verify that water added to the parking area seal mixture conforms to the manufacturer’s recommendations, and that added water does not exceed by 15 percent the volume of undiluted emulsion.
- Intermittent inspection to make sure that if placing in multiple applications, the previous application has thoroughly dried before repeating the application.
- Intermittent inspection to verify that contractor keeps traffic off parking area seals for at least 24 hours.
- Intermittent inspection to make sure striping or pavement markings are only applied when the surface is dry.
- Benchmark inspection of the completed surface to assure it meets the requirements for visual acceptance.

4-3706D Quality Control

Guidance for quality control activities for parking area seal is summarized as follows:

- For parking area seal, make sure the contractor performs the quality control sampling and testing at the specified frequency and reports results within the specified time frame.
- Verify that the contractor submits a copy of the AASHTO accreditation for the laboratory performing the testing.
- Check that the contractor's authorized laboratory performs the required quality control material sampling and testing at the specified frequency.
- Make sure the contractor submits quality control test results within the specified maximum reporting time.

4-3706E Payment

For measurement and payment, do the following:

- The quantity of parking seal to be paid for is the combined weight of asphaltic emulsion and aggregate without added water and set-control additive. Because the materials are mixed at a plant, it is important to have a proportioning record from the plant.
- As necessary to determine pay quantities, collect weighmaster certificates 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.

For compensation adjustment for price index fluctuations for parking area seal, refer to Section 9-1.07, "Payment Adjustments for Price Index Fluctuations," of the *Standard Specifications*, and do the following:

- Verify that the contractor has not opted out of payment adjustments for price index fluctuation at the time of bid.
- Process a change order to allow for payment increases and decreases.
- Calculate on a monthly basis the amount of asphalt used in the asphaltic emulsion in the parking area seal.
- Calculate a paving asphalt adjustment if the California Statewide Crude Oil Index for the current month has fluctuated more than the specified amount from the same index for the month the bid opening occurred. Include the asphalt price adjustment in the monthly estimate.

4-3707 Crack Treatment

The following covers the duties required throughout each phase of the project for crack treatment.

4-3707A Before Work Begins

Before work begins, take the following steps:

- Verify that Form CEM-3101, “Notice of Materials to Be Used,” includes crack treatment materials. Refer to Section 6-202, “Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products,” of this manual for additional information.
- Verify the receipt of a certificate of compliance for each load of crack treatment material if it is on the Authorized Materials List. If the crack treatment material is not on the Authorized Materials List, obtain samples and authorized laboratory test results 20 days before use.
- Obtain the name of the laboratory authorized to perform material testing.
- Review laboratory tests from the contractor and determine if the material test results conform to the requirements in Section 37-5.02, “Materials,” of the *Standard Specifications*. Advise the contractor of the test results.
- Examine the proposed equipment to verify compliance with the specifications and discuss with the contractor the proposed operation.
- Determine whether cracks to be treated are clean and dry. Make sure the contractor cleans the cracks 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.

4-3707B During the Course of Work

During the course of work, take the following steps:

- Verify the receipt of a certificate of compliance for each load of crack treatment material if it is on the Authorized Materials List. Verify that the certificate of compliance includes all required items.
- If crack treatment material is not on the Authorized Materials List, make sure contractor submits test results and samples 20 days before use.
- Verify that each delivery of material includes manufacturer’s heating and application instructions, safety data sheet, and manufacturer’s recommended detackifying agent.
- Make sure acceptance testing is performed at frequencies listed in Section 6-1, “Sample Types and Frequencies,” of this manual.
- For contracts specifying to fill the crack recessed 1/4-inch or flush, check that the contractor removes crack material that is spilled or deposited on the pavement surface.
- For contracts specifying to fill the crack with overband not more than 3 inches wide, check that the contractor removed crack material that is spilled or deposited on the pavement surface outside the 3-inch wide overband limit.
- Observe the application of crack treatment material using approved equipment.

- If the crack treatment is tacky before opening to traffic have the contractor apply sand or the manufacturer's recommended detackifying agent.

4-3707C Level of Inspection

Suggested levels of field inspection for crack treatment activities are:

- Intermittent inspection including sampling and testing of materials.
- Intermittent inspection of certificates of compliance for crack treatment material if listed on the Authorized Materials List.
- Intermittent inspection to verify that "No Parking—Tow Away" signs are posted 24 hours before application of parking area seal if public parking will be affected.
- Intermittent inspection to check that existing cracks have been cleaned with oil-free compressed air at a minimum of 90 pounds per square inch.
- Intermittent inspection to verify that cracks are clean and dry before treating and pavement surface temperature is at least 40 degrees Fahrenheit. If cracks containing moisture are being heated or dried with a hot air lance, make sure the flame is not applied directly to the pavement adjacent to the crack.
- Intermittent inspection to check that hot-applied crack treatment material is applied in accordance with the manufacturer's instructions.
- Intermittent inspection to make sure that cold-applied crack treatment material applied using a distributor kettle meets the requirements.
- Intermittent inspection to verify that the contractor treats tacky crack treatment material with sand or manufacturer's recommended detackifying agent before opening to traffic.
- Intermittent inspection to check that contractor treats cracks on shoulders adjacent to lanes.
- Benchmark inspection of the completed surface to assure it meets the requirements for visual acceptance.

4-3707D Payment

Crack treatment is paid for by lane mile measured along the edge of each paved lane parallel to the pavement centerline and includes crack treatment of the adjacent shoulder.

Chapter 6 Sampling and Testing

Chapter 6 Sampling and Testing

Section 1 Sample Types and Frequencies

6-101 General

Sampling and testing materials and products must be in accordance with contract specifications. Sampling and testing are of equal importance for assuring materials and products meet acceptance specifications.

Caltrans representatives must be familiar with materials handling and processing methods to assure representative samples are obtained. Caltrans representatives should be sufficiently knowledgeable about test methods to assure compatibility between sample and test procedure.

Samples for acceptance must be taken in accordance with California Test 125, "Method of Test for Sampling Highway Materials and Products Used in the Roadway Pavement Structure Sections," or sampling requirements in specifications. For California Tests, Caltrans representatives must be qualified testers in accordance with information found on the Independent Assurance Program page:

https://dot.ca.gov/programs/engineering-services/independent-assurance-program

It is the resident engineer's responsibility to assure the safety of the Caltrans representative. In accordance with *Material Plant Quality Program* or California Test 109, "Method for Testing of Material Production Plants," the district weights and measures coordinator inspects material plants for safety in areas that the Caltrans representative will enter.

In certain situations, to assure the Caltrans representative's safety, the contractor will take acceptance samples for Caltrans. The Caltrans representative must witness the contractor taking acceptance samples. The Caltrans representative must determine when the sample is taken and observe that the sample is taken in accordance with California Test 125, or sampling requirements in specifications. The Caltrans representative must take possession of the sample from the contractor and transport it to a Caltrans office or the testing laboratory. The Caltrans representative must properly fill out form TL-0101 "Sample Identification Card."

The resident engineer is responsible for the chain of custody for material acceptance samples. Material acceptance samples and dispute resolution samples must be in Caltrans' possession from the sampling point. Adequate sample storage facilities must be arranged for at construction field offices or other Caltrans facilities. The chain of custody for material samples is an important part of the Caltrans quality assurance program.

6-101A References

- Independent Assurance Program, Division of Engineering Services, Materials Engineering and Testing Services (METS), Caltrans:

  https://dot.ca.gov/programs/engineering-services/independent-assurance-program

- California Test Methods, METS, Caltrans, available at:

https://dot.ca.gov/programs/engineering-services/california-test-methods

- American Association of State Highway and Transportation Officials (AASHTO), American Society for Testing and Materials International (ASTM), and other test methods are available at the IHS Markit website, which can be accessed from the Material Standards (ASTM/AASHTO) link on the Division of Engineering Services' METS webpage.
- *Material Plant Quality Program*, Division of Construction, Caltrans, available at:

  https://dot.ca.gov/programs/construction/material-plant-quality-program
- DIME, an online web application developed by METS to allow Caltrans staff and contractors to submit material samples and test data for Caltrans projects and programs, is available at:

  https://dime.dot.ca.gov/index.php

6-102 Types of Sampling and Testing

The following are the types of sampling and testing used by Caltrans.

6-102A Preliminary Samples and Tests

Preliminary samples and tests are made before award of a contract. Construction personnel rarely perform preliminary sampling and testing. The district materials engineer is responsible for preliminary sampling and testing. Such tests are used for design purposes, and to provide data for the materials information package for prospective bidders.

6-102B Initial Samples and Tests

Initial samples and tests are performed on materials proposed for use in the project. These initial tests determine whether proposed materials sources, local materials, or products meet the specifications.

Construction personnel may sample potential sources. For soils and aggregate tests, send samples to the district materials laboratory. Caltrans laboratories that perform acceptance tests are not required to be qualified under AASHTO re:source. However, TransLab, the Southern Regional Lab, and district labs that perform JMF verifications are required to be qualified under AASHTO re:source.

Sampling and testing potential local materials is not mandatory unless specified. Charge the contractor for the cost of sampling and testing potential local materials sources in accordance with Section 6, "Control of Materials," of the *Standard Specifications*.

The typical time required for testing initial source samples of potential local materials sources is shown in Table 6-1.1.

Table 6-1.1. Time Required for Source Testing

Material	Time
Aggregates for hot mix asphalt	2 weeks

Material	Time
Aggregates for cement treatment	4 weeks
Aggregates for concrete mixture	4 weeks
Aggregates for concrete pavement	60 days
Screenings for bituminous seals	2 weeks
Soils (R-value)	3 weeks
Untreated base materials	3 weeks

6-102B (1) Unprocessed Soils and Aggregates

The discussion on unprocessed soils and aggregates is primarily applicable to preliminary and initial sampling, although the same precautions apply when sampling for specification compliance.

6-102B (1a) Stone from Ledges and Quarries

Inspect the ledge or quarry face to determine any variations in strata, or in portions of the ledge. Observe and record differences in color and structure. Obtain separate samples of unweathered stone from all strata that appear to vary in color and structure.

6-102B (1b) Material Sites of Sand, Gravel, or Soil

Select samples representing the different materials available in the deposit. If the deposit is worked as an open face or pit, take the samples by channeling the face so that they will represent material that visual inspection indicates may be used. It is necessary, especially in small deposits, to excavate test holes some distance in back of, and parallel to, the face to determine the extent of the supply. The number and depth of these test holes depend on the quantity of material to be used from the deposit. Obtain samples from open test pits by channeling a face of the test pit in the same manner as sampling a face of a materials site. Do not include material in the sample that will be stripped from the pit as overburden. Obtain separate samples from the face of the bank and from the test holes. If visual inspection indicates that there is considerable variation in the material, obtain separate samples at different depths.

Use test holes to sample deposits that have no open faces. When sampling material sites, select depth and spacing of test holes considering the probable method of operating the pit. In general, dozers will combine the material laterally. A shovel will remove the material vertically. Test results in a “spotty” pit may be misleading to the extent that operations may be too expensive to make the required grading.

If possible, use a dozer or shovel to open the pit before sampling rather than depending on test holes.

6-102B (2) Processed Aggregates

Sample processed aggregates from locations such as stockpiles, transportation units, conveyors, or windrows in accordance with California Test 125, “Method of Test for

Sampling Highway Materials and Products Used in the Roadway Pavement Structure Sections."

6-102C Acceptance Samples and Tests

Acceptance tests are generally performed on materials that will be incorporated into the work. Some acceptance tests are performed on materials already incorporated into the work. Acceptance sampling and testing should begin as soon as the material is delivered or in place.

Sample materials at the locations specified in the *Standard Specifications*, the special provisions, or as required by California Test 125. If the sampling location is not specified, sample at the location indicated in the materials acceptance sampling and testing requirements tables in Section 6-107, "Materials Acceptance Sampling and Testing" of this manual. Regardless of location, sample randomly and within the frequency specified to obtain representative samples of the material used in the work.

On Form TL-0101, "Sample Identification Card," use the "Priority" designation for the first few acceptance samples of each construction material. Use "Priority" for verification tests for acceptance. Use the "Priority" designation for all samples if the material being supplied is of questionable quality or if the construction means and methods or source of materials changes. For "Priority" tests, indicate if there is a preference for telephoned, faxed, or emailed test results on Form TL-0101, "Sample Identification Card," along with the telephone number of the person who is to receive them.

For "Priority" and "Normal" processing times for acceptance tests of materials, refer to Table 6-1.2., "Time Required for Materials Acceptance Tests," of this manual.

The minimum time required for acceptance tests of products is shown in Table 6-1.2., of this manual.

Make sure acceptance samples are shipped or transported to testing laboratories within the following timeframes:

1. Within 1 business day from sampling for projects within 50 miles of the testing laboratory
2. Within 2 business days from sampling for projects more than 50 miles from the testing laboratory

The specified timeframes are not applicable if specific sampling or test method requirements preclude doing so, for example, curing of specimens before transport.

Assure that proper chain of custody is maintained throughout the process, including delivery to and receipt from commercial shipping services.

Use Form CEM-3701, "Test Result Summary," available in DIME or a paper copy, to summarize acceptance test frequency and test results on each material. Use this form to record sampling and testing related dates and monitor timeliness of acceptance testing. Compare timeliness of material testing turnaround against Table 6-1.2., "Time Required for Materials Acceptance Tests," and verify that corrective actions are taken and documented if repeated deficiencies are detected.

Notify the contractor of all acceptance test results within 2 business days of receipt from the laboratory. Advise the contractor that that they may opt in to receive automated email notifications of new acceptance tests in DIME. All test results are available for their inspection, and copies of these test results will be made available upon their request. Sample records and verified test results uploaded to DIME are publicly available for viewing. Maintain copies of the test results within the project files or DIME for ready accessibility.

Table 6-1.2. Time Required for Materials Acceptance Tests (1 of 4)

Material and Test	**Sample to Lab** (Note 1) (business days)	**Lab Time Priority** (Note 2) (business days)	**Lab Time Normal** (Note 2) (business days)	**Reporting to Contractor** (Note 3) (business days)	**Total** (business days)
SOILS					
Gradation (CT 202)	1 to 2	1	3	2	4 to 7
Sand Equivalent (CT 217)	1 to 2	1	3	2	4 to 7
Relative Compaction (CT 231/216)	1 to 2	1	2	2	4 to 6
Plasticity Index (Geosynthetic Reinforced Embankment)	1 to 2	3	7	2	6 to 11
pH (Geosynthetic Reinforced Embankment)	1 to 2	2	3	2	5 to 7
Percentage Crushed Particles (Shoulder Backing – CT 205)	1 to 2	2	5	2	5 to 9
Durability Index (Shoulder Backing – CT 229)	1 to 2	2	5	2	5 to 9
R-value (Imported Borrow – CT 301)	1 to 2	4	6	2	7 to 10
SUBBASES AND BASES					
Relative Compaction (CT 231/216)	1 to 2	1	2	2	4 to 6
Gradation (CT 202)	1 to 2	1	3	2	4 to 7
Sand Equivalent (CT 217)	1 to 2	1	3	2	4 to 7
R-value (CT 301)	1 to 2	4	6	2	7 to 10
Durability Index (CT 229)	1 to 2	2	5	2	5 to 9
Compressive Strength (Cement-treated base [CTB] aggregate – CT 312)	-	Age based	Age based	2	Age +2
Compressive Strength (Lean Concrete Base [LCB]–ASTM C39)	-	Age based	Age based	2	Age +2
Compressive Strength (LCB – rapid setting – CT 521)	-	Age based	Age based	2	Age +2
Modulus of Rupture (Concrete base – CT 523)	-	Age based	Age based	2	Age +2
Modulus of Rupture (Rapid strength concrete base – CT 524)	-	Age based	Age based	2	Age +2
Percentage of Crushed Particles (CT 205)	1 to 2	2	5	2	5 to 9
Los Angeles Abrasion Testing (CT 211)	1 to 2	2	4	2	5 to 8
Cleanness Value (CT 227)	1 to 2	2	3	2	5 to 7
Film Stripping (CT 302)	1 to 2	2	7	2	5 to 11
Asphalt Content (ATPB – CT 382)	1 to 2	1	5	2	4 to 9
Soundness (CTPB – CT 214)	1 to 2	8	10	2	11 to 14
SEAL COATS					
Los Angeles Abrasion Testing (CT 211)	1 to 2	2	4	2	5 to 8
Percentage of Crushed Particles (CT 205)	1 to 2	2	5	2	5 to 9
Film Stripping (CT 302)	1 to 2	2	7	2	5 to 11
Gradation (CT 202)	1 to 2	1	3	2	4 to 7

Table 6-1.2. Time Required for Materials Acceptance Tests (2 of 4)

Material and Test	Sample to Lab (Note 1) (business days)	Lab Time Priority (Note 2) (business days)	Lab Time Normal (Note 2) (business days)	Reporting to Contractor (Note 3) (business days)	Total (business days)
SEAL COATS (Cont.)					
Gradation (ASTM C136)	1 to 2	1	3	2	4 to 7
Cleanness Value (CT 227)	1 to 2	2	3	2	5 to 7
Durability Index (CT 229)	1 to 2	2	5	2	5 to 9
Sand Equivalent (CT 217)	1 to 2	1	3	2	4 to 7
Viscosity (AASHTO T 59)	1 to 2	3	15	2	6 to 19
Viscosity (ASTM D7741)	1 to 2	3	15	2	6 to 19
Viscosity (ASTM D445)	1 to 2	3	15	2	6 to 19
Flash Point (ASTM D92)	1 to 2	3	15	2	6 to 19
Aromatics (ASTM D2007)	1 to 2	7	15	2	10 to 19
Cone Penetration (ASTM D217)	1 to 2	3	15	2	6 to 19
Resilience (ASTM D5329)	1 to 2	3	15	2	6 to 19
Settlement (AASHTO T 59)	1 to 2	7	30	2	10 to 34
Sieve Test (AASHTO T 59)	1 to 2	3	15	2	6 to 19
Demulsibility (AASHTO T 59)	1 to 2	3	15	2	6 to 19
Torsional Recovery (CT 332)	1 to 2	3	15	2	6 to 19
Penetration (AASHTO T 49)	1 to 2	3	15	2	6 to 19
Ring and Ball Softening Point Temperature (AASHTO T 53)	1 to 2	3	15	2	6 to 19
Field Softening Point (ASTM D36)	1 to 2	3	15	2	6 to 19
Elastic Recovery (AASHTO T 301)	1 to 2	4	15	2	7 to 19
Ductility (AASHTO T 51)	1 to 2	4	15	2	7 to 19
Bending Beam Rheometer (AASHTO T 313)	1 to 2	5	8	2	8 to 12
HMA					
Aggregates for HMA					
Gradation (AASHTO T 27)	1 to 2	1	3	2	4 to 7
Sand Equivalent (AASHTO T 176)	1 to 2	1	3	2	4 to 7
Los Angeles Abrasion Testing (AASHTO T 96)	1 to 2	2	4	2	5 to 8
Percentage of Crushed Particles (Coarse) (AASHTO T 335)	1 to 2	2	5	2	5 to 9
Percentage of Crushed Particles (Fine) (AASHTO T 335)	1 to 2	2	5	2	5 to 9
Flat and Elongated Particles (ASTM D4791)	1 to 2	2	4	2	5 to 8
Fine Aggregate Angularity (AASHTO T 304, Method A)	1 to 2	2	4	2	5 to 8
Asphalt Binder					
Flash Point (AASHTO T 48)	1 to 2	3	15	2	6 to 19
Solubility (AASHTO T 44)	1 to 2	3	15	2	6 to 19
Viscosity (AASHTO T 316)	1 to 2	3	15	2	6 to 19

Table 6-1.2. Time Required for Materials Acceptance Tests (3 of 4)

Material and Test	**Sample to Lab** (Note 1) (business days)	**Lab Time Priority** (Note 2) (business days)	**Lab Time Normal** (Note 2) (business days)	**Reporting to Contractor** (Note 3) (business days)	**Total** (business days)
HMA (Cont.)					
Asphalt Binder (Cont.)					
Dynamic Shear – Original Phase (AASHTO T 315)	1 to 2	3	15	2	6 to 19
Dynamic Shear – Rolling Thin Film Oven (RTFO) Phase (AASHTO T 315)	1 to 2	4	15	2	7 to 19
Dynamic Shear – Pressure Aging Vessel (PAV) Phase (AASHTO T 315)	1 to 2	5	15	2	8 to 19
RTFO Test (AASHTO T 240)	1 to 2	3	15	2	6 to 19
Ductility (AASHTO T 51)	1 to 2	3	15	2	6 to 19
Elastic Recovery (AASHTO T 301)	1 to 2	3	15	2	6 to 19
PAV (AASHTO R 28)	1 to 2	4	15	2	7 to 19
Creep and Stiffness (AASHTO T 313)	1 to 2	5	15	2	8 to 19
Binder Recovery (AASHTO T164 / ASTM D1856)	1 to 2	2	15	2	5 to 19
Binder Recovery (AASHTO R 59)	1 to 2	4	15	2	7 to 19
Asphalt Rubber Binder					
Cone Penetration (ASTM D217)	1 to 2	4	15	2	7 to 19
Resilience (ASTM D5329)	1 to 2	4	15	2	7 to 19
Softening Point (ASTM D36)	1 to 2	3	15	2	6 to 19
Viscosity (ASTM D7741)	1 to 2	3	15	2	6 to 19
Asphalt Modifier Properties (ASTM D445, ASTM D92, ASTM D2007)	1 to 2	3	15	2	6 to 19
Crumb Rubber Modifier (CRM) properties (CT 208, CT 385, ASTM D297)	1 to 2	7	30	2	10 to 34
In-Place Hot Mix Asphalt					
Moisture Content (AASHTO T 329)	1 to 2	2	5	2	5 to 9
Asphalt Binder Content (AASHTO T 308, Method A)	1 to 2	2	5	2	5 to 9
Hamburg Wheel Track (AASHTO T 324 [Modified])	1 to 2	7	30	2	10 to 34
Bulk Specific Gravity (AASHTO T 275)	1 to 2	2	7	2	5 to 11
Maximum Theoretical Density (AASHTO T 209)	1 to 2	2	7	2	5 to 11
Field Softening Point (ASTM D36)	1 to 2	3	15	2	6 to 19
Elastic Recovery (AASHTO T 301)	1 to 2	4	15	2	7 to 19
Ductility (AASHTO T 51)	1 to 2	4	15	2	7 to 19
Bending Beam Rheometer (AASHTO T 313)	1 to 2	5	8	2	8 to 12

Table 6-1.2. Time Required for Materials Acceptance Tests (4 of 4)

Material and Test	Sample to Lab (Note 1) (business days)	Lab Time Priority (Note 2) (business days)	Lab Time Normal (Note 2) (business days)	Reporting to Contractor (Note 3) (business days)	Total (business days)
CONCRETE PAVEMENT					
Los Angeles Abrasion Testing (CT 211)	1 to 2	2	4	2	5 to 8
Cleanness Value (CT 227)	1 to 2	2	3	2	5 to 7
Gradation (CT 202)	1 to 2	1	3	2	4 to 7
Sand Equivalent (CT 217)	1 to 2	1	3	2	4 to 7
Modulus of Rupture (CT 523)	-	Age based	Age based	2	Age +2
Thickness (CT 531)	2	2	7	2	6 to 11
Dowel bar alignment and concrete consolidation	2	2	5	2	6 to 9
Tie bar alignment and concrete consolidation	2	2	5	2	6 to 9
Coefficient of Friction (CT 342)	7 (See Note 4)	2	5	2	11 to 14
Inertial Profiler (AASHTO R 56 & R 57)	7 (See Note 4)	3	7	2	12 to 16
CONCRETE STRUCTURES					
Los Angeles Abrasion Testing (CT 211)	1 to 2	2	4	2	5 to 8
Cleanness Value (CT 227)	1 to 2	2	3	2	5 to 7
Gradation (CT 202)	1 to 2	1	3	2	4 to 7
Sand Equivalent (CT 217)	1 to 2	1	3	2	4 to 7
Compressive Strength (CT 521)	-	Age based	Age based	2	Age +2
CONCRETE					
Gradation (CT 202)	1 to 2	1	3	2	4 to 7
Cement (Various)	1 to 2	35	60	2	38 to 64
Supplementary Cementitious Materials (Various)	1 to 2	35	60	2	38 to 64
Shrinkage (AASHTO T 160)	1 to 2	42	60	2	45 to 64

Notes:

1. Time to testing laboratory begins from time of sampling and includes any required field curing time and time required for transport to the testing laboratory.
2. Time in laboratory begins from time laboratory receives the sample and includes any required laboratory curing time before testing and time required to prioritize samples. This time also includes the lab manager's review of test results and the time to notify the resident engineer.
3. Reporting time begins when the test is provided to the resident engineer and ends when the contractor is notified of the test results.
4. Days to schedule lab for testing

Table 6-1.3. Time Required for Products Acceptance Tests

Product	Minimum Time (Business Days)
Coating tests	3
Expansion joint material	3
Fencing, all types	2
Guide posts	3
Geosynthetic fabrics	3
Geosynthetic fabrics, UV testing	45
Metal guardrail	7
Pavement markers	4
Prestressing steel	10
Reinforcing steel and wire	2
Rubber accompanied by manufacturer test report	3
Rubber without test report	14
Structural steel	10
Type B joint seal	7

6-102D Dispute Resolution Samples

Code of Federal Regulations, Title 23, Section 637.207 (23 CFR 637.207), "Quality Assurance Program," paragraph (a)(1)(iii), states, "If the results from the quality control sampling and testing are used in the acceptance program, the STD (state transportation department) shall establish a dispute resolution system. The dispute resolution system shall address the resolution of discrepancies occurring between the verification sampling and testing and the quality control sampling and testing." When specified, the engineer must split acceptance test samples and store the split samples in case of a disputed test result. Caltrans requires split samples to be stored in a facility under state control in case they are needed for dispute resolution.

6-102E Investigation Samples and Tests

Specific materials or quality problems such as pavement failures, difficulty in achieving percent of maximum theoretical density, or inconsistent test results may require special samples and tests. When materials problems are encountered, contact the district materials engineer. The district materials engineer may request help from METS and the Division of Construction. METS will request all acceptance test results and contractor quality control test results along with material-specific additional samples and tests in order to conduct a forensic investigation.

6-102F Research Samples and Tests

Pilot projects usually have special requirements for sampling and testing of materials.

Projects developed around research needs usually require larger samples and more frequent testing than what is required by Caltrans' acceptance testing minimum

frequencies. The unit that requested the research project will provide oversight for all special sampling and testing requirements.

6-103 Field Sampled Material Identification for Testing

Samples must be properly identified so the testing laboratory can function efficiently and report results to the project in a timely manner. In addition, accuracy in identifying where the material was placed in the project is important if the material must be rejected by the engineer and then removed by the contractor.

One method for submitting sample identification information uses Form TL-0101 and TL-0502. Creating a DIME sample record online is an alternative approach to Form TL-0101 and TL-0502. DIME is a web application designed to collect and store material sample and testing information on California transportation projects.

6-103A Forms TL-0101 and TL-0502

For requesting faster processing of samples, use the “Priority” designation as discussed in Section 6-102C, “Acceptance Samples and Tests,” of this manual.

For field material samples, except for concrete cylinder compressive strength, use Form TL-0101, “Sample Identification Card,” or create a DIME sample record. For concrete cylinder compressive strength, use Form TL-0502, “Field Sample of Portland Cement Concrete Sample Card,” or create a DIME sample record.

Form TL-0101 can be generated by DIME after creating a DIME sample record. In general, prepare Form TL-0101 as follows:

- Fill in every blank space with complete information, including the quantity and lot of material sampled.
- The “Location of Source” must clearly indicate the place, behind paver, stockpile, or cold feed belt, where the sample was taken.
- Indicate “Normal” for laboratory processing of sample or “Priority” if a test result is needed quickly.
- If the sample was taken at the request of the contractor from local deposits as a potential source in accordance with Section 6-1.03, “Local Materials,” of the *Standard Specifications,* note this under “Remarks.” Request that the district materials laboratory provides the cost of testing so that Caltrans can be reimbursed by the contractor.
- To protect the sample identification card against moisture or stains, place it in a plastic bag or shipping label protector and tape it to the sample container.
- Distribute copies as shown on the form on the same day the sample is shipped.
- Prepare Form TL-0101 in accordance with the following details based on the type of material:
    - Aggregate sources must be in compliance with or not subject to the State Mining and Reclamation Act (SMARA). Verify that sources of aggregates are indicated and include the SMARA listing number. For additional information,

refer to Section 7-103H (2), “Surface Mining and Reclamation Act,” of this manual.

- For hot mix asphalt (HMA) sample be sure to:
  1. Identify the HMA plant producing the material.
  2. Identify the job mix formula (JMF) producer identification number.
  3. Include the type of mix and aggregate grading specified.
  4. Under “Remarks,” include the grade and source of the asphalt binder.
  5. Under “Remarks,” include the percentage of asphalt binder designated in the JMF.
- For asphalt binder sample be sure to:
  1. Identify the HMA plant using the material.
  2. Identify the source of asphalt binder.

  A list of approved asphalt suppliers is available at:

  https://mets.dot.ca.gov/aml/AsphaltBindersList.php
- For nonapproved suppliers, identify the refinery and shipment number for each truckload.
- For tack coat or asphalt emulsion samples, be sure to:
  1. Identify the source of the asphalt binder or asphaltic emulsion.
  2. Under “Remarks” include the dilution rate (50/50 or 60/40) for asphaltic emulsions or enter “Not Diluted.”
- If the specification has requirements based on the use of the material, include the intended use under “Remarks.” This is especially important for electrical conductors, because the applicable specifications depend on where and how the conductor is used.

- Prepare Form TL-0502, “Field Sample of Portland Cement Concrete Sample Card,” for each set of 2 cylinders, set of 3 cylinders, or set of 5 cylinders shipped as follows:
  - Fill in every blank space with complete information.
  - Indicate sources of aggregates and include the SMARA listing number. Aggregate sources must be in compliance with or not subject to SMARA. For additional information, refer to Section 7-103H (2), “Surface Mining and Reclamation Act,” of this manual. Indicate in the space for water the total weight of water used per cubic yard of cementitious material in the mix based on actual weight, not design weight.
  - Under “Remarks,” indicate the specified concrete strength.
  - Under “Remarks,” indicate if the unit weight of the hardened concrete cylinders is required. The testing laboratory will not furnish unit weight data unless it is specifically requested.

- To protect the sample card against moisture or stains, place it in a plastic bag or shipping label protector, and tape it to the sample container.
- Distribute copies as shown on the form on the same day the sample is shipped.

A uniform system for marking cylinders is used. This system consists of the contract number and the sample number. The sample number consists of a series of digits separated by dashes (-) to indicate: method of storage for curing; age at which cylinders are to be tested; the cylinder number of the set of 2, set of 3, or set of 5, that is to be tested; and project coding. Use a flow pen or permanent marker to mark the cylinders.

Following are examples of the cylinder marking system.

Example 6-1.1. Sample Cylinder Label (Set of either five 6- by 12-inch or five 4- by 8-inch cylinders)

Contract No. 03-100844

Sample No. 1-28-1/5_ _ _ _ _

Date Cast _____

Structure ID: 59-5629L

For sample shown in Example 6-1.1., (Set of either five 6- by 12-inch or five 4- by 8-inch cylinders):

- The first digit indicates method 1 storage for curing.
- The second 2 digits indicate that the cylinder is to be tested at 28 days.
- The 1/5 set indicates that it is the No. 1 cylinder of 5 cylinders. The No. 2 cylinder would be marked 2/5, and so on, for the remaining cylinders of the group.
- The last 4 spaces are reserved for any project coding consisting of numbers, letters, or a combination.

Note if only 1 sample card was made for 5 cylinders, the third symbol on the card would be 1,2,3,4,5/5.

Example 6-1.2. Sample Cylinder Label (Set of two 6- by 12-inch cylinders)

Contract No. 03-100844

Sample No. 2-14-2/2_ _ _ _

Date Cast _____

Structure ID: 59-5629L

For sample shown in Example 6-1.2., (Set of two 6- by 12-inch cylinders):

- The first digit indicates method 2 storage for curing.
- The second 2 digits indicate that the cylinder is to be tested at 14 days.
- The 2/2 set indicates that it is the No. 2 cylinder of a group of 2 cylinders.
- The last 4 spaces are reserved for any project coding consisting of numbers, letters or a combination.

Note if one sample card is made for the 2 cylinders, the third symbol on the card would be 1,2/2.

Example 6-1.3. Sample Cylinder Label (Set of three 4- by 8-inch cylinders)

Contract No. 03-100844

Sample No. 2-07-3/3_ _ _ _

Date Cast _____

Structure ID: 59-5629L

For sample shown in Example 6-1.3., (Set of three 4- by 8-inch cylinders)

• The first digit indicates method 2 storage for curing.

• The second 2 digits indicate that the cylinder is to be tested at 7 days.

• The 3/3 set indicates that it is the No. 3 cylinder of a group of 3 cylinders.

• The last 4 spaces are reserved for any project coding consisting of numbers, letters or a combination.

Note if 1 sample card is made for the 3 cylinders, the third symbol on the card would be 1,2,3/3.

6-103B DIME Sample Record

METS allows Caltrans staff to submit sample information and test data using DIME.

A DIME account is needed to submit and view test result information. For a complete overview of how to access DIME, submit sample information, provide test results, and learn about DIME features, go to DIME Instructions, available at:

https://dime.dot.ca.gov/index.php?r=site/instructions

Prepare a DIME sample record as follows:

- Log in to DIME.
- Click on the “New Sample” link from the secondary menu panel. You will be presented with a form for creating a new DIME sample record. You must fill out all required fields.
- Enter the Caltrans project identification number associated with the material sample.
- Fill in all the fields applicable to the material sample with complete information in both the Sample and Material Identification section.
- Fill in the optional fields applicable to the material sample and provide additional notes if needed.
- Verify that the sample record information is filled out completely and correctly.
- Click on the “Create Sample” button to create the sample record and a DIME Sample ID will be generated.

6-104 Shipping of Field Samples

The material sampler makes sure the DIME Sample ID or Forms TL-0101 or TL-0502 accompanies the material sample when it is shipped from the job site to the testing laboratory. Testing laboratories will use the DIME Sample ID to submit test results for the sample.

Based on turnaround time needed to receive a test result, ship samples from the job site to the laboratory using the most economical mode of transportation available consistent with the time element involved. Do not accumulate samples at the project site to save transportation costs.

Concrete cylinders are shipped to the laboratory in accordance with California Test 540, “Method of Test for Making and Curing Concrete Test Specimens in the Field.” Cylinders are shipped without removing the mold and are packed in cardboard containers available at the district warehouse.

If the district laboratory is equipped to test concrete cylinders, they should be shipped there. Otherwise, cylinders may be delivered either to the Southern Regional Lab at 13970 Victoria Street, Fontana, CA 92336, or METS at 5900 Folsom Boulevard, Sacramento, CA 95819, whichever is more convenient. Ship concrete cylinders within the time limits specified in California Test 540 or the test result cannot be used as an acceptance test.

Shipping costs to district materials laboratories, the Southern Regional Lab, or METS, are to be prepaid.

6-105 Acceptance Records

Keep records of all samples and tests in the project files as permanent job records. DIME can be used as Caltrans laboratory management tool to efficiently store material sample and test data for California transportation projects. Monitor acceptance testing frequency, results, and timelines by using Form CEM-3701, “Test Result Summary,” available in DIME or a paper copy. Corrective action or retesting of failing tests must be noted in the “Remarks” column of the form.

Documentation of the reason materials represented by failing tests were incorporated into the project must be included in the project files. For more information on procedures to follow in the case of failing tests, refer to Section 3-6, “Control of Materials,” of this manual.

It is not necessary to secure separate samples for each project when two or more projects receive materials from the same source. File a copy of the test report with each project.

6-106 Project Materials Certification

When construction work on the project is complete, prepare Form CEM-6302, “Final Materials Certification.” Use the form to certify that, other than for the exceptions listed on the form, the results of tests performed on acceptance samples show that the materials used in the work controlled by sampling and testing conform to the approved plans and specifications.

If exceptions exist, check the exceptions box and note all nonconforming materials on the form. The following are examples of nonconforming materials that must be noted as exceptions:

- Materials accepted by applying a specified pay factor or deficiency adjustment, such as for hot mix asphalt, concrete pavement, or rapid-strength concrete.
- Materials out of "operating range" but within "contract compliance" for which a specified payment deduction was made.
- Materials not in compliance with the as-bid contract plans or specifications for which a change order was approved to accept the material.
- Materials that require certificates of compliance but one or more have not been submitted.

Sign the form and put the original in the project files. Send a copy to district Construction and, if the project is subject to Federal Highway Administration (FHWA) construction oversight activities, send a copy to the FHWA California division administrator. The name and address of the FHWA California division administrator is available at:

https://www.fhwa.dot.gov/cadiv/directory.cfm

6-107 Materials Acceptance Sampling and Testing

Sampling and testing materials and products must be in accordance with contract specifications. Sampling and testing are of equal importance for assuring materials and products meet acceptance specifications.

The tables that make up Table 6-1.4., "Materials Acceptance Sampling and Testing Requirements," contain Caltrans' minimum sampling and testing requirements for materials acceptance. The frequency of sampling and testing indicated in the tables is to be used under normal conditions. Materials that are marginal in meeting the specifications should be sampled and tested on a more frequent basis. Request "Priority" testing for samples taken on potentially marginal materials.

When shown in the tables that testing frequencies may be adjusted, document any adjustment in a "Memo to File." Place the "Memo to File" in the appropriate part of Category 37, "Initial Tests and Acceptance Tests," of the project files.

Adherence to the sample size requirements shown in the tables will prevent unnecessary delays and expense of obtaining supplementary samples to complete tests.

Refer to Section 6-105, "Acceptance Records," of this manual for documenting acceptance tests results. For more information on procedures to follow in the case of failing tests, refer to Section 3-6, "Control of Materials," of this manual.

Table 6-1.4. Materials Acceptance Sampling and Testing Requirements: Earthwork (*Standard Specifications* Section 19) (1 of 3)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
STRUCTURE BACKFILL (Section 19-3.02C)					
Sieve Analysis	California Test 202	50 lb	Materials site or stockpile	1 every 3,000 tons or 2,000 cu yd	If uniform material is within specification limits, test frequency may be decreased to 1 per day
Sand Equivalent	California Test 217	50 lb	Materials site or stockpile	1 every 3,000 tons or 2,000 cu yd	If uniform material is within specification limits, test frequency may be decreased to 1 per day
Relative Compaction	California Test 231	Sample for California Test 216	Project site in accordance with California Test 231	1 every 2,000 sq yd and test compaction at every 8 in. of thickness	Relative compaction test is required at each location structure backfill is placed
Maximum Wet Density	California Test 216	35 lb	Relative compaction test site locations	1 every relative compaction test	Wet common-composite test maximum value may be used in accordance with California Test 231
PERVIOUS BACKFILL MATERIAL (Section 19-3.02D)					
Sieve Analysis	California Test 202	50 lb	Stockpile	1 every 3,000 tons or 2,000 cu yd	If uniform material is within specification limits, test frequency may be decreased to 1 per day
COMPACTION (Section 19-5)					
R-Value	California Test 301	50 lb	Project site	Test to verify R-value if differing site conditions are encountered	If R-value testing in the materials report is incomplete because of preproject conditions, then test to verify design R-value
Relative Compaction	California Test 231	Sample for California Test 216	California Test 216	1 every 2,000 sq yd	
Maximum Wet Density	California Test 216	35 lb	Relative compaction test site locations	1 every relative compaction test	

Table 6-1.4. Materials Acceptance Sampling and Testing Requirements: Earthwork (*Standard Specifications* Section 19) (2 of 3)

Test	Test Method	Sample Size & Container Size	Sampling Location (See Note 1)	Acceptance Test Frequency	Remarks
EMBANKMENT CONSTRUCTION (Section 19-6)					
Relative Compaction	California Test 231	Sample for California Test 216	Project site in accordance with California Test 231	1 every 2,000 sq yd and test compaction at every 8 in. of thickness	
Maximum Wet Density	California Test 216	35 lb	Relative compaction test site locations	1 every relative compaction test	Wet common-composite test maximum value may be used in accordance with California Test 231
GEOSYNTHETIC REINFORCED EMBANKMENT (Section 19-6.02B)					
Plasticity Index	California Test 204	50 lb	Materials site or stockpile	1 per source before use	
pH	California Test 643	50 lb	Materials site or stockpile	1 per source before use	
Sieve Analysis	California Test 202	50 lb	Stockpile	Before use, 1 every 3,000 tons or 2,000 cu yd	If material is uniform and well within specification limits, the test frequency may be decreased to 1 per day
BORROW MATERIAL (Section 19-7)					
R-Value	California Test 301	50 lb	Import borrow source	1 per source	Test for R-value only when an R-value is specified for import borrow in the special provisions; if material at import borrow source is not uniform, increase testing frequency

Table 6-1.4. Materials Acceptance Sampling and Testing Requirements: Earthwork (*Standard Specifications* Section 19) (3 of 3)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
SHOULDER BACKING (Section 19-9)					
Crushed Particles	California Test 205	50 lb	Materials site or stockpile	1 per project before use	
Durability	California Test 229	50 lb	Materials site or stockpile	1 per project before use	
Unit Weight	California Test 212 Rodding Method	50 lb	Materials site or stockpile	1 per project before use	
Sieve Analysis	California Test 202	50 lb	Materials site or stockpile	1 every 3,000 tons or 2,000 cu yd	If uniform material is within specification limits, test frequency may be decreased to 1 per day
Sand Equivalent	California Test 217	50 lb	Materials site or stockpile	1 every 3,000 tons or 2,000 cu yd	If uniform material is within specification limits, test frequency may be decreased to 1 per day

Note:

1. Refer to California Test 125 for sampling procedures.

Table 6-1.5. Materials Acceptance Sampling and Testing Requirements: Stabilized Soils (*Standard Specifications* Section 24) (1 of 3)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
LIME (Section 24-2.02)					
Various properties	See *Standard Specifications* Section 24-2.02	One 10-lb sample for each type and source of lime; use a 2-qt airtight container	Initial sample provided by contractor; subsequent sampling from mid-point of delivery	Each 100 tons of lime, 2 per day maximum	Must be on an Authorized Materials List and certificate of compliance must accompany each shipment; recommend 1 acceptance test per 5 samples of lime
LIME TREATMENT					
DETERMINATION OF LIME APPLICATION RATE (Section 24-2.01D)					
Unconfined Compressive Strength	California Test 373	100 lb	Native soils; test each type of material to be treated	Before soil stabilization work and if source of lime changes	To determine appropriate lime content
Optimum Moisture Content	California Test 373	100 lb	Native soils; test each type of material to be treated	Before soil stabilization work	
VERIFICATION OF LIME APPLICATION RATE AND STABILIZED SOIL MIXTURE (Section 24-2.01D)					
Lime Application (Dry Form)	Calibrated tray method or equal	Building paper or pan of known area	Surface receiving lime	Each 40,000 sq ft, 2 per day minimum	To determine if application rate is within ± 5% of ordered application rate
Lime Application (Slurry Form)	Volumetric measurement that is then reduced to lime weight	Deter-mined over known area	Slurry holding tank	Each 40,000 sq ft, 2 per day minimum	To determine if application rate is within ± 5% of ordered application rate
Uniformity of Mixed Stabilized Soil	Phenolphthalein alcohol indicator solution spray	N/A	Representative areas	Each day at five separate locations	Taken after completion of initial mixing

Table 6-1.5. Materials Acceptance Sampling and Testing Requirements: Stabilized Soils (*Standard Specifications* Section 24) (2 of 3)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
VERIFICATION OF LIME APPLICATION RATE AND STABILIZED SOIL MIXTURE (Section 24-2.01D)					
Moisture Content of Mixed Stabilized Soil	California Test 226	0.25 lb each sample	Representa-tive areas at mid depth	Each day at five separate locations to verify contractor's quality control tests	Taken during mellowing period
Gradation of Mixed Stabilized Soil	California Test 202	25 lb	Representa-tive areas	1 every 4,000 sq yd, 1 per day minimum	Taken before compaction
MIXED STABILIZED SOIL (Sections 24-2.01 and 24-2.03)					
Relative Compaction	California Test 231	Sample for California Test 216	Project site in accordance with California Test 231	1 every 2,000 sq yd and test compaction at every 6 in. of thickness	
Maximum Wet Density	California Test 216	35 lb	Relative compaction test site locations	1 every relative compaction test	Wet common-composite test maximum value may be used in accordance with California Test 231
Dimensions	Measurement	N/A	Random locations in place after compaction	As necessary for verification of stabilized soil thickness and surface grades	

Table 6-1.5. Materials Acceptance Sampling and Testing Requirements: Stabilized Soils (*Standard Specifications* Section 24) (3 of 3)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
CURING SEAL-ASPHALTIC EMULSION (Section 24-1.02C)					
Various properties based on asphaltic emulsion type used	Based on asphaltic emulsion type used; see *Standard Specifications* Section 94	1 liter (or 1 qt) wide-mouth plastic bottle with screw on lids that are sealed with tape	Sampling line leading to the spray bar	1 each shipment	Each shipment must be accompanied by a certificate of compliance; recommend 1 random test from samples taken

Note:

1. Refer to California Test 125 for sampling procedures.

Table 6-1.6. Materials Acceptance Sampling and Testing Requirements: Aggregate Subbases (*Standard Specifications* Section 25)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
AGGREGATE SUBBASE					
Gradation (Sieve Analysis)	California Test 202	50 lb	Windrow or roadway	Every 3,000 tons or 2,000 cu yd (See Note 2)	If uniform material is within specification limits, frequency may be decreased to 1 test per day
Sand Equivalent	California Test 217	50 lb	Windrow or roadway	Every 3,000 tons or 2,000 cu yd (See Note 2)	If uniform material within specification limits, frequency may be decreased to 1 test per day
R-Value	California Test 301	50 lb	Windrow or roadway	Every 3,000 tons or 2,000 cu yd	R-value testing may be reduced to 1 acceptance test per project when test records demonstrate that comparable material from the same source meets minimum R-value requirements
Relative Compaction	California Test 231	Sample for California Test 216	Roadway in accordance with California Test 231	Every 2,000 sq yd	
Maximum Wet Density	California Test 216	35 lb	Relative compaction test site locations	Every 2,000 sq yd	Wet common-composite test maximum value may be used in accordance with California Test 231
Dimensions	N/A	N/A	Random locations	As necessary for acceptance	Verify thickness of aggregate subbase

Notes:

1. Refer to California Test 125 for sampling procedures.
2. If material is outside the specification limits, sample and test representative material every 500 cu yd so that deductions may be taken for noncompliant material.

Table 6-1.7. Materials Acceptance Sampling and Testing Requirements: Aggregate Bases (*Standard Specifications* Section 26)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
AGGREGATE BASES					
Gradation (Sieve Analysis)	California Test 202	50 lb	Windrow or roadway	Every 3,000 tons or 2,000 cu yd (See Note 2)	If uniform material is within specification limits, frequency may be decreased to 1 test per day
Sand Equivalent	California Test 217	50 lb	Windrow or roadway	Every 3,000 tons or 2,000 cu yd (See Note 2)	If uniform material is within specification limits, frequency may be decreased to 1 test per day
Resistance Value (R-Value)	California Test 301	50 lb	Windrow or roadway	Every 3,000 tons or 2,000 cu yd	R-value testing may reduced to 1 acceptance test per project when test records demonstrate that comparable material from the same source meets minimum R-value requirements
Durability Index	California Test 229	50 lb	Windrow or roadway	1 per project	Durability test not required for Class 3 aggregate base
Moisture	California Test 226	25 lb	Materials site or stockpile	2 daily when aggregate base is paid for by weight	
Relative Compaction	California Test 231	Sample for California Test 216	Roadway in accordance with California Test 231	Every 2,000 sq yd	
Maximum Wet Density	California Test 216	35 lb	Relative compaction test site locations	Every 2,000 sq yd	Wet common-composite test maximum value may be used in accordance with California Test 231
Dimensions	N/A	N/A	Random locations	As necessary for acceptance	Verify thickness of aggregate base

Notes:
1. Refer to California Test 125 for sampling procedures.
2. If material is outside the specification limits, sample and test representative material every 500 cu yd so that deductions may be taken for noncompliant material.

Table 6-1.8. Materials Acceptance Sampling and Testing Requirements: Cement Treated Bases (*Standard Specifications* Section 27) (1 of 3)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
CEMENT TREATED BASE Class A or Class B					
AGGREGATE					
Gradation (Sieve Analysis)	California Test 202, California Test 105	40 lb	Plant, truck, windrow, or roadway	1 every 3,000 tons or 2,000 cu yd, minimum 1 per day of production	
Sand Equivalent	California Test 217	40 lb	Plant, truck, windrow, or roadway	1 every 3,000 tons or 2,000 cu yd, minimum 1 per day of production	
AGGREGATE Class B					
R-Value (with and without cement)	California Test 301	100 lb for aggregate qualifica-tion	Windrow or roadway	Before production	
CEMENT Type II Portland Cement					
Various properties must comply with *Standard Specifications* Section 90-1.02B(2)	See *Standard Specifications* Section 90-1.02B(2)	8 lb	Cement treated base plant or cement spreader	1 each 100 tons of cement, 2 per day maximum	Recommend 1 acceptance test per project for cement from approved suppliers and certificate of compliance with each shipment
WATER					
Chlorides	California Test 422	Clean 2-qt plastic jug with lined, sealed lid	1 per source; at point of use		Water supplies for domestic use do not need to be tested

Table 6-1.8. Materials Acceptance Sampling and Testing Requirements: Cement Treated Bases (*Standard Specifications* Section 27) (2 of 3)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
WATER (Cont.)					
Sulfates	California Test 417	Clean 2-qt plastic jug with lined, sealed lid	1 per source; at point of use		Water supplies for domestic use do not need to be tested
COMPLETED MIX Class A					
Compressive Strength	California Test 312	See California Test 312, Part II	Windrow or roadway before compaction	1 per day	If first 3 days of production test records demonstrate materials are in compliance, recommend test every 5 days of production
COMPLETED MIX Class B					
R-Value	California Test 301	50 lb	Windrow or roadway before compaction	1 every 3,000 tons or 2,000 cu yd	Recommend R-value testing be reduced to 1 every 10,000 cu yd when test records demonstrate that material from the same source, and having comparable grading and sand equivalent values, meets the minimum R-value requirements

Table 6-1.8. Materials Acceptance Sampling and Testing Requirements: Cement Treated Bases (*Standard Specifications* Section 27) (3 of 3)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
COMPLETED MIX Class A and Class B					
Cement Content	California Test 338	See California Test 338, Part I	Windrow or roadway before compaction	1 every 1,500 tons or 1,000 cu yd, minimum 1 per day of production	
Optimum Moisture	California Test 312	See California Test 312	Windrow or roadway	Before production	
Moisture Content	California Test 226	10 lb in sealed container	Roadway before compaction	2 daily	
Relative Compaction	California Test 312 or 231	Sample for California Test 216	Roadway in accordance with California Test 231	1 every 2,000 sq yd	
Maximum Wet Density	California Test 216, California Test 312	35 lb	Relative compaction test site locations	1 every 2,000 sq yd	Wet common-composite test maximum value may be used in accordance with California Test 231
Dimensions	N/A	N/A	Random locations	As necessary for acceptance	Verify thickness of cement treated base

Note:

1. Refer to California Test 125 for sampling procedures.

Table 6-1.9. Materials Acceptance Sampling and Testing Requirements:
Concrete Bases (*Standard Specifications* Section 28)
Lean Concrete Base

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
LEAN CONCRETE BASES					
Compressive strength (7-days)	ASTM C39	6 cylinders 6x12 in. - 3 tests	Concrete truck discharge chute	1,000 cu yd or 1 day's production if less than 1,000 cu yd	
Compressive strength (3-days)	ASTM C39	6 cylinders 6x12 in. - 3 tests	Concrete truck discharge chute	1,000 cu yd or 1 day's production if less than 1,000 cu yd	Optional test to qualify for a transverse contraction joint waiver
RAPID STRENGTH CONCRETE BASE					
Modulus of rupture (7-days)	California Test 524	3 beams - 6x6x20 inches	Concrete truck discharge chute	1 per 500 cu yd or 1 day's production if less than 500 cu yd	
LEAN CONCRETE BASE RAPID SETTING					
Compressive strength (7-days)	California Test 521	6 cylinders 6x12 in. - 3 tests	Concrete truck discharge chute	1 per 500 cu yd or 1 day's production if less than 500 cu yd	
CONCRETE BASE					
Modulus of rupture (7-days)	California Test 523	2 beams of 6x6x32 in. for centerpoint loading or 6x6x20 in. for third-point loading	Concrete truck discharge chute	1,000 cu yd or 1 day's production if less than 1,000 cu yd	
Dimensions	N/A	N/A	Random locations	As necessary for acceptance	Verify thickness of base

Note:
1. Refer to California Test 125 for sampling procedures.

Table 6-1.10. Materials Acceptance Sampling and Testing Requirements: Treated Permeable Bases (*Standard Specifications* Section 29) Asphalt Treated Permeable Base (ATPB) (1 of 4)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
AGGREGATE					
Percentage Crushed Particles	California Test 205	Combined two 40-lb canvas bags (See Note 2) or Batch 160 lb (proportioned per bin percentages)	Plant	Before production and minimum 1 random for every 50,000 tons or less of paving	
Los Angeles Abrasion Testing (at 500 revolutions)	California Test 211	Combined two 40-lb canvas bags (See Note 2) or Batch 160 lb (proportioned per bin percentages)	Plant	Before production and minimum 1 random for every 50,000 tons or less of paving	
Film Stripping	California Test 302	Combined two 40-lb canvas bags (See Note 2) or Batch 160 lb (proportioned per bin percentages)	Plant	Before production and minimum 1 random for every 50,000 tons or less of paving	
Gradation (Sieve Analysis)	California Test 202	Combined two 20-lb canvas bags (See Note 3) or Batch 40 lb (proportioned per bin percentages)	Plant	1 for every 4 hours of production	

Table 6-1.10. Materials Acceptance Sampling and Testing Requirements:
Treated Permeable Bases (*Standard Specifications* Section 29)
Asphalt Treated Permeable Base (ATPB) (2 of 4)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
AGGREGATE (Cont.)					
Cleanness Value	California Test 227	Combined two 20-lb canvas bags (See Note 3) or Batch 40 lb (proportioned per bin percentages)	Plant	1 for every 4 hours of production	Recommend 1 acceptance test per day if 3 consecutive results exceed 62
ASPHALT					
Various properties based on asphalt type used; see *Standard Specifications* Section 92	Based on asphalt type used; see *Standard Specifications* Section 92	1-qt double-seal friction-top metal cylindrical shaped can	Asphalt feed line connecting plant storage tanks	1 per day	Certificate of compliance required for each shipment; if asphalt binder source is not on approved list, sample and test asphalt before use
COMPLETED MIX					
Asphalt Content	California Test 382	40 lb in metal containers	Plant, truck, windrow, or roadbed	1 for every 4 hours of production	
AGGREGATE					
Los Angeles Abrasion Testing (loss at 500 revolutions)	California Test 211	50 lb	Plant	Before production and minimum 1 random for every 25,000 cu yd	
Soundness	California Test 214	50 lb	Plant		
Sieve Analysis (Gradation)	California Test 202	40 lb	Plant	1 for every 4 hours of production; (See Note 4)	

Table 6-1.10. Materials Acceptance Sampling and Testing Requirements:
Treated Permeable Bases (*Standard Specifications* Section 29)
Asphalt Treated Permeable Base (ATPB) (3 of 4)

Test	Test Method	Sample Size & Container Size	Sampling Location (See Note 1)	Acceptance Test Frequency	Remarks
AGGREGATE (Cont.)					
Cleanness Value	California Test 227				
CEMENT					
Cement, various properties; must comply with *Standard Specifications* Section 90-1.02B(2)	Must comply with *Standard Specifications* Section 90-1.02B(2)	8 lb	Concrete plant	1 for each 100 tons, 2 per day max	Recommend 1 acceptance test per project for cement from approved suppliers with certificate of compliance
WATER					
Chlorides	California Test 422	Clean 2-qt plastic jug with lined, sealed lid At point of use; see Remarks	1 per source		Water supplies for domestic use do not need to be tested
Sulfates	California Test 417	Clean 2-qt plastic jug with lined, sealed lid At point of use; see Remarks	1 per source		Water supplies for domestic use do not need to be tested
Setting Time	ASTM C 191 or ASTM C 266	Contact METS for required quantity of water sample	At point of use	1 per source	Water supplies for domestic use do not need to be tested
Mortar Compressive Strength	ASTM C109	Contact METS for required quantity of water sample	At point of use	1 per source	Water supplies for domestic use do not need to be tested
Coloring Agents	Must comply with *Standard Specifications* Section 90-1.02D	Contact METS for required quantity of water sample	At point of use	1 per source	Water supplies for domestic use do not need to be tested

Table 6-1.10. Materials Acceptance Sampling and Testing Requirements:
Treated Permeable Bases (*Standard Specifications* Section 29)
Asphalt Treated Permeable Base (ATPB) (4 of 4)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
WATER					
Alkalis	Must comply with *Standard Specifications* Section 90-1.02D	Contact METS for required quantity of water sample	At point of use	1 per source	Water supplies for domestic use do not need to be tested
Specific Gravity	Must comply with *Standard Specifications* Section 90-1.02D	Contact METS for required quantity of water sample	At point of use	1 per source	Water supplies for domestic use do not need to be tested

Notes:
1. Refer to California Test 125 for sampling procedures.
2. Store one 40-lb canvas bag for dispute resolution.
3. Store one 20-lb. canvas bag for dispute resolution.
4. If test records determine that aggregate gradation or cleanness value is close to specification limit or outside the specification limits, sample and test concrete every 300 cu yd so that deductions may be taken for noncompliant material.

Table 6-1.11. Materials Acceptance Sampling and Testing Requirements: Recycled Pavement (*Standard Specifications* Section 30)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
FULL-DEPTH RECYCLING WITH NO STABILIZER (Section 30-2)					
Thickness	Thickness-Field Measurement	Field Measurement	Random location	3 per lot	
Relative Compaction (% min)	California Test 231	Sample for California Test 216	In accordance with California Test 231	1 every 2,000 sq yd and test compaction at every 6 in. of thickness	
FULL DEPTH RECYCLING–FOAMED ASPHALT (Section 30-3)					
Relative Compaction (% min)	California Test 231	Sample for California Test 216	In accordance with California Test 231	1 every 2,000 sq yd and test compaction at every 6 in. of thickness	
Thickness	Thickness	California Test 531. 4- or 6-in.-diameter core, full thickness	3 random locations per lot	See Section 4-4004 of this manual	
FULL DEPTH RECYCLING—CEMENT (Section 30-4)					
Thickness	Thickness-Core thickness measurement	California Test 531, 4- or 6-in.-diameter core, full thickness	3 random locations per lot	See Section 4-4004 of this manual	
Cement application rate	Calibrated tray or equal	Building paper or pan of known area	Surface receiving cement	Each 40,000 sq ft, 2 per day minimum	Determine if application rate is within ± 5% of mix design rate
Relative Compaction (% min)	California Test 231	Sample for California Test 216	In accordance with California Test 231	1 every 2,000 sq yd and test compaction at every 6 in. of thickness	

Notes:

1. Refer to California Test 125 for sampling procedures.

Table 6-1.12. Materials Acceptance Sampling and Testing Requirements: Seal Coats (*Standard Specifications* Section 37) (1 of 9)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
ASPHALTIC EMULSION AND ASPHALTIC EMULSION FOR FLUSH COAT					
Various properties in accordance with Section 37 of *Standard Specifications*	See Section 37-2.02A(4)(b)(ii) of *Standard Specifications*	1 liter (or 1 qt) wide-mouth plastic bottle with screw on lids that are sealed with tape	Transport tanker	Each shipment	Certificate of compliance required with each shipment
Asphaltic emulsion spread rate	ASTM D2995	Per test method	Full width of boot truck	Once per project	
POLYMER MODIFIED ASPHALTIC EMULSION					
Viscosity	AASHTO T 59	1 liter (or 1 qt) wide-mouth plastic bottle with screw on lids that are sealed with tape	Transport tanker	Each shipment	Certificate of compliance required with each shipment
Sieve Test	AASHTO T 59	1 liter (or 1 qt) wide-mouth plastic bottle with screw on lids that are sealed with tape	Transport tanker	Each shipment	Certificate of compliance required with each shipment
Demulsibility	AASHTO T 59	1 liter (or 1 qt) wide-mouth plastic bottle with screw on lids that are sealed with tape	Transport tanker	Each shipment	Certificate of compliance required with each shipment

Table 6-1.12. Materials Acceptance Sampling and Testing Requirements: Seal Coats (*Standard Specifications* Section 37) (2 of 9)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
POLYMER MODIFIED ASPHALTIC EMULSION (Cont.)					
Torsional Recovery	California Test 332	1 liter (or 1 qt) wide-mouth plastic bottle with screw on lids that are sealed with tape	Transport tanker	Each shipment	Certificate of compliance required with each shipment
Penetration	AASHTO T 49	1 liter (or 1 qt) wide-mouth plastic bottle with screw on lids that are sealed with tape	Transport tanker	Each shipment	Certificate of compliance required with each shipment
Ring and Ball	AASHTO T 53	1 liter (or 1 qt) wide-mouth plastic bottle with screw on lids that are sealed with tape	Transport tanker	Each shipment	Certificate of compliance required with each shipment

Table 6-1.12. Materials Acceptance Sampling and Testing Requirements: Seal Coats (*Standard Specifications* Section 37) (3 of 9)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
ASPHALT MODIFIER FOR ASPHALT RUBBER BINDER					
Viscosity	ASTM D445	1-qt round wide-mouth can with friction top lid or 1-qt rectangular can with screw-on lid	Sample port on tanker truck	1 random per project	
Flash Point	ASTM D92	1-qt round wide-mouth can with friction top lid or 1-qt rectangular can with screw-on lid	Sample port on tanker truck	1 random per project	
Molecular Analysis	ASTM D2007	1-qt round wide-mouth can with friction top lid or 1-qt rectangular can with screw-on lid	Sample port on tanker truck	1 random per project	
CRUMB RUBBER MODIFIER FOR ASPHALT RUBBER BINDER					
Wire in CRM (max %)	CT 385	CRM scrap tire: Two 2.5 lb in gallon zip-lock bags CRM high natural: Two 2.5 lb in gallon zip-lock bags	CRM bulk bag	Minimum 1 random per project	

Table 6-1.12. Materials Acceptance Sampling and Testing Requirements: Seal Coats (*Standard Specifications* Section 37) (4 of 9)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
CRUMB RUBBER MODIFIER FOR ASPHALT RUBBER BINDER (Cont.)					
Fabric in CRM (max %)	CT 385	CRM scrap tire: Two 2.5 lb in gallon zip-lock bags CRM high natural: Two 2.5 lb in gallon zip-lock bags	CRM bulk bag	Minimum 1 random per project	
CRM particle length		CRM scrap tire: Two 2.5 lb in gallon zip-lock bags CRM high natural: Two 2.5 lb in gallon zip-lock bags	CRM bulk bag	Minimum 1 random per project	
CRM specific gravity	CT 208				
Natural rubber content in high nature CRM (%)	ASTM D297				
ASPHALT RUBBER BINDER					
Cone Penetration		1-qt double-seal friction-top metal cylindrical shaped can	Asphalt feed line connecting to the HMA plant	Production start-up evaluation and 1 random per 5 samples	Certificate of compliance required with each shipment

Table 6-1.12. Materials Acceptance Sampling and Testing Requirements: Seal Coats (*Standard Specifications* Section 37) (5 of 9)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
ASPHALT RUBBER BINDER (Cont.)					
Resilience		1-qt double-seal friction-top metal cylindrical shaped can	Asphalt feed line connecting to the HMA plant	Production start-up evaluation and 1 random per 5 samples	Certificate of compliance required with each shipment
Softening point		1-qt double-seal friction-top metal cylindrical shaped can	Asphalt feed line connecting to the HMA plant	Production start-up evaluation and 1 random per 5 samples	Certificate of compliance required with each shipment
Asphalt Rubber Binder Viscosity	ASTM D7741	1 gal metal cylindrical shaped can with double-seal friction top	Asphalt storage tank	The greater of 1 every 5 lots or once a day	For safety, engineer may witness contractor perform test
Base Asphalt Binder Properties	See *Standard Specifications* Section 92	Five 1-qt double-seal friction-top metal cylindrical shaped can	Asphalt storage tank	The greater of 1 every 5 lots or once a day	Certificate of compliance required for each shipment; if asphalt binder source is not on approved list, test before use
SCREENINGS/AGGREGATE FOR CHIP SEALS					
Los Angeles Abrasion Testing	California Test 211	50 lb in canvas bags or 5-gal buckets	Stockpile	Once per project	
% Crushed Particles	AASHTO T 335	50 lb in canvas bags or 5-gal buckets	Stockpile	Once per project	

Table 6-1.12. Materials Acceptance Sampling and Testing Requirements: Seal Coats (*Standard Specifications* Section 37) (6 of 9)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
SCREENINGS/AGGREGATE FOR CHIP SEALS					
Film Stripping	California Test 302	50 lb in canvas bags or 5-gal buckets	Stockpile	Once per project	
Sieve Analysis	California Test 202	30 lb	Stockpile	Twice daily	
Cleanness Value	California Test 227	30 lb	Stockpile	Once daily	
SAND FOR FLUSH COAT					
Sieve Analysis	California Test 202	25 lb	Stockpile	Once per project	
CRACK TREATMENTS					
Crack Treatment Material					
Softening point	ASTM D36	2 each 3-lb minimum samples in silicone release boxes	From crack treatment material dispensing wand	Once per project	Indicate the specified type of crack treatment material on the TL-0101
Cone penetration	ASTM D5329	2 each 3-lb minimum samples in silicone release boxes	From crack treatment material dispensing wand	Once per project	Indicate the specified type of crack treatment material on the TL-0101
Resilience	ASTM D5329	2 each 3-lb minimum samples in silicone release boxes	From crack treatment material dispensing wand	Once per project	Indicate the specified type of crack treatment material on the TL-0101

Table 6-1.12. Materials Acceptance Sampling and Testing Requirements: Seal Coats (*Standard Specifications* Section 37) (7 of 9)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
CRACK TREATMENTS (Cont.)					
Crack Treatment Material					
Tensile adhesion	ASTM D5329	2 each 3-lb minimum samples in silicone release boxes	From crack treatment material dispensing wand	Once per project	Indicate the specified type of material on the TL-0101
Asphalt compatibility	ASTM D5329	2 each 3-lb minimum samples in silicone release boxes	From crack treatment material dispensing wand	Once per project	Indicate the specified type of material on the TL-0101
Flexibility	ASTM D3111	2 each 3-lb minimum samples in silicone release boxes	From crack treatment material dispensing wand	Once per project	Indicate the specified type of material on the TL-0101
Specific gravity	ASTM D70	2 each 3-lb minimum samples in silicone release boxes	From crack treatment material dispensing wand	Once per project	Indicate the specified type of material on the TL-0101
Sieve test	See note in Section 37-6.01D(3) "Department Acceptance" of the *Standard Specifications*	2 each 3-lb minimum samples in silicone release boxes	From crack treatment material dispensing wand	Once per project	Indicate the specified type of material on the TL-0101

Table 6-1.12. Materials Acceptance Sampling and Testing Requirements: Seal Coats (*Standard Specifications* Section 37) (8 of 9)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
SAND FOR CRACK TREATMENT					
Sieve Analysis	California Test 202	25 lb	Stockpile	Once per project	
SLURRY SEAL AGGREGATE					
Los Angeles Abrasion Testing (loss at 500 revolutions)	California Test 211	50 lb	Stockpile	Once per project	
Percentage of Crushed Particles	California Test 205	50 lb	Stockpile	Once per project	
Film Stripping	California Test 302	50 lb	Stockpile	Once per project	
Durability Index	California Test 229	50 lb	Stockpile	Once per project	
Sieve Analysis	California Test 202, California Test 105	30 lb	Stockpile	Once daily	
Sand Equivalent	California Test 217	30 lb	Stockpile	Once daily	
MICRO-SURFACING AGGREGATES					
Los Angeles Abrasion Testing (loss at 500 revolutions)	California Test 211	50 lb	Stockpile	Once per project	
Percentage of Crushed Particles	California Test 205	50 lb	Stockpile	Once per project	
Durability Index	California Test 302	50 lb	Stockpile	Once per project	

Table 6-1.12. Materials Acceptance Sampling and Testing Requirements:
Seal Coats (*Standard Specifications* Section 37) (9 of 9)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
MICRO-SURFACING AGGREGATES (Cont.)					
Sieve Analysis	California Test 202	30 lb	Stockpile	Once daily	
Sand Equivalent	California Test 217	30 lb	Stockpile	Once daily	

Note:
1. Refer to California Test 125 for sampling procedures.

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (1 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
AGGREGATE: All Types of HMA						
Gradation (Sieve Analysis) (See Note 2)	AASHTO T 27, California Test 105, California Test 384	Combined six 20-lb canvas bags (see See Note 3) or Batch 30 lb (proportioned per bin percentages)	HMA plant	For standard process, 1 for each 750 tons, 1 per day minimum For statistical pay factor (SPF) process, per stratified random sampling plan (See Notes 10 and 11)	Production start-up evaluation. For standard process, minimum 1 per day of paving For SPF process, test per stratified random sampling plan (See Note 14)	
Sand Equivalent	AASHTO T 176	Combined six 20-lb canvas bags (See Note 3) or Batch 30 lb (proportioned per bin percentages)	HMA plant or before lime treatment	For standard process, 1 for each 750 tons, 1 per day minimum, For SPF process, same frequency as gradations	Production start-up evaluation. For standard process, minimum 1 per day of paving For SPF process, test with gradation samples	Not required for OGFC (open graded friction course)

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (2 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
AGGREGATE: All Types of HMA						
Percent Crushed Particles (Coarse)	AASHTO T 335	Combined six 20-lb canvas bags (See Note 3) or Batch 30 lb (proportioned per bin percentages)	HMA plant or before lime treatment	1 for each 750 tons, 1 per day minimum For the SPF process, see Note 17	Production start-up evaluation, and minimum 1 random for every 25,000 tons or less of paving For the SPF process, see Note 17	
Percent Crushed Particles (Fine)	AASHTO T 335	Combined six 20-lb canvas bags (See Note 3) or Batch 30 lb (proportioned per bin percentages)	HMA plant or before lime treatment	1 for each 750 tons, 1 per day minimum For the SPF process, see Note 17	Production start-up evaluation, and minimum 1 random for every 25,000 tons or less of paving For the SPF process, see Note 17	
Los Angeles Abrasion Testing (500 Revolutions)	AASHTO T 96	Combined six 20-lb canvas bags (See Note 3) or Batch 30 lb (proportioned per bin percentages)	HMA plant or before lime treatment	1 for each 750 tons, 1 per day minimum For the SPF process, see Note 17	Production start-up evaluation, and minimum 1 random for every 50,000 tons or less of paving For the SPF process, see Note 17	

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (3 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
AGGREGATE: All Types of HMA (Cont.)						
Los Angeles Abrasion Testing (100 Revolutions)	AASHTO T 96	Combined six 20-lb canvas bags (See Note 3) or Batch 30 lb (proportioned per bin percentages)	HMA plant or before lime treatment	1 for each 750 tons, 1 per day minimum For the SPF process, see Note 17	Production start-up evaluation, and minimum 1 random for every 50,000 tons or less of paving For the SPF process, see Note 17	
Fine Aggregate Angularity	AASHTO T 304, Method A	Combined six 20-lb canvas bags (See Note 3) or Batch 30 lb (proportioned per bin percentages)	HMA plant or before lime treatment	1 for each 750 tons, 1 per day minimum For the SPF process, see Note 17	Production start-up evaluation, and minimum 1 random for every 50,000 tons or less of paving For the SPF process, see Note 17	Not required for OGFC or Minor HMA
Flat and Elongated Particles	ASTM D4791	Combined six 20-lb canvas bags (See Note 3) or Batch 30 lb (proportioned per bin percentages)	HMA plant or before lime treatment	1 for each 750 tons, 1 per day minimum For the SPF process, see Note 17	Production start-up evaluation, and minimum 1 random for every 50,000 tons or less of paving For the SPF process, see Note 17	Not required for Minor HMA

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (4 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
ASPHALT BINDER						
Various properties based on asphalt type used (see *Standard Specifications* Section 92)	See *Standard Specifications* Section 92	1-qt double-seal friction-top metal cylindrical shaped can	Asphalt feed line connecting the plant storage tanks	1 per day of HMA production	1 random for every 5 samples	Certificate of compliance required for each shipment; if asphalt binder source is not on approved list, sample and test asphalt before use
ASPHALT RUBBER BINDER						
Asphalt Rubber Binder Properties	See *Standard Specifications* Section 39-2.03A(4)(e)(ii)	1-qt double-seal friction-top metal cylindrical shaped can	Asphalt rubber feed line from the HMA plant	1 every lot	Production start-up evaluation and 1 random per 5 samples	Certificate of compliance required for each lot
Asphalt Rubber Binder Viscosity	ASTM D7741	1 gal double-seal friction-top metal cylindrical shaped can	Asphalt rubber feed line connecting to the HMA plant	1 every lot	1 every lot	For safety, engineer may witness contractor perform test

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (5 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
ASPHALT RUBBER BINDER (Cont.)						
Base Asphalt Binder Properties	See *Standard Specifications* Section 92	1-qt double-seal friction-top metal cylindrical shaped can	Asphalt storage tank	Each shipment	Production start-up evaluation and 1 random per 5 samples	Certificate of compliance required for each shipment; if asphalt binder source is not on approved list, sample and test asphalt before use
Asphalt Modifier Properties	ASTM D445 ASTM D92 ASTM D2007	1-qt double-seal friction-top metal cylindrical shaped can or 1-qt rectangular can with screw-on lid	Sample port on tanker truck	Each shipment	1 random per project	
Crumb Rubber Modifier (CRM) Properties	California Test 208, California Test 385, ASTM D297	CRM scrap tire: Two 2.5 lb in gallon zip-lock bags; CRM high natural: Two 2.5 lb in gallon zip-lock bags	CRM bulk bag	Each shipment	1 random per project	

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (6 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
HOT MIX ASPHALT: Type A						
Moisture Content	AASHTO T 329	10 lb, sealed metal container	Loose mix from behind the paver (See Note 4)	Production start-up evaluation, and minimum 1 per project	Production start-up evaluation, and minimum 1 per project during paving	Test within 1 hour of sampling
Asphalt Binder Content	AASHTO T 308, Method A	60 lb (See Notes 5 and 18) (8x8x4=6 boxes, 8½x8½x4½=4 boxes) (See Notes 5 and 18)	Loose mix from behind the paver (See Note 4)	For standard process, 1 for each 750 tons, 1 per day minimum. For SPF process, per stratified random sampling plan (See Notes 10 and 11)	Production start-up evaluation; For standard process, minimum 1 per day of paving For SPF process, per stratified random sampling plan (See Note 14)	
Maximum Theoretical Density	AASHTO T 209	60 lb (See Notes 5 and 18) (8x8x4=6 boxes, 8½x8½x4½=4 boxes) (See Notes 5 and 18)	Loose mix from behind the paver (See Note 4)	For standard process, 1 for each 750 tons, 1 per day minimum For SPF process, two samples per shift with verification density cores (See Notes 10 and 13)	Production start-up evaluation. For standard process, 1 random test per day of paving For SPF process, per stratified random sampling plan	

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (7 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (See Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
HOT MIX ASPHALT: Type A (Cont.)						
Air Void Content	AASHTO T 269	100 lb (See Note 5) (8x8x4=10 boxes, 8½x8½x4½=8 boxes)	Loose mix from behind the paver (See Note 4)	Production start-up evaluation, 1 every 25,000 tons of paving. For HMA placed using SPF, see Notes 10 and 11	Production start-up evaluation, and minimum 1 random for every 25,000 tons of paving, except for HMA placed using SPF, see Note 14	
Voids in Mineral Aggregate	SP-2 Asphalt Mixture Volumetrics	100 lb (See Note 5) (8x8x4=10 boxes, 8½x8½x4½=8 boxes)	Loose mix from behind the paver (See Note 4)	Production start-up evaluation, 1 every 25,000 tons of paving	Production start-up evaluation, and minimum 1 random for every 25,000 tons of paving	
Dust Proportion	SP-2 Asphalt Mixture Volumetrics	100 lb (See Note 5) (8x8x4=10 boxes, 8½x8½x4½=8 boxes)	Loose mix from behind the paver (See Note 4)	Production start-up evaluation, 1 every 25,000 tons of paving	Production start-up evaluation, and minimum 1 random for every 25,000 tons of paving	

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (8 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
HOT MIX ASPHALT: Type A (Cont.)						
Hamburg Wheel Track	California Test 389	70 lb (See Notes 5 and 18) (8x8x4=7 boxes, 8½x8½x4½=6 boxes)	Loose mix at plant, truck, or windrow	Production start-up evaluation, 1 every 10,000 tons of paving For SPF process, see Note 16	Production start-up evaluation, and minimum 1 random for every 10,000 tons or less of paving For SPF process, see Note 16	Not required for Minor HMA
Moisture Susceptibility	AASHTO T 283	140 lb (See Notes 5, 6 and 18) (8x8x4=15 boxes, 8½x8½x4½=12 boxes)	Loose mix at plant, truck, or windrow	Production start-up evaluation, 1 every 50,000 tons of paving	Production start-up evaluation, and minimum 1 random test for every 50,000 tons of paving	Test for dry strength and wet strength; not required for Minor HMA
HOT MIX ASPHALT: With RAP/RAS						
Binder Recovery	AASHTO T 164 ASTM D1856	10 lb (8x8x4=1 box, 8½x8½x4½=1 box) (See Note 18)	Loose mix from behind the paver (See Note 4)	Production start-up evaluation, 1 every 25,000 tons of paving	1 random for every 25,000 tons or less of paving	

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (9 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
RUBBERIZED HOT MIX ASPHALT: Gap Graded						
Moisture Content	AASHTO T 329	10 lb, sealed metal container	Loose mix from behind the paver (See Note 4)	Production start-up evaluation, and minimum 1 per project	Production start-up evaluation, and minimum 1 per project during paving	Test within 1 hour of sampling
Asphalt Binder Content	AASHTO T 308, Method A	60 lb (See Notes 5 and 18) (8x8x4=6 boxes, 8½x8½x4½=4 boxes)	Loose mix from behind the paver (See Note 4)	1 for each 750 tons, 1 per day minimum. For HMA placed using SPF, see Notes 10 and 11	Production start-up evaluation; 1 random test per day of paving. For HMA placed using SPF, see Note 10	
Maximum Theoretical Density	AASHTO T 209	60 lb (See Notes 5 and 18) (8x8x4=6 boxes, 8½x8½x4½=4 boxes)	Loose mix from behind the paver (See Note 4)	1 for each 750 tons, 1 per day minimum. For HMA placed using SPF, see Notes 11 and 13	Production start-up evaluation; minimum 1 per day of paving, except for HMA placed using SPF, see Notes 10 and 13	

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (10 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
RUBBERIZED HOT MIX ASPHALT: Gap Graded (Cont.)						
Air Void Content	AASHTO T 269	100 lb (See Notes 5 and 18) (8x8x4= 10 boxes, 8½x8½x4½=8 boxes)	Loose mix from behind the paver (See Note 4)	Production start-up evaluation, 1 every 25,000 tons of paving. For HMA placed using SPF, see notes 10 and 11	Production start-up evaluation, and minimum 1 random test for every 25,000 tons of paving For SPF process, test per stratified random sampling plan. See note 14	
Voids in Mineral Aggregate	SP-2 Asphalt Mixture Volumetrics	100 lb (See Notes 5 and 18) (8x8x4= 10 boxes, 8½x8½x4½=8 boxes)	Loose mix from behind the paver (See Note 4)	Production start-up evaluation, 1 every 25,000 tons of paving	Production start-up evaluation, and minimum 1 random test for every 25,000 tons of paving	
Dust Proportion	SP-2 Asphalt Mixture Volumetrics	100 lb (See Notes 5 and 18) (boxes, 8x8x4=10 boxes, 8½x8½x4½=8 boxes)	Loose mix from behind the paver (See Note 4)	Production start-up evaluation, 1 every 25,000 tons of paving	Production start-up evaluation, and minimum 1 random test for every 25,000 tons of paving	

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (11 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
RUBBERIZED HOT MIX ASPHALT: Gap Graded (Cont.)						
Hamburg Wheel Track	California Test 389	75 lb (See Notes 5 and 18) (8x8x4=7 boxes, 8½x8½x4½=6 boxes)	Loose mix at plant, truck, or windrow	Production start-up evaluation 1 every 10,000 tons of paving For SPF process, see Note 16	Production start-up evaluation, and minimum 1 random test for every 10,000 tons or less of paving For SPF process, see Note 16	
Moisture Susceptibility	AASHTO T 283	75 lb (See Notes 5, 6 and 18) (8x8x4= 15 boxes, 8½x8½x4½=12 boxes)	Loose mix at plant, truck, or windrow	Production start-up evaluation, 1 every 50,000 tons of paving	Production start-up evaluation, and minimum 1 random test for every 50,000 tons of paving	Test for dry strength and wet strength
OPEN GRADED FRICTION COURSE (OGFC)						
Asphalt Binder Content	AASHTO T 308, Method A	20 lb (See Note 5) 4, 1-gal metal containers with friction lids	Loose mix from behind the paver (See Note 4)	1 for each 750 tons, 1 per day minimum	Production start-up evaluation; minimum 1 per day of paving	

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (12 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
OPEN GRADED FRICTION COURSE (OGFC) (Cont.)						
Moisture Content	AASHTO T 329	10 lb, sealed metal container	Loose mix from behind the paver (See Note 4)	Production start-up evaluation, and minimum 1 per project	Production start-up evaluation, and minimum 1 per project during paving	Test within 1 hour of sampling
BONDED WEARING COURSE: Gap Graded (BWC-G) (See Note 7)						
Asphalt Binder Content	AASHTO T 308, Method A	20 lb (See Note 5) 4, 1-gal metal containers with friction lids	Loose mix at plant	1 for each 750 tons, 1 per day minimum	Production start-up evaluation. Minimum 1 per day of paving	
Moisture Content	AASHTO T 329	10 lb sealed metal container	Loose mix at plant	Production start-up evaluation, and minimum 1 per project	Production start-up evaluation, and minimum 1 per project during paving	Samples should be tested within 1 hour of sampling
PAVEMENT DENSITY						
Density of cores (% of maximum theoretical density) (See Note 8)	California Test 375	4- or 6–in cores	Final layer, cored to the specified total paved thickness	For the standard process, 1 for each 250 tons For the SPF process, see Note 12	For the standard process, 1 for each 250 tons For SPF process, test per stratified random sampling plan. See Note 14	Density applies to HMA thickness of 0.15 ft or greater

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (13 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (See Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
PAVEMENT SMOOTHNESS						
Straightedge	N/A	N/A	Pavement surface (See Note 9)	Entire final surface	Entire final surface	Areas exempt from Inertial Profiler
Inertial Profiler for Mean Roughness Index and Areas of Localized Roughness	California Test 387 AASHTO R 56 & AASHTO R 57	Each 0.1 mile	Pavement surface	Entire final surface	Entire final surface	Entire final surface excluding areas requiring straightedge; use contractor-furnished profiles for IRI values within 10% of Caltrans' IRI values
TACK COAT						
Asphalt Binder	Based on asphalt type used (see *Standard Specifi-cations* Section 92)	1-qt double-seal friction-top metal cylindrical shaped can	Spray bar on asphalt distributor truck	Each truckload	1 random per project	

Table 6-1.13. Materials Acceptance Sampling and Testing Requirements: Asphalt Concrete (*Standard Specifications* Section 39) (14 of 14)

Test	Test Method	Sample Size & Container Type	Sampling Location (See Note 1)	Sampling Frequency	Acceptance Test Frequency	Remarks
TACK COAT (Cont.)						
$pread Rate	ASTM D2995	N/A	Pavement	N/A	As necessary for verification of tack coat spread rate	Verify tack coat spray rate is sufficient to meet the minimum specified residual rate. (See example in Section 4-9403, "During the Course of Work," in this manual)
Asphaltic Emulsion	Based on emulsion type used (see *Standard Specifi-cations* Section 94)	1 liter (or 1 qt) wide-mouth plastic bottle with screw on lids that are sealed with tape	Spray bar on emulsion distributor truck	Each truckload	1 random per project	

Notes:

1. Refer to California Test 125 for sampling procedures.
2. When using RAP, RAS, or RAP/RAS, adjust gradation by the correction factor determined under California Test 384.
3. Store three 20-lb canvas bags for dispute resolution.
4. Sampling HMA behind the paver is the preferred location. You may also take samples from the windrow, production plant, or truck.
5. Sample sizes are based on split samples—one sample for acceptance testing, and one for dispute resolution. Store one-half of the boxes or cans for dispute resolution.

6. Contractor ships directly to district material laboratory.
7. For bonded wearing course using RHMA-G, RHMA-O, or HMA-O, sampling and testing must comply with requirements for RHMA-G, RHMA-O, or HMA-O.
8. Determine percent of maximum theoretical density under California Test 375, except use AASHTO T 275 to determine in-place density of each core and AASHTO T 209, Method A to determine maximum theoretical density instead of calculating maximum density.
9. May use Inertial Profiler data and ProVAL Rolling Straightedge module to assist in determining where to check with 12-foot straightedge.
10. For the statistical pay factor (SPF) process, and for each lot, prepare a stratified random sampling plan for the following pay factor quality characteristic: aggregate gradations, binder content, air voids, and percent of maximum theoretical density. Sample at milestones identified in the stratified random sampling plan. Do not share the verification sampling time or location with the contractor until immediately before sampling. Do not share the stratified random sampling plan with the contractor until completion of the lot. For guidance on developing the engineer's stratified random sampling plans, refer to section 4-3902K, "Stratified Random Sampling Plan" of this manual.
11. Obtain enough material to split each sample into four parts. Perform verification testing on one part, provide one part to the contractor, hold one part for dispute resolution testing, and reserve the fourth part for additional verification testing in the event the lot runs short and you do not have at least the 3 tests needed for verification.
12. To determine in-place density, obtain verification density cores from the contractor's sublot identified in the engineer's stratified random sampling plan. Break the identified sublot into three equal parts, and randomly determine the coring location of each part. At each location, core three samples aligned longitudinally within 1 to 2 feet of the center core. Retain the center core for verification testing, and randomly determine which of the two remaining cores will be provided to the contractor and which will be retained by the engineer.
13. To determine the paving shift's maximum theoretical density value used for verification of percent in-place density, obtain two samples of HMA from each paving shift the verification density cores are obtained from. Determine the shift's maximum theoretical density value used for the verification by averaging the test results of the two samples. The two samples must be obtained randomly from the first and last half of the paving shift, or from a split of a single sample pulled within the sublot the density cores are obtained from.
14. Do not share the test results of pay factor quality characteristics with the contractor until completion of the lot.
15. For HMA placed using SPF, during production, sample non-pay factor items at the frequency determined by the engineer. Notify the contractor of your intent to sample, and obtain enough material to split into four parts. Test one part, provide one part to the contractor, and retain one part for independent third-party testing. When sampling for non-pay factors, except sand equivalent testing, pull two samples from two consecutive sublots. If the first sample fails, immediately test the second sample. Refer to Section 4-3904A(5), "Monitoring Non-Pay Factor Quality Characteristics Using Statistical Pay Factor Specifications" of this manual for guidance related to non-pay factor testing.
16. For HMA placed using SPF, when sampling for Hamburg Wheel Track, pull one additional sample for testing from the contractor's next sublot. Test this second sample if the first sample fails.

17. For HMA placed using SPF, sample at same frequency as aggregate gradations, except pull two samples and test the second sample if the first sample fails.
18. Box quantities indicated represent recommended amounts for each individual test. Use CT 125 Appendix B Table 1 for more comprehensive quantities or suites of tests.

Table 6-1.14. Materials Acceptance Sampling and Testing Requirements: Concrete Pavement (*Standard Specifications* Section 40) (1 of 2)
See Table 6-1.17. for concrete materials

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
CONCRETE					
Modulus of Rupture (Open to Traffic)	California Test 523 (Field Curing)	3 beams of 6x6x20 in. for third-point loading	Concrete truck discharge chute	1 set for the last pavement section placed before opening to traffic	Not used for acceptance, only to verify that pavement can be opened to traffic
Compressive Strength Equivalent to Modulus of Rupture (42-days)	California Test 540, California Test 521	3 cylinders of the same size (either 6x12 in. or 4x8 in.) for compressive strength equivalent to Modulus of Rupture	Concrete truck discharge chute	1 set per age for each 1,000 cu yd, 1 per day minimum (See Note 2)	Recommend frequency of every 2,000 cu yd if after 10 sets all tests are in compliance
Air Content	California Test 504	See test method	Concrete truck discharge chute	1 every day of production	Only test when air entrainment is specified
Use of the Maturity Method (Open to Traffic)	ASTM C1074, California Test 523 (Field Curing), California Test 540, California Test 521	Contractor develops the strength-maturity relationship using specimens prepared under ASTM C1074	Estimate in-place strength of concrete based on strength-maturity relationship per ASTM C1074 and sensors embedded in the concrete placement	Place a sensor at the beginning and end of the concrete placement	Not used for acceptance, only to verify that pavement can be opened to traffic. Contractor validates test strip once and every 15,000 cu yd or 30 days, whichever comes first.

Table 6-1.14. Materials Acceptance Sampling and Testing Requirements: Concrete Pavement (*Standard Specifications* Section 40) (2 of 2)
See Table 6-1.17. for concrete materials

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
PAVEMENT					
Thickness	California Test 531	4-in. diameter core, full thickness of pavement	See Section 4-4004, "Level of Inspection," of this manual	1 every 1,200 sq yd	
Dowel Bar Alignment and Concrete Consolidation	Measurement and Inspection	4-in. diameter core size	Transverse pavement joints	1 test every 700 sq yd	Each test consists of 2 cores, one on each end of dowel bar
Tie Bar Alignment and Concrete Consolidation	Measurement and Inspection	4-in. diameter core size	Longitudinal pavement joints	1 test every 4,000 sq yd	Each test consists of 2 cores, one on each end of tie bar
Coefficient of Friction	California Test 342	N/A	Pavement surface	1 test for each day of paving	Each test consists of 5 measurements
Smoothness - Straightedge	Measurement with 12-ft straightedge	N/A	Pavement surface	Entire final surface requiring straightedge	
Smoothness - Inertial Profiler for Mean Roughness Index and Areas of Localized Roughness	AASHTO R 56, AASHTO R 57, and California Test 387	0.1 mile	Pavement surface	Entire final surface	Entire final surface excluding areas requiring straightedge; use contractor-furnished profiles for IRI values within 10% of Caltrans' IRI values

Notes:

1. Refer to California Test 125 for sampling procedures.
2. If concrete compressive strength is close to specification limit or outside the specification limits, sample and test concrete every 1,000 cu yd so that deductions may be taken for noncompliant material.

Table 6-1.15. Materials Acceptance Sampling and Testing Requirements: Existing Concrete Pavement (*Standard Specifications* Section 41)

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
INDIVIDUAL SLAB REPLACEMENT WITH RAPID STRENGTH CONCRETE (Section 41-9)					
Coefficient of Friction	California Test 342	N/A	Pavement surface	1 every 1,200 sq yd	Each test consists of 5 measurements
Smoothness - Straightedge	Measurement with 12-ft straightedge	N/A	Pavement surface	Entire final surface	Areas exempt from Inertial Profiler
Modulus of rupture (3-days)	California Test 524	3 beams of 6x6x20 inches	Concrete truck discharge chute	1 per shift	

Notes:

1. Refer to California Test 125 for sampling procedures.

Table 6-1.16. Materials Acceptance Sampling and Testing Requirements: Concrete Structures (*Standard Specifications* Section 51)
See Table 6-1.17. for concrete materials

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
JOINT SEALS TYPE B (Section 51-2.02C)					
Various properties; must comply with *Standard Specifications* Section 51-2.02C(2)	See *Standard Specifications* Section 51-2.02C(2)	1 piece, 3 ft	Job site	Each lot	Certificate of compliance and certified test report required for each lot; test report must include the seal movement range, manufacturer minimum uncompressed width and test results; submit samples at least 30 days before use
JOINT SEALS TYPE A AND TYPE AL (Section 51-2.02B)					
	Use Authorized Materials List at: https://dot.ca.gov/programs/engineering-services/authorized-materials-lists			Type A and AL joint seals must be on the Authorized Materials List for Type A and AL joint seals	Submit a certificate of compliance for each batch of sealant at least 15 days before use

Notes:

1. Refer to California Test 125 for sampling procedures.

Table 6-1.17. Materials Acceptance Sampling and Testing Requirements: Concrete (*Standard Specifications* Section 90) (1 of 9)
Concrete, Except Minor Concrete and Rapid Strength Concrete

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
AGGREGATE: Coarse Aggregate					
Los Angeles Abrasion Testing (loss at 500 revolu-tions)	Cali-fornia Test 211	See Note 2	Stockpile	Before production and minimum 1 random test for every 25,000 cu yd	1 for every 4,000 cu yd, if initial test shows abrasion loss greater than 40%
Clean-ness Value	Cali-fornia Test 227	25 lb	Stockpile	Before production and minimum 1 for every 600 cu yd, 1 per day minimum	Recommend 1 acceptance test per day if 3 consecutive results exceed 80; increase sampling to 1 for every 300 cu yd (deductive lot) with engineer's authorization
Sieve Analysis	Cali-fornia Test 202	50 lb	Belt Feed	Before production and minimum 1 for every 600 cu yd, 1 per day minimum	Recommend 1 acceptance test per day if 3 consecutive results are within operating range; increase sampling to 1 for every 300 cu yd (deductive lot) with engineer's authorization
AGGREGATE: Fine Aggregate					
Organic Impurities	Cali-fornia Test 213	See Note 2	Stockpile	Before production or when contamination is suspected	
Durability	Cali-fornia Test 229	See Note 2	Stockpile	Before production	
Sand Equivalent	Cali-fornia Test 217	25 lb	Stockpile	Before production and minimum 1 for every 600 cu yd, 1 per day minimum	Recommend 1 acceptance test per day if 3 consecutive results exceed 80; increase sampling to 1 for every 300 cu yd (deductive lot) with engineer's authorization

Table 6-1.17. Materials Acceptance Sampling and Testing Requirements: Concrete (*Standard Specifications* Section 90) (2 of 9)
Concrete, Except Minor Concrete and Rapid Strength Concrete

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
AGGREGATE: Fine Aggregate					
Sieve Analysis	California Test 202	50 lb	Belt feed	Before production and minimum 1 for every 600 cu yd, 1 per day minimum	Recommend 1 acceptance test per day if 3 consecutive results are within operating range; increase sampling to 1 for every 300 cu yd (deductive lot) with engineer's authorization
AGGREGATE: **Coarse & Fine Aggregate**					
Specific Gravity and Absorption	California Test 206, California Test 207	See Note 2	Stockpile	Before production and when aggregate source changes	
Soundness	California Test 214	See Note 2	Stockpile	Before production	Soundness for fine aggregate waived if durability is ≥ 60
Sieve Analysis (combined gradation determined with fine and coarse aggregate sieve analyses)	California Test 202		N/A	Before production and minimum 1 for every 600 cu yd, 1 per day minimum	Recommend 1 acceptance test per day if 3 consecutive results are within operating range. Increase sampling to 1 for every 300 cu yd (deductive lot) with engineer's authorization

Table 6-1.17. Materials Acceptance Sampling and Testing Requirements:
Concrete (*Standard Specifications* Section 90) (3 of 9)
Concrete, Except Minor Concrete and Rapid Strength Concrete

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
CEMENTITIOUS MATERIALS					
Cement, various properties; must comply with *Standard Specifications* Section 90-1.02B(2)	See *Standard Specifications* Section 90-1.02B(2)	8 lb	Concrete plant	Sample each 100 tons of cement, 2 per day maximum	Cement must be on Authorized Materials List; cement accepted based on certificate of compliance with each shipment; recommend 1 verification test per 5 samples
Supplementary Cementitious Materials (SCM), various properties; must comply with *Standard Specifications* Section 90-1.02B(3)	See *Standard Specifications* Section 90-1.02B(3)	8 lb	Concrete plant	Sample each 100 tons of SCM, 2 per day maximum	SCM must be on Authorized Materials List; SCM accepted based on certificate of compliance with each shipment; recommend 1 verification test per 5 samples
WATER					
Chlorides	California Test 422	Clean 2-qt plastic jug with lined, sealed lid	At point of use	1 per source	Water supplies for domestic use do not need to be tested
Sulfates	California Test 417	Clean 2-qt plastic jug with lined, sealed lid	At point of use	1 per source	Water supplies for domestic use do not need to be tested
Setting Time	ASTM C 191 or ASTM C 266	Contact METS for required quantity of water sample	At point of use	1 per source	Water supplies for domestic use do not need to be tested

Table 6-1.17. Materials Acceptance Sampling and Testing Requirements:
Concrete (Standard Specifications Section 90) (4 of 9)
Concrete, Except Minor Concrete and Rapid Strength Concrete

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
WATER (Cont.)					
Mortar Compressive Strength	ASTM C109	Contact METS for required quantity of water sample	At point of use	1 per source	Water supplies for domestic use do not need to be tested
Coloring Agents	Must comply with *Standard Specifications* Section 90-1.02D	Contact METS for required quantity of water sample	At point of use	1 per source	Water supplies for domestic use do not need to be tested
Alkalis	Must comply with *Standard Specifications* Section 90-1.02D	Contact METS for required quantity of water sample	At point of use	1 per source	Water supplies for domestic use do not need to be tested
Specific Gravity	Must comply with *Standard Specifications* Section 90-1.02D	Contact METS for required quantity of water sample	At point of use	1 per source	Water supplies for domestic use do not need to be tested
ADMIXTURES: Air Entraining Agent					
Air entraining properties Must comply with *Standard Specifications* Section 90-1.02E	See *Standard Specifications* Section 90-1.02E	1-qt can or plastic bottle of liquid, 2 lb of powder	Concrete plant	Sample each shipment	Must be on Authorized Materials List and certificate of compliance must accompany each shipment; recommend 1 verification test per 5 samples

Table 6-1.17. Materials Acceptance Sampling and Testing Requirements:
Concrete (*Standard Specifications* Section 90) (5 of 9)
Concrete, Except Minor Concrete and Rapid Strength Concrete

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
CHEMICAL ADMIXTURE: Water Reducers or Set Retarders					
Claimed properties, chloride identification	ASTM C494 Type A, B, D, F or Type G California Test 415	1-qt can of liquid, 2 lb of powder	Concrete plant	Sample each shipment	Must be on Authorized Materials List and certificate of compliance must accompany each shipment; recommend 1 verification test per 5 samples
CONCRETE for Pavement and Structures					
Shrinkage	AASHTO T 160 Modified See *Standard Specifications* Section 90-1.01D(3)	Set of three: 4x4x11¼ in.	During mix design process	Before production	Engineer may use contractor-provided test result for acceptance; test results must be within 3 years of contract authorization date
CONCRETE Designated Compressive Strength 3,600 psi or Greater					
Yield	California Test 518	See test method	Concrete truck discharge chute; (See Note 3)	As necessary to assure accuracy of mix design; minimum 2 per each mix design	No deductions for cement content will be made based on the results of California Test 518
Concrete Uniformity	ASTM C143, California Test 533	See test method	Concrete truck discharge chute (See Note 3)	When compressive test specimen is fabricated and when consistency or uniformity is questionable, minimum 2 per day	

Table 6-1.17. Materials Acceptance Sampling and Testing Requirements: Concrete (*Standard Specifications* Section 90) (6 of 9)
Concrete, Except Minor Concrete and Rapid Strength Concrete

Test	Test Method	Sample Size & Container Size	Sampling Location See Note 1)	Acceptance Test Frequency	Remarks
CONCRETE Designated Compressive Strength 3,600 psi or Greater (Cont.)					
Concrete Uniformity	California Test 529	100 lb	Concrete truck discharge chute (See Note 3)	When uniformity is questionable	
Compressive Strength	ASTM C172, California Test 540	1 set of 2 cylinders 6x12 in. or 1 set of 3 cylinders 4x8 in. for each test	Concrete truck discharge chute (See Note 3)	1 set per age for every 300 cu yd concrete or as required for acceptance, minimum 1 set per project	For trial batches, see *Standard Specifications* or job special provisions and Section 6-3, "Field Tests," of this manual
Air Content	California Test 504	See test method	Concrete truck discharge chute (See Note 3)	1 every 4 hours of production and when test specimens are fabricated	Where air is specified for freeze-thaw resistance, a minimum of 1 every 30 cu yd
CONCRETE WITH COMPRESSIVE STRENGTH LESS THAN 3,600 psi					
Concrete Uniformity	ASTM C143, California Test 533	See test method	Concrete truck discharge chute (See Note 3)	When compressive test specimen is fabricated and when uniformity is questionable	

Table 6-1.17. Materials Acceptance Sampling and Testing Requirements:
Concrete (*Standard Specifications* Section 90) (7 of 9)
Concrete, Except Minor Concrete and Rapid Strength Concrete

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
CONCRETE WITH COMPRESSIVE STRENGTH LESS THAN 3,600 psi					
Concrete Uniformity	California Test 529	100 lb	Concrete truck discharge chute (See Note 3)	When uniformity is questionable	
Compressive Strength	California Test 540, California Test 521	1 set of 2 cylinders, 6x12 in. or 1 set of 3 cylinders 4x8 in. for each test	Concrete truck discharge chute (See Note 3)	1 set per age for every 300 cu yd, minimum 1 set per project	
Air Content	California Test 504	See test method	Concrete truck discharge chute (See Note 3)	When compressive test specimens are fabricated	Where air is specified for freeze-thaw resistance, a minimum of 1 every 100 cu yd
CURING COMPOUND					
Curing Compound; must comply with *Standard Specifications* Section 90-1.03B(3)	ASTM C309	1-qt can	At time of use (See Note 1)	1 every shipment	Each shipment must have certificate of compliance that includes: 1. Test results for tests specified in Section 90-1.01D(6) of *Standard Specifications* 2. Certification that material was tested within 12 months before use

Table 6-1.17. Materials Acceptance Sampling and Testing Requirements: Concrete (*Standard Specifications* Section 90) (8 of 9)
Concrete, Except Minor Concrete and Rapid Strength Concrete

Test	Test Method	Sample Size & Container Size	Sampling Location (Note 1)	Acceptance Test Frequency	Remarks
CEMENTITIOUS MATERIALS					
Cement, various properties; must comply with *Standard Specifications* Section 90-1.02B(2)	See *Standard Specifications* Section 90-1.02B(2)	8 lb	Concrete plant	Sample and test if cement quality is questionable	Cement source must be shown on Authorized Materials List; certificate of compliance must accompany each cement shipment
Supplementary cementitious materials (SCM), various properties; must comply with *Standard Specifications* Section 90-1.02B(3)	See *Standard Specifications* Section 90-1.02B(3)	8 lb	Concrete plant	Sample and test if SCM quality is questionable	SCM source must be shown on Authorized Materials List; certificate of compliance must accompany each SCM shipment
ADMIXTURES: Air Entraining Agent					
Air entraining properties; must comply with *Standard Specifications* Section 90-1.02E	See *Standard Specifications* Section 90-1.02E	N/A	N/A		Must be on Authorized Materials List and certificate of compliance must accompany each shipment
CHEMICAL ADMIXTURES: Water Reducers or Set Retarders					
Claimed properties, chloride identification	ASTM C494 Type A, B, D, F or Type G California Test 415	N/A	N/A		Must be on Authorized Materials List and certificate of compliance must accompany each shipment

Table 6-1.17. Materials Acceptance Sampling and Testing Requirements: Concrete (*Standard Specifications* Section 90) (9 of 9)
Minor Concrete

Test	Test Method	Sample Size & Container Size	Sampling Location	Acceptance Test Frequency	Remarks
CONCRETE					
Yield	California Test 518	See test method	Concrete truck discharge chute (See Note 3)	As necessary to assure accuracy of mix design; minimum 1 per each mix design	No deductions for cement content will be made based on the results of California Test 518
Com-pressive Strength	California Test 540, California Test 521	1 set of 2 cylinders 6x12 in. or 1 set of 3 cylinders 4x8 in. for each test	Concrete truck discharge chute (See Note 3)	Sample and test if concrete quality is questionable; minimum 1 per mix design	Minor concrete must have the strength described or 2,500 psi, whichever is greater; see *Standard Specifications* Section 90-1.02A
Air Content	California Test 504	See test method	Concrete truck discharge chute (See Note 3)	Where air is specified for freeze-thaw resistance, a minimum of 1 every 100 cu yd	
CURING COMPOUND					
Curing Compound; must comply with *Standard Specifi-cations* Section 90-1.03B(3)	ASTM C309	1-qt can	At time of use; (See Note 1)	1 every shipment	Each shipment must have certificate of compliance that includes: 1. Results for tests specified in Section 90-1.01D(6) of *Standard Specifications* 2. Certification that material was tested within 12 months before use

Notes:

1. Refer to California Test 125 for sampling procedures.

2. For initial testing, provide 100 lb of 1-1/2 in. x 3/4 in., 75 lb of 3/4 in. x No. 4, 75 lb of pea gravel, and 50 lb of sand. Use this material for California Test 202, 206, 207, 211, 213, 214, 217, 227 and 229.
3. Refer to California Test 539 for method of sampling fresh concrete.

Table 6-1.18. Materials Acceptance Sampling and Testing Requirements: Miscellaneous Materials (1 of 5)

Test	Test Method	Sample Size & Container Size	Sampling Location	Acceptance Test Frequency	Remarks
BARBED WIRE AND WIRE MESH FENCES (Section 80-2)					
Barbed Wire, various properties; must comply with *Standard Specifications* Section 80-2.02D	ASTM A121	1 yd length	Job site	As necessary for verification if quality is questionable	
BOLTS AND HARDWARE (Section 75)					
		2 samples each diameter		Each lot	Sample and test if not previously inspected at the source
CHAIN LINK FENCES (Section 80-3)					
Wire Mesh, various properties; must comply with *Standard Specifications* Section 80	ASTM A116, Class 1	2 ft width	Job site	Each lot for verification if quality is questionable	Certificate of compliance required for vinyl clad fencing
CONCRETE PIPE (Section 65)					
Compliance with specifications		Contact METS for instructions		Contact METS for instructions	Sample and test if not previously inspected at source
CONDUIT (Section 86-1.02B)					
Conduit, various properties; must comply with *Standard Specifications* Section 86-1.02B	See *Standard Specifi-cations* Section 86-1.02B	2 ft. long from center of length, 2 samples each size	Job site	As necessary for verification if quality is questionable	

Table 6-1.18. Materials Acceptance Sampling and Testing Requirements: Miscellaneous Materials (2 of 5)

Test	Test Method	Sample Size & Container Size	Sampling Location	Acceptance Test Frequency	Remarks
ELECTRICAL CONDUCTORS AND CABLES (Section 86-1.02F)					
Electrical conductors and cables, various properties; must comply with *Standard Specifications* Section 86-1.02F	See *Standard Specifications* Section 86	2 ft. long, include markings, 2 samples per gauge	Job site	Each lot for verification if quality is questionable	
EXPANSION JOINT FILLER					
Compliance with specifications		6 in. long, full width of sheet		Each 1,000 sq ft not less than 2 per shipment	
GEOSYNTHETICS (Section 96)					
Various properties; must comply with *Standard Specifications* Section 96	See *Standard Specifications* Section 96	1 piece, 3 ft x full width of roll	Job site	Each lot for verification if quality is questionable. See Remarks	Certificate of compliance required for each lot; unroll at least 1 circumference before sampling
PAINT (Section 91)					
Paint, various properties; must comply with *Standard Specifications* Section 91	See *Standard Specifications* Section 91	For miscellaneous painting, 1 qt (see Section 6-2 of this manual)	Job site	Each batch	If less than 20 gallons, testing not required and resident engineer must field release. Zinc-rich primer must be on the Authorized Materials List
PAVEMENT MARKERS (Section 81-3)					
Pavement Markers, various properties; must comply with *Standard Specifications* Section 81-3	See *Standard Specifications* Section 81-3	20 markers	Job site	As necessary for verification if quality is questionable	Each shipment must have certificate of compliance

Table 6-1.18. Materials Acceptance Sampling and Testing Requirements: Miscellaneous Materials (3 of 5)

Test	Test Method	Sample Size & Container Size	Sampling Location	Acceptance Test Frequency	Remarks
PERMEABLE MATERIALS: (Section 68-2.02F)					
Durability Index	California Test 229	50 lb	Stockpile	Before use	
Sieve Analysis	California Test 202	50 lb	Stockpile	Before use,1 every day	
PERMEABLE MATERIALS: Class 3 (Section 68-2.02F)					
Crushed Faces	California Test 205	50 lb	Stockpile	Before use	
PRESTRESSED TENDON GROUT (Section 50)					
Efflux time	California Test 541	One 6x12 in. cylinder mold can	From batch immediately after mixing for prequalification, thereafter from outlet end of tendon, storage tank, or both	At the start of each day's work, and thereafter 1 test per each 5% of ducts; see Remarks	Repeat acceptance tests whenever source of material is changed
RAISED BARS (PRECAST)					
Compliance with specifications		1 unit or full size bar		Each lot	Sample and test if not previously inspected at the source
REINFORCING STEEL (Section 52)					
Reinforcing Steel, various properties	See *Standard Specifi-cations* Section 52	2 samples, 30 in., except 40 in. for No. 14 and No. 18	Job site	As necessary for verification if quality is questionable	Each shipment must be accompanied by a certificate of compliance
SLOPE PROTECTION (Section 72)					
Size	N/A		Quarry or stockpile	As required for acceptance	Adequate size of slope protection documented by measuring or weighing the material
Apparent Specific Gravity	California Test 206	75 lb	Quarry or stockpile	Before use	

Table 6-1.18. Materials Acceptance Sampling and Testing Requirements: Miscellaneous Materials (4 of 5)

Test	Test Method	Sample Size & Container Size	Sampling Location	Acceptance Test Frequency	Remarks
SLOPE PROTECTION (Section 72) (Cont.)					
Absorption	California Test 206	75 lb	Quarry or stockpile	Before use	
Durability Index	California Test 229	75 lb	Quarry or stockpile	Before use	
STEEL PRODUCTS					
		Contact METS for instructions		Contact METS for instructions	
STRUCTURAL STEEL AND MISCELLANEOUS METAL (Sections 55 & 75)					
		2 samples, 30-in., cut parallel to direction of rolling		Each heat or melt or 10 tons or fraction	Sample and test if not previously inspected at the source
STRUCTURAL STEEL COATINGS (Section 59)					
Paint, various properties; must comply with *Standard Specifications* Section 59	See *Standard Specifi-cations* Section 59	For bridge or major structure, send an unopened 5-gal can	Job site	Each batch; see Remarks	Unused portion of 5-gal sample will be returned to job; see Section 6-2, "Acceptance of Manufactured or Fabricated Materials and Products," of this manual
WATERPROOFING MATERIALS (Section 54)					
Glass Fiber	ASTM D1668, Type 1	9 sq ft of asphalt saturated cotton fabric	Job site	1 sample from each lot	
Asphalt	ASTM D449	5 lb of asphalt	Job site	1 sample from each lot	
Primer	ASTM D41	1 qt of asphalt primer	Job site	1 sample from each lot	

Table 6-1.18. Materials Acceptance Sampling and Testing Requirements: Miscellaneous Materials (5 of 5)

Test	Test Method	Sample Size & Container Size	Sampling Location	Acceptance Test Frequency	Remarks
WELDED WIRE REINFORCEMENT (Section 52-1.02C)					
Welded Wire Reinforcing Steel, must comply with *Standard Specifi-cations* Section 52-1.02C	ASTM A 1064/A 1064M	9 sq ft	Job site	As necessary for verification if quality is questionable	Each shipment must be accompanied by a certificate of compliance