STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

# MANUAL CHANGE TRANSMITTAL		NO. **22-6**
TITLE: Department of Transportation *Construction Manual*	APPROVED BY:  Ramon Hopkins, Chief Division of Construction	DATE ISSUED: **12-5-2022**
SUBJECT AREA Sections 4-36, 4-42, 4-51, 6-1, 6-2	ISSUING UNIT Division of Construction	
SUPERSEDES Sections 4-36 of July 2019, 4-42 of July 2019, 4-51 of July 2019, 6-1 of March 2022, and 6-2 of September 2019	DISTRIBUTION All Requested Manual Holders	

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:

Section 4-36, "Surfacing and Pavements—General"

Updates guidance to match updated pavement smoothness nonstandard special provisions (nSSPs). The *Construction Manual* and *Pavement Smoothness Guidelines* are being updated to match the April 15, 2022 specifications. Adds details on preconstruction conference discussions and offers guidance on smoothness measuring and reporting.

Section 4-42, "Groove and Grind Concrete"

Updates guidance to match updated pavement smoothness nSSPs. The *Construction Manual* and *Pavement Smoothness Guidelines* are being updated to match the April 15, 2022, specifications. Update includes new references to *Standard Specifications* and updated email address for submission of profile information.

Section 4-51, "Concrete Structures"

Updates language to refer to "movement range" rather than "movement rating" on joint seal assemblies to match October 24, 2022, change in the *Standard Specifications*.

Section 6-1, "Sample Types and Frequencies"

Updates guidance to include use of Data Interchange for Material Engineering, an online web application developed by Caltrans' Materials Engineering and Testing Services. The application collects and stores material sample and testing information on California transportation

projects. Corrects guidance on laboratory accreditation by AASHTO re:source and updates Table 6-1.2, “Time Required for Materials Acceptance Tests,” to list correct HMA types and updates reference to “movement rating” of joint seal assemblies in Table 6-1.16 to match specification issued October 24, 2022.

Section 6-2, “Sample Types and Frequencies”

Changes language on joint seal assemblies in Tables 6-2.1 and 6-2.3 from “movement rating” to “movement range” to match updated specifications.

Chapter 4 Construction Details

Section 36 Surfacing and Pavements—General

Chapter 4 Construction Details

Section 36 Surfacing and Pavements—General

4-3601 General

Section 36, "General," of the *Standard Specifications* includes general requirements for sections within Division V, "Surfacings and Pavements" of the *Standard Specifications.*

This section provides general guidelines for preconstruction meetings and pavement smoothness. Refer to the sections listed in Table 4-36.1, "Additional Information for Surfacing and Pavements," of this manual for additional information.

Table 4-36.1. Additional Information for Surfacing and Pavements

Section Title	Standard Specification Section	Construction Manual Section
Bituminous Seals	37	4-37
Asphalt Concrete	39	4-39
Concrete Pavement	40	4-40
Existing Concrete Pavement	41	4-41
Groove and Grind Concrete	42	4-42

This section also includes inspection guidelines for base bond breaker that is applied between a base and concrete pavement.

4-3602 Before Work Begins

4-3602A Preconstruction Meetings

Hold a preconstruction meeting to discuss the surfacing and paving operation work a minimum of 3 business days before the start of the work. This meeting is specific to the surfacing or paving work and is not the same meeting as required in Section 8-1.03, "Preconstruction Conference," of the *Standard Specifications* and as described in Section 5-003, "Preconstruction Conference with the Contractor," of this manual. For preconstruction meetings under this section, discuss specifications and processes for producing materials and constructing the surfacing or pavement. Refer to Section 36-1.01D(2), "Preconstruction Meetings," of the *Standard Specifications* for a list of topics to include in the meeting. Review the applicable specification section for additional items that must be discussed in this preconstruction meeting.

Caltrans staff at this preconstruction meeting must include the resident engineer, principal assistants, material sampling and testing staff, and other key personnel.

Refer to Section 36-1.01D(2), "Preconstruction Meetings," of the *Standard Specifications* for the list of contractor personnel that are required to attend. Make sure the contractor also includes:

- For seal coats, the emulsion and binder suppliers
- For hot mix asphalt using a warm mix asphalt additive technology, the technical representative for the warm mix asphalt technology
- For individual slab replacement with rapid strength concrete, the concrete plant inspectors and personnel performing saw-cutting and joint sealing

Do not allow placement of the trial slabs, construction of test strips, or paving to start until the required personnel have attended the preconstruction meeting.

4-3602B Base Bond Breaker

Before work on the base bond breaker begins, do the following:

- Review the contractor's proposed base bond breaker to verify that it meets the requirements for the type of base it is being placed over.

4-3602C Pavement Smoothness

Before work begins, take the following steps:

- Set up an electronic file structure for the smoothness submittals. You will receive numerous files from various lanes. It is recommended to have at least one folder for each route and direction. The PPF, PVP and XLSM file names are long, so abbreviate the folder names to the extent possible. This allows the electronic smoothness submittals from the contractor to be organized and prevent exceeding maximum file path name warnings.
- At least 15 days before measuring pavement smoothness with an inertial profiler, contractors must register with the Caltrans' secure file transfer system. If contractors need to obtain information on the registration process, have them send an email request with their contact information to:
- Asphalt.Smoothness@dot.ca.gov for asphalt
- Concrete.Smoothness@dot.ca.gov for concrete surfaces
- Review Section 36-3.01D(3)(b)(i), "General," of the *Standard Specifications* and determine which portions of new pavement will be subject to inertial profiler requirements and which portions will be subject to straightedge requirements.
- Discuss pavement smoothness requirements at the preconstruction meeting required for the surfacing or pavement operation. Include the following items in the discussion:
- Requirements for the smoothness quality control plan.
- Specified naming conventions on all submitted profiles. All bridge approach slabs, bridges, and culverts visible on the roadway surface and at grade intersections must be included in the raw inertial profile data.

- Contactor-marked locations of the beginning and ending stations and leave-outs in order for the engineer to verify final acceptance profiles.

Discuss that a written smoothness quality control plan must be submitted by the contractor to the resident engineer at or before the preconstruction meeting. The plan must incorporate the following elements:

1. Organization: Contact names, organizational chart, telephone numbers, current certifications, titles, roles, and the responsibilities of personnel monitoring smoothness, collecting profile data, submitting data, requesting pay adjustments and reports, and implementing corrective actions.
2. Inertial profiler and operator certification requirements: Inertial profiler certification issued by Caltrans within the past 12 months
    a. Manufacturer's instructions and test procedures for calibration and verification of the inertial profiler
    b. Operator certification for the inertial profiler issued by Caltrans within the past 12 months
3. Schedule: The methods and timing used for monitoring and testing ride quality throughout the placement operation process. An indication of the approximate timing of acceptance testing for the profile operations defined in Section 36-3.01C (3), “Smoothness Corrective Grinding Plan,” of the *Standard Specifications,* in relation to placement operations and stages of construction.
4. Layout plan: Includes the following elements:
    a. Semi-permanent reference points at the beginning and end of the project based on the plans.
    b. For each profile run, define additional semipermanent reference points for the beginning and end positions of each run.
    c. List the position and name of each semipermanent reference point. These reference points must be outside the traveled way, perpendicular to the starting position of each lane. Where starting positions are adjacent to each other but staggered, there must be separate starting positions. An example of this would be staggered starting positions caused by bridge abutment skew angles.
    d. The semi-permanent reference points used to establish the beginning position of a profile must be based on the EXIST profile run for HMA and grind existing concrete pavement, and the PAVE profile for new concrete pavement. This requires the EXIST profile to be run, semi-permanent reference points marked and tied to the EXIST inertial profile distance measurement instrumentation (DMI-) stationing before submitting the smoothness quality control plan. When the EXIST profile run delays the preconstruction meeting, the DMI stationing of the semi-permanent reference points may be estimated, if the layout plan is updated after completing the EXIST profile run. The semipermanent reference points from the EXIST

profile must be labeled in the field and in the pavement profiles using the following naming convention:

XXX-D-L-STA-VAL

In which:

XXX = "Beg" for the beginning of each profile run, "End" for the end of each profile run, "ExB" for the beginning point of the areas excluded from inertial profiler testing, and "ExE" for the end point of the areas excluded from inertial profiler testing.

D = traffic direction~~,~~: *NB*, *SB*, *WB*, or *EB.*

L = lane number from left to right in the direction of travel, such as "1," "2," or "3."

STA= station to the nearest foot, such as 10+20. Do not use postmiles. For HMA and grind existing concrete plans, the station is based on the DMI reading from the EXIST inertial profile. For new concrete pavement, the station is based on the DMI reading from the PAVE profile.

VAL= use "INC" where the value of stationing in the pavement profile data file (*.PPF) will increase in the direction of travel. Use "DEC" where the absolute value of the stationing in the pavement profile data file (*.PPF) will decrease in the direction of travel.

Use the same label name regardless of the stage of the profile.

- For each semi-permanent reference point, include a KMZ file with:
  - Color photographs clearly displaying the physical label used to define the semi-permanent reference points.
  - Listing of GPS coordinates.
- Semi-permanent reference points, where possible, must be recorded by inertial profilers using electronic eye readings or reflectors.
- Within 12 hours or on the same day of completing smoothness measurement, the contractor is required to submit the raw profile data as a PPF file on an authorized data storage device, along with a coordinated video or images taken at intervals no greater than 52.8 feet for the existing and baseline profiles. Also, submit a hard copy or a PDF file listing the following:
  1. Profile data collection time and date
  2. Data collection software version used
  3. Sensor serial number
  4. Low- and high-pass filter used
  ~~1.~~5. 0.1-mile mean roughness index (MRI) values
- Within 2 business days after each profiling, the contractor must submit the profile information to the engineer and to Caltrans' file sharing system. Refer to Section

4-3603, “During the Course of Work,” of this manual for more specific details of what is required in each submittal.

- After submitting the profile information to Caltrans’ file sharing system, the contractor must also send a notification to the engineer and to Asphalt.Smoothness@dot.ca.gov for asphalt projects Concrete.Smoothness@dot.ca.gov for concrete pavement projects.
- Failure to submit profile information within prescribed time frames is subject to progress payment withholds specified in Section 9-1.16E(3), “Performance Failure Withholds,” of the *Standard Specifications*. Refer to Section 3-906F (2), “Performance Failure Withholds,” of this manual.
- All bridge approach slabs, bridges, and culverts visible on the roadway surface and at-grade intersections must be recorded in the raw inertial profile data.
- The contractor must mark beginning and ending stationing of contractor profiles so the engineer may verify final acceptance profiles. Lack of beginning and ending station markings on shoulders may delay the engineer’s validation profiles and acceptance.

4-3602D ProVAL Training

In advance of the contractor’s start of surfacing or paving operations, verify that project staff is trained and knowledgeable in the use of ProVAL computer software. ProVAL is used to view and analyze raw profile data, as well as to review and generate PDF reports. ProVAL is on Caltrans’ Approved Software List, and online training is available for Caltrans employees at:

https://maintenance.onramp.dot.ca.gov/paveprogram/pavement-smoothness

ProVAL online training and software are available at:

https://maintenance.onramp.dot.ca.gov/paveprogram/office-asphalt-pavements

http://www.roadprofile.com

Step-by-step videos on the steps the contractor takes to complete the smoothness payment adjustment request are available at:

https://dot.ca.gov/programs/construction/pavement-smoothness

4-3603 During the Course of Work

4-3603A Base Bond Breaker

During the base bond breaker work, take the following steps:

- Make sure contractor submits a certificate of compliance for each shipment of base bond breaker material delivered.
- Make sure base material is free of any foreign and loose materials and the base is cured before base bond breaker is applied.

- Verify that the base bond breaker used is specified for the type of base it is covering.
- Verify that the base bond breaker is paved over within 72 hours of placing base bond breaker.
- Verify that the base bond breaker is applied in accordance with the specifications.

4-3603B Pavement Smoothness

During the pavement smoothness work, take the following steps:

Verify that the contractor plans, and measures smoothness profiles based on the type of work using Table 4-36.2, "Profiles Needed by Smoothness." These inertial profiles are required in accordance with the specification to determine acceptance and any payment adjustments.

Table 4-36.2. Profiles Needed by Smoothness

Profile	Asphalt Target 55 Percent Improvement	Concrete Target 60/67.5/75	Grind Existing Concrete Percent improvement
EXISTING	X		X
BASELINE	X		X
PAVE	X	X	
FINAL	X	X	X

For asphalt concrete pavement, smoothness measurements are required from the contractor for the following:

- Existing asphalt concrete surface before performing any work on the surface. The contractor must provide the engineer the result labeled as the "EXIST" inertial profiler data file and notify the engineer if the MRI results vary by more than 10 percent from the MRI information provided by Caltrans at the time of advertisement. For projects suspended longer than 30 days, the contractor must measure the smoothness of the existing surface that has not received an HMA overlay and provide the engineer the result labeled as "EXISTR" inertial profiler data file. The contractor will use the EXISTR profile as the EXIST profile.
- Existing pavement segments if structural repairs, such as remove and replace asphalt concrete or leveling courses, are made. The contractor must provide the engineer the result labeled as "BASELINE" inertial profiler data file.
- Pavement segments exclusive of an open-graded friction course (OGFC) on new HMA before performing any HMA smoothness corrections. The contractor must provide the engineer the result labeled as "PAVE" inertial profiler data file.

- Pavement segments exclusive of OGFC on new HMA after performing any HMA smoothness corrective work. The contractor must provide the engineer the results labeled as "FINAL" inertial profiler data file. If there is no corrective work in the segment, the contractor will use the "PAVE" inertial profiler data as the "FINAL" inertial profiler data.
- Pavement segments of OGFC before performing any OGFC smoothness correction. The contractor must profile the sections and provide the engineer the result labeled as "PAVE" inertial profiler data file.
- Pavement segments of OGFC after performing any OGFC smoothness corrective work. The contractor must provide the engineer the result labeled as "FINAL" inertial profiler data file. If no corrective work in the segment is performed, the contractor must use the "PAVE" inertial profiler data file as the "FINAL" inertial profiler data file.

For concrete pavement, smoothness measurements must be taken by the contractor during the following scenarios:

- For new concrete pavement, measure profile:
  - After placing concrete, but before performing any smoothness corrections to calculate pavement MRI. The contractor must provide the engineer the results labeled as "PAVE" inertial profiler data file.
  - After performing any smoothness correction to calculate final MRI. The contractor must provide the engineer the results labeled as "FINAL" inertial profiler data file. If there is no corrective work in the segment, the contractor will use the "PAVE" inertial profiler data as the "FINAL" inertial profiler data.
- For grinding existing pavement project type, measure profile:
  - Before any work is performed to calculate existing MRI. The contractor must provide the engineer the result labeled as the "EXIST" inertial profiler data file.
  - After any work is performed but before grinding to calculate baseline MRI. This profile is required for informational purposes only. The contractor must provide the engineer the result labeled as "BASELINE" inertial profiler data file.
  - After the contractor's grinding achieves 60 MRI or 40 percent improvement, calculate final MRI. The contractor must provide the engineer the results labeled as "FINAL" inertial profiler data file.
- Verify that the inertial profiler displays a current certification. Both the left and right accelerometers must have a Caltrans-issued decal indicating the date the certification expires.

Confirm that the inertial profiler operator has a current Caltrans-issued certificate for each model of inertial profiler operated. Verify that the certificate covers the model of the certified inertial profiler. The following website includes a current list of inertial profilers and operators:

https://dot.ca.gov/programs/engineering-services/inertial-profiler-certification-program

Make sure the contractor marks the beginning and ending stations on the pavement shoulder. When stationing is covered by additional surfacing, pavement, or removed by cold planing, make sure markings are transferred to the next surface and display the same stationing. Before running verification tests, verify that the beginning and ending stations are still clearly marked and that Caltrans' inertial profiler operator uses the same stationing as the contractor.

At locations requiring pavement smoothness testing using an inertial profiler:

- The engineer must witness inertial profiler calibration and verification tests including contractor inertial profile smoothness measurements.
- The contractor must notify the engineer at least 2 business days before performing calibration and verification testing of the inertial profiler.

Before each day of profiling and in the presence of the engineer:

- The contractor must conduct the following calibration and verification tests:
  1. Block test to verify the accuracy of the height sensor using California Test 384, "Method of Test for Combining Gradations for Hot Mix Asphalt (HMA) Using Reclaimed Asphalt Pavement (RAP) and/or Reclaimed Asphalt Shingles (RAS)."
  2. Bounce test to verify the combined accuracy of the height sensor and accelerometer using California Test 384.
  3. Distance measurement instrument (DMI) verify the accuracy of the distance measuring instrument using California Test 384.
  4. Manufacturer's recommended tests.

At least annually, the contractor must conduct a cross-correlation verification.

Caltrans inertial profile operators performing verification testing must also perform the block, bounce, and DMI test daily. To reduce variability between the contractor's and Caltrans' DMI readings, the Caltrans inertial profiler operator should use the same 528-foot test section the contractor used when performing the daily DMI test, but only after confirming the length of the contractor's 528-foot test section.

At locations requiring pavement smoothness testing using an inertial profiler:

- Make sure the contractor tests areas for smoothness using a 12-foot straightedge. After testing, check that the contractor submits a list of areas that require correction. Verify that each area is identified by size and location as required by the *Standard Specifications*
- Confirm that a follow-up acceptance test with a straightedge is performed to verify that the contractor's list is complete. If the area was measured using an inertial profiler, consider using the ProVAL Rolling Straightedge module to help identify locations that should be manually checked with the straightedge.

- Verify that the contractor submits pavement smoothness data in compliance with the current pavement smoothness requirements.
- Contractors must submit an electronic copy of the raw profile data as a PPF file on an authorized data storage device within 12 hours or on the same day of completing smoothness measurement. The PPF file must be submitted with either a coordinated video or photographs taken at intervals no greater than 52.8 feet for the EXIST and BASELINE profiles. Contractors are also required to submit a printout or a PDF file listing the following:
    - Profile data collection time and date
    - Data collection software version used
    - Sensor serial number
    - Low- and high-pass filter used
    - 0.1-MRI values

After a contractor submits the profile information to Caltrans' file sharing system, the contactor must also send a notification of their electronic submittal to the resident engineer and to either Asphalt.Smoothness@dot.ca.gov or Concrete.Smoothness@dot.ca.gov with the names of the files submitted.

For each surface subject to inertial profile smoothness requirements, the profile data information must include:

1. Raw profile data for each lane (PPF files).
2. ProVAL ride quality analysis report for the MRI of each lane in a PDF file. Report the following, using the ProVAL Ride Quality Fixed Interval MRI Report:
    a. Listing of MRI values for 0.1-mile segments or portions thereof.
    b. Input data including the specified MRI threshold and fixed segment length. The MRI threshold value shown in the report must correspond to the value that requires mandatory corrective action. The percent improvement MRI thresholds will vary, and these do not need to be shown in the report.
    c. Raw profile data name selections.
    d. Areas exempt from inertial profile smoothness requirements.
3. ProVAL ride quality analysis report for the international roughness index (IRI) of the left and right wheel paths of each lane in a PDF file. Report the following using the ProVAL ride quality continuous IRI report:
    a. Listing of areas of localized roughness (ALR)
    b. Input data including the specified ALR threshold and continuous segment length
    c. Raw profile data name selections
    d. Areas exempt from inertial profile smoothness

4. GPS data file for each lane. Submit the data file in GPS exchange file format, which has a suffix of *.GPX.
5. Manufacturer's recommended calibration and verification test results for the inertial profiler.
6. Inertial profiler's calibration and verification test results, including results for bounce, block, and the distance measurement instrument.
7. Completed pavement smoothness inertial profiler submittal record.

Require the contractor to submit the raw profile data in an unfiltered pavement profile standard (PPF) file format. Reject any files that do not use the following file naming convention:

YYYYMMDD_TTCCCRRR_EA_D_L_W_B_E_X_PT.EXT

Where:

YYYY = year

MM = month, leading zero

DD = day of the month, leading zero

TT = district, leading zero

CCC = county, 2- or 3-letter abbreviation

RRR = route number with no leading zeros

EA = contract number, excluding the district identification number, expressed as 6 characters

D = traffic direction: NB, SB, WB, or EB

L = lane number from left to right in the direction of travel

W = wheel path, L for left, R for right, or B for both

B = beginning station to the nearest foot, such as 10+20, or beginning postmile to the nearest hundredth, such as 25.06 with no leading zero

E = end station to the nearest foot, such as 14+20, or ending postmile to the nearest hundredth, such as 28.06 with no leading zero

X = profile operation, EXIST for existing pavement, BASELINE for existing pavement after performing repairs, PAVE for after paving, and FINAL for completed pavement documentation of compliance

PT = type of pavement surface profiled, such as:

- Type A HMA (hot mix asphalt)
- RHMA-G (rubberized hot mix asphalt-gap graded)
- OGFC (open--graded friction course)
- JPCP (jointed plain concrete pavement)

- CRCP (continuously reinforced concrete pavement)

EXT = “PPF” for raw profile data file extension

Multiple inertial profiler data files should be compressed into a .ZIP file format and submitted using the file-naming convention TT_EA_X_YYYYMMDD.zip.

The contractor must submit a grinding plan as an informational submittal at least 2 business days before performing corrective grinding for areas that do not meet the smoothness requirements.

Review the smoothness corrective grinding plan to verify that only necessary grinding is performed for HMA pavement. The contractor may not grind into incentive pay for HMA pavement. The payment adjustment worksheet accounts for this automatically by analyzing the adjustments planned for the PAVE uncorrected surface and the FINAL corrected surface. A contractor must only develop grinds to address ALR and to reduce disincentives because of excessive MRI values for HMA pavement.

For concrete pavement, grinding into incentive pay is an option available to the contractor. Grinding must not reduce pavement thickness below minimums in section 40-1.01D(8)(c)(iv), “Thickness,” of the *Standard Specifications*.

The corrective grinding plan must include:

1. Grinder make and model:
    a. Grinder wheelbase in feet, measured from the front centerline to the back centerline of the single wheel or tandem wheel spread.
    b. Grinder head position in feet, measured relative to the centerline of the front single wheel or the front tandem wheel spread.
2. Tandem wheel spreads in feet.
3. Tabular listing of the planned corrective grinding, including:
    a. Start and end locations in stationing to the nearest foot
    b. Width of grind, such as left half–lane, right–half lane, or full-width lane
    c. Corresponding grinder head depths to the nearest 0.01 inch
    d. Direction of grind such as forward, reverse, forward-forward, reverse-reverse, forward-reverse, or reverse-forward
4. Anticipated improvement in the MRI and ALR values.

After each inertial profiling by the contractor, verify that the inertial profiles and other required files for contract compliance, include but are not limited, to the following:

- PPF files and PDF report that are submitted on an electronic storage device and received within 12 hours or on the same day of completing the smoothness measurement.
- Submittals for EXIST and BASELINE profiles include a coordinated video or photographs taken at a minimum of 52.8 feet.

- File naming convention meets the specification requirement.
- Stationing conforms with smoothness quality control plan.
- Each PPF file is required to have a printout or PDF produced by the inertial profiler (not ProVAL). Check the following:
  - Profile data collection time and date matches the date the engineer witnessed the profile.
  - Data collection software version used matches that used during inertial profiler certification.
  - Sensor serial number on the inertial profilers match those used during inertial profiler certification.
  - Low- and high-pass filters are set to zero. If they are not, request a new printout. Low- and high-pass filters smooth out the profile, which can result in lower smoothness values and higher pay adjustments.
  - 0.1-MRI values are listed. These MRI values are calculated by the profilers' software, not by ProVAL. The average of these numbers will be similar to the smoothness values entered into the profile summary worksheets submitted at a later date as part of the smoothness payment adjustment request submitted by the contractor.

Upon receipt of the contractor's inertial profiles proposed for acceptance, review the FINAL profile data file and the two ride-quality reports. Carefully review the submittals to confirm:

- All listed leave-outs meet the requirements for the contract.
- The ride-quality analysis report for IRI indicates no locations where short continuous roughness exceeds the established specification limit for ALR.

On the ride-quality analysis report for MRI, where 0.05-mile to 0.10-mile fixed increments are indicated, all MRI values must not exceed the maximum MRI noted in the contract. Partial fixed increments 0.00 to 0.05-miles in length are not required to meet an MRI threshold but are required to meet ALR threshold.

4-3603C Profile Verification

After reviewing the contractor's profiles proposed for acceptance, request that Caltrans' inertial profile be run. Include a copy of the contractor's raw data file. Before submitting the request, confirm the contractor's semi-permanent reference points for the beginning and ending stationing locations are still clearly visible as described in the smoothness quality control plan. Caltrans must use the same stationing and semi-permanent reference points for verification profiles. This allows both files to be simultaneously loaded in ProVAL and compared for differences.

Verification testing will be performed using Caltrans' inertial profiler. The engineer must notify the contractor of Caltrans' intention to perform verification testing:

- Acceptance test results will be used for incentive or disincentive payments if the contractor's overall MRI is within 10 percent of Caltrans' overall MRI from the same project length.
- If the acceptance test results are not considered acceptable, Caltrans' MRI values will be used in the calculation for incentive and disincentive payments for that evaluated length. Caltrans will have 15 days to complete an evaluation of both profiler certifications.
- The contractor and the resident engineer must work together to resolve disputes regarding test result discrepancies in accordance with Section 36-3.01D(4)(b) "Profile Verification," of the *Standard Specifications*.
- Contractors must notify the resident engineer within 5 business days of receiving the verification test result if they intend to dispute it:
    - An independent third party will perform referee testing over the same project length. Before the third party participates in a dispute resolution, their profiler and operator must be certified under Caltrans' "Profiler Certification Program." The independent third party must have no previous direct involvement with this contract and no current direct involvement with the contractor. The MRI value closest to the independent third party's MRI value will be used to calculate incentive and disincentive payment. The party with the MRI value furthest from that of the independent third party's will pay for the referee testing.
- At locations not requiring pavement smoothness testing using an inertial profiler, pavement smoothness is determined using a 12-foot straightedge and must not vary from the lower edge of the straightedge by more than:
    - 0.01 foot when the straightedge is laid parallel with the traffic lane centerline.
    - 0.02 foot when the straightedge is laid perpendicular to the centerline and extends from edge to edge of a traffic lane.
    - 0.02 foot when the straightedge is laid within 24 feet of a pavement conform.
- The specifications require a physical check with a 12-foot straightedge to determine if the surface meets specification. The ProVAL software has a "rolling straightedge" module to assist with determining compliance and identify where to physically check locations with a 12-foot straightedge.

4-3603D Payment adjustment

The contractor must submit a payment adjustment spreadsheet with their data. The spreadsheet is available from:

The engineer uses this spreadsheet for payment purposes only after taking the following steps to verify that:

1. No MRI values are in the "must correct" range.
2. The contractor certified that all ALR issues were resolved.

3. The contractor's profiles used in the payment adjustment spreadsheet are aligned within tolerance.
4. The contractor's MRI data is directly from ProVAL.
5. Caltrans' verification profiles are within 10 percent of the contractor profiles.
6. The profiles used in the PVP are from the same PPF files received the day the profiles were run.

The front worksheet in the spreadsheet titled "PayAdj" will highlight locations that do not meet requirements. Noncompliant areas are noted in red on this worksheet; immediately reject the payment adjustment spreadsheet with a description of the issues.

After successfully verifying the payment adjustment spreadsheet, make the applicable payment adjustment in the Extra Work Billing System with a change order that encumbers the supplemental fund allotment for the smoothness adjustment incentives.

Resident engineers must submit the hot mix asphalt pavement or concrete pavement smoothness pay adjustment spreadsheet file used to determine acceptance and the applicable payment adjustments for each lane, as well as the accompanying ProVAL project data files.

Submit these files to the email address for hot mix asphalt pavement or concrete pavement within 10 business days of including the smoothness payment adjustment in the progress estimate. Submit the same files to the email address within 10 business days of approving a contractor's smoothness acceptance request for grinding existing concrete pavement.

For hot mix asphalt pavement, submit the files to:

Asphalt.Smoothness@dot.ca.gov

For concrete pavement, submit the files to:

Concrete.Smoothness@dot.ca.gov

If the contractor's test results are not within 10 percent of the Caltrans' MRI value, the resident engineer and the contractor must attempt to resolve the differences. If the parties cannot agree, the specifications require using Caltrans' MRI values to determine the applicable adjustment. If the contractor disputes Caltrans' MRI values, the contractor can follow steps in the dispute resolution process. The contractor's remaining profile values that do not have a corresponding engineer verification profile or are within 10 percent of the MRI will be used to calculate the incentive and disincentive payments.

Section 36-3.01D(4)(b), "Profile Verification," of the *Standard Specifications* describes the dispute resolution process. This section requires independent third-party referee testing of the disputed sections of pavement. The MRI value used for the smoothness adjustment will be from the party whose mean MRI value is closer to the independent third party's. The party whose values were not closer pays for the independent third-party testing.

If, after reviewing internally at Caltrans and reviewing with the contractor, the discrepancies are confirmed, the resident engineer must send a notice to the contractor of the discrepancies and Caltrans' intent to use its MRI values to calculate the incentive and disincentive.

The resident engineer is encouraged to request assistance from the district's smoothness expert and Headquarters Construction.

To assist in gathering pavement smoothness information and pavement smoothness data files, promote the use of data collection forms. Pavement smoothness forms are available at:

https://dot.ca.gov/programs/construction/forms

These forms include:

- Form CEM-3736, "Pavement Smoothness Inertial Profiler Submittal Record," is a checklist to review the completeness of submittals of inertial profiler data files, reports, and calibration information. This form should be used for both HMA and concrete pavements.
- Forms CEM-3736AC, "Asphalt Concrete Pavement Smoothness Corrections Information," and CEM-3736C, "Concrete Pavement Smoothness Corrections Information," provide information on pavement smoothness corrections made by contractors. The information collected on these forms will be used by Caltrans to help determine if improvements to the Caltrans pavement smoothness specifications are required. These forms should be completed by the contractor and submitted to the resident engineer and the appropriate pavement smoothness email address.

For hot mix asphalt pavement, submit the forms to: Asphalt.Smoothness@dot.ca.gov

For concrete pavement, submit the forms to:Concrete.Smoothness@dot.ca.gov

4-3604 Level of Inspection

4-3604A Base Bond Breaker

- Benchmark inspection of the existing base material to verify it is free of any foreign or loose material, and base has fully cured before application of the base bond breaker.
- Intermittent inspection of the application of the base bond breaker to verify it meets the requirements

4-3604B Pavement Smoothness

- Intermittent inspection to assure inertial profiler and operator certifications are current.
- Intermittent inspection to assure beginning and ending stationing of inertial profiler runs are marked on the shoulder, and correctly transferred to subsequent lifts when necessary.

- Intermittent inspection of submitted inertial profile submittals to verify that they meet the contractual requirements.
- Benchmark inspection of contractor's final "corrected" inertial profiles to verify that they meet the requirements for pavement smoothness, including that they are within 10 percent of Caltrans' International Roughness Index values for each 0.1-mile section.

4-3605 Quality Control

4-3605A Base Bond Breaker

- Make sure contractor submits a certificate of compliance for each delivery of base bond breaker material.

4-3605B Pavement Smoothness

- Verify that contractor has current certifications for inertial profiler and its operator.

4-3606 Payment

4-3606A Base Bond Breaker

- Measure and pay for base bond breaker where shown on the plans. Do not include any quantity for overlap.
- If performance grade asphalt binder is used as a base bond breaker, determine its weight in accordance with the Section 92-1.04, "Payment," of the *Standard Specifications.* Make any adjustments in accordance with Section 9-1.07, "Payment Adjustments for Price Index Fluctuations," of the *Standard Specifications.* Do not include the weight of the asphalt binder used for base bond breaker in any other payment item.

4-3606B Pavement Smoothness

Payment for pavement smoothness is included in bid item covering the pavement being placed. If the contractor fails to submit required pavement smoothness submittals within the specified time, withhold from the next progress payment in accordance with Section 9-1.16E(3), "Performance Failure Withholds," of the *Standard Specifications.*

- During each progress payment, estimate the cost to correct smoothness on final surfaces that were constructed during the previous estimate period and apply an equivalent reduction in the corresponding pavement item pay quantities for incomplete work.

Chapter 4 Construction Details

Section 42 Groove and Grind Concrete

Chapter 4 Construction Details

Section 42 Groove and Grind Concrete

4-4201 General

This section provides guidelines for inspecting groove and grind concrete roadway surfaces for work specified under Section 42, "Groove and Grind Concrete," of the *Standard Specifications*.

The *Concrete Pavement Guide* discusses groove and grind strategies of concrete pavements and is available at:

https://dot.ca.gov/programs/maintenance/pavement/concrete-pavement-and-pavement-foundations

Grooving is usually performed to reduce wet weather accidents on existing concrete pavements or as friction correction on new concrete pavements.

Grinding is usually performed to improve the ride quality and texture on existing concrete pavements or for smoothness and friction correction on new concrete pavements.

4-4202 Before Work Begins

Include the following in the preliminary review and inspections:

- If the contract specifies inertial profiler measurements, discuss pavement smoothness requirements with the contractor, including existing smoothness information, submittals, and any contractual testing dispute resolution processes. Refer to Section 4-36, "Surfacing and Pavements—General," of this manual for pavement smoothness procedures. Remind the contractor that failure to achieve compliance will require corrective action or removal and replacement, refer to Section 5-1.30, "Noncompliant and Unauthorized Work," of the *Standard Specifications*.
- Discuss traffic handling with the contractor and review the contractor's plan for lane closures. For traffic handling devices and lane closure procedures, refer to Sections 4-12, "Temporary Traffic Control," and 2-2, "Traffic," of this manual.
- Verify that the contractor's equipment meets specified requirements.
- Locate loop detectors to prevent damage to the loop detectors' sealant. If loop detectors are not visible, consult with the district Traffic Unit.
- Check local noise ordinances and review specified noise requirements.
- In areas to be grooved and ground, see if the contract requires yellow stripe and pavement marking removal before grooving and grinding. If yellow striping and marking must be removed before grooving and grinding, refer to Section 7-107E, "Removing Yellow Traffic Stripe and Pavement Markings with Hazardous Waste Residue," of this manual.

- Verify the existence of a water pollution control plan.
- The contract may show locations for on-site drying of concrete grooving and grinding residue before disposal. Verify that temporary storage materials for this purpose conform to WM-8, "Concrete Waste Management," in the *Construction Site Best Management Practices (BMPs) Manual* or Section 13-9.02, "Materials," of the *Standard Specifications*.
- The contract or materials information handout may identify locations within the right-of-way for final disposal of concrete grinding and grooving residue. The resident engineer must verify that a Regional Water Quality Control Board permit or approval is included in the materials information handout or resident engineer file. If the permit or approval has not been included, contact your environmental-construction liaison for assistance in obtaining these documents. Refer to the contract special provisions to obtain information about offsite disposal facilities for concrete grooving and grinding residue.
- When the contract documents do not allow final disposal of grooving and grinding residue within the right-of-way, obtain from the contractor the name and location of the disposal facility that will receive the concrete grooving and grinding residues, in accordance with Sections 5-1.20B(4), "Contractor-Property Owner Agreement," and 13-4.03E(7), "Paving, Sealing, Saw Cutting, Grooving, and Grinding Activities," of the *Standard Specifications*. Obtain a copy of the facility's water quality or other applicable agency permit or written approval; or applicable local, state, or federal agency permits for disposal sites outside of California. Also verify the following:

  1. The disposal facility is permitted by the California Environmental Protection Agency (CalEPA) to accept concrete residue. Oral confirmation from the facility operator and documentation in the resident engineer's daily report are sufficient verification of the permit status of commercial disposal facilities on this list.
  2. The contractor provides a copy of the CalEPA permit for disposal of the liquid concrete residue if choosing the noncommercial offsite disposal facility.
  3. If the disposal site is outside of California, the contractor must provide to the resident engineer a copy of the permit issued by the state agency having jurisdiction over the site. The permit must be provided before disposal.

4-4203 During the Course of Work

During the course of the work, do the following:

4-4203A Grooving and Grinding Operations

The following apply to both grooving and grinding operations:

- Observe the operation to verify that equipment and noise levels comply with specifications.

- Make sure that the handling of residue and dust from the operation meets specifications.
- Verify that the grooved or ground widths meet specifications.
- Make sure that a vacuum device picks up the concrete residue and that the residue does not flow across the pavement or enter storm drain inlets.
- For projects that temporarily store concrete residue in washout facilities, check that the plastic liner seams are installed in accordance with manufacturer requirements. Regularly inspect the liners during installation and operations to verify that they are free of holes, tears, or other defects that will compromise the impermeability of the liner. Inspect washout facilities to make sure that adequate holding capacity and minimum freeboard are maintained.
- When the operation is complete, and offsite disposal is specified, obtain from the contractor final proof of delivery of the residue to the off-site disposal facility.

4-4203B Grooving

When grooving is specified:

- At the beginning of the work shift, check behind the grooving machine to make sure that all the blades are cutting grooves to the specified depth.
- Record the locations of omitted grooves. When specified, require the cutting of omitted grooves.

4-4203C Grinding

When grinding is specified:

- Unless specified otherwise, test for pavement smoothness under Sections 36-3, "Pavement Smoothness," and 40, "Concrete Pavement," of the *Standard Specifications*.
- Determine if any abnormally depressed areas must be excluded from testing with the inertial profiler and the 12-foot straightedge.
- Verify that the inertial profiler uses a minimum 4-inch line laser to obtain profile measurements for concrete pavements.
- Make sure the contractor submits inertial profile information to Concrete.Smoothness@dot.ca.gov in accordance with Section 36-3, "Pavement Smoothness," of the *Standard Specifications*.
- Check that ground areas on structures, approach slabs, and 50 feet of approach pavement meet the smoothness and cover requirements in Section 51-1.01D(3)(b), "Testing Concrete Surfaces," of the *Standard Specifications*.
- In accordance with California Test 342, "Method of Test for Surface Skid Resistance with the California Portable Skid Test," determine the coefficient of friction for surfaces that have been ground, and do not open lanes to traffic unless requirements are met.

4-4204 Level of Inspection

Suggested levels of inspection for grooving and grinding activities are:

- Intermittent review of pavement smoothness
- Benchmark review of coefficient of friction

4-4205 Quality Control

Check that the contractor is actively performing quality control on pavement smoothness throughout the grinding operations by reviewing inertial profile data.

4-4206 Payment

For measurement and payment, do the following:

- Review the plans and quantity calculations in the resident engineer's file to determine if there is sufficient detail and accuracy to be used in the project records.
- Measure both grooving and grinding by the area grooved or ground. As the work progresses, make transverse measurements to verify that the grooved or ground areas meet the widths specified. You may compute lengths by measuring the distance to start and stop locations from known stations and by computing the length grooved or ground from the stationing. Include curve corrections in the calculations.
- Where grinding has begun on an area that is then replaced by concrete pavement, do not pay for the original grinding area. Instead, measure the area of replaced concrete pavement and pay under the item for grind existing concrete pavement. Do not pay for grinding replacement concrete pavement or for additional grinding to comply with smoothness requirements.
- Refer to Sections 36-3, "Pavement Smoothness," and 40-1, "General," of the *Standard Specifications* for pavement smoothness requirements and payment adjustments, as well as Section 4-4003D, "Post-Paving," of this manual.

Chapter 4 Construction Details

Section 51 Concrete Structures

Chapter 4 Construction Details

Section 51 Concrete Structures

4-5101 General

This section covers items related to constructing concrete structures. Section 51, "Concrete Structures," of the *Standard Specifications* provides requirements for constructing concrete structures. Concrete structures include concrete bridges, structure approach slabs, culverts, headwalls, endwalls, drainage inlets, retaining walls, and other concrete structures shown on the plans.

Many specified requirements for concrete structures apply only to bridges and other major structures and are covered in detail in Structure Construction's *Bridge Construction Records and Procedures* manual at:

https://dot.ca.gov/programs/engineering-services/manuals

Additional reference material can be found in the *Foundation Manual,* the *Prestress Manual*, and the *Bridge Deck Construction Manual* at the website.

Section 3-703, "Public Safety," of this manual contains guidelines for work that temporarily impairs horizontal and vertical bridge clearance.

4-5102 Before Work Begins

Before work begins, take the following steps:

- Review the plans and specifications. Determine the cementitious material content and compressive strength of the concrete to be used. Review Section 4-90, "Concrete," of this manual, which covers the mix design review, authorization, and production of concrete.
- Review and discuss with the contractor plans for placing concrete in each of a structure's parts. Before allowing the work to commence, discuss any obvious shortages of workers, equipment, or material that may prevent the completion of the structure's parts without interruption in the placing of concrete. Also discuss and evaluate project specific conditions for safely placing concrete, such as avoiding overhead lines.
- Determine which tests will be performed, and the frequency and location of such testing, and assign the duties accordingly. For guidelines, refer to Chapter 6, "Sampling and Testing," of this manual.
- Verify that Form CEM-3101, "Notice of Materials to Be Used," includes concrete structure materials. Refer to Section 6-202, "Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products," of this manual for additional information.

4-5103 During the Course of Work

Once work begins, take the steps listed for inspecting the following items:

- Placing of concrete
- Concrete placed under water
- Minor structures
- Forms
- Joints and bearings
- Drains in walls
- Surface finishing

4-5103A Placing Concrete

During the placement of concrete, do the following:

- Check for any movement or deformation of forms that may exceed the specified tolerance. If the movement or deformation exceeds the specified tolerances, take appropriate action. This action may include halting concrete placement to install additional bracing or changing the rate or sequence of concrete placement to achieve the required lines and grade.
- Make sure the contractor follows the specified placement order. Also, assure that concrete for horizontal members or sections is not placed until the concrete in the supporting vertical members or sections has been consolidated and subsidence has occurred.
- Through observation, verify that concrete is placed without causing segregation. Also, verify that high-frequency internal vibrators consolidate the concrete when specified. The method used to vibrate concrete directly affects the structure's strength. Check for minimum contact between the vibrator and reinforcing steel. Concrete must be vibrated to the point where mortar and water flush to the surface; vibration beyond this point is not necessary or desirable. Insufficient vibration, on the other hand, will leave rock pockets or voids.
- Determining when subsidence has occurred will require judgment based on experience with various concrete mixes. In general, subsidence has occurred when bleed water at the surface has disappeared.

4-5103B Concrete Placed Under Water

Make sure the contractor meets all specifications related to Section 51-1.03D(3), "Concrete Placed Under Water," of the *Standard Specifications*. Unless otherwise provided for in the special provisions, only concrete designated as "seal course concrete" is to be placed under water.

4-5103C Minor Structures

Verify that paving or surfacing has been completed immediately adjacent to a structure before the structure has been constructed to final grade.

4-5103D Forms

When using concrete forms, do the following:

- Make sure the forms are located properly. To detect any major discrepancy, include both spot-checking from the control stakes as well as general observation independent of the stakes.
- For proper dimensions, measure inside the forms.
- Check that forms are mortar tight.
- When specified, check that form oil was used.
- Verify that all materials required to be embedded in concrete, such as reinforcement and miscellaneous metal, are in place and secured properly. For details, refer to Section 4-52, "Reinforcement," and Section 4-75, "Miscellaneous Metal," of this manual.
- Decide whether forms are sufficiently rigid to prevent undulations that exceed the specified values. If corrective measures are necessary, advise the contractor accordingly, and note the circumstances in the daily report.
- Check the forms for exposed surfaces to assure the surfaces are faced with form panels as specified. Where required, verify the use of triangular fillets.
- Verify that form bolts and fasteners are the types specified.
- Before concrete placement, check that the forms are free of dirt, chips, sawdust, and other foreign materials. Also, make sure the contractor dewaters the forms and does any necessary pumping as specified and in accordance with the contract's environmental provisions.
- Before concrete placement, inform the contractor of any corrective action required. Note such action in the daily report.
- Verify that forms are removed in the specified manner. When forms are removed before the end of the specified curing period, require proper curing of the concrete.

4-5103E Joints and Bearings

For specific requirements for joints and bearings, review the contract plans and specifications. For bridges and other major structures, refer to the *Bridge Construction Records and Procedures* manual.

Assure that joints are constructed as specified. Verify they are constructed in a way that they will function as intended. The following are some of the important items to check:

- Verify material has been inspected at the source and is properly identified for shipment. When required, make sure the material is sampled and tested in accordance with Chapter 6, "Sampling and Testing," of this manual.
- When an open joint is required, check that the reinforcement does not extend across the joint.

- Make sure sheet packing, preformed pads, and board fillers are held in place as specified.
- During concrete placement, check that expansion joint armor is placed and firmly held in position.
- Verify bearing devices are placed as specified and measure concrete bearing areas to determine that placement falls within specified tolerances.
- Before additional concrete placement, make sure horizontal construction joints are cleaned as specified. Verify that expansion joint filler or bond-breaking compound is placed where required. Note such observations in the daily report.
- If an emergency makes a construction joint necessary, decide on the construction details of this joint and direct the contractor during its construction.
- Check the placement of any dowels to make sure the contractor cleans the holes before grouting or bonding and places the grout or bonding material and dowels as specified.
- When mortar is used, check that the contractor proportions, places, and cures the mortar as specified.
- Verify that water stops are installed as specified and where shown on the plans. During concrete placement, make sufficient observations to verify that the water stops are not shifted out of position or shape.

4-5103F Drains in Walls

Verify that drain holes and weep holes are constructed as specified. Examine the excavation and consider other factors that could contribute to the buildup of hydrostatic pressure. When necessary, order additional drain holes or weep holes.

4-5103G Surface Finishing

Make sure concrete surfaces comply with the specifications. Make sure that the required finishing work is performed before structures are backfilled and that the appropriate finish is applied to all surfaces. For additional information, refer to the *Bridge Construction Records and Procedures* manual.

4-5104 Quality Control

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

- Verify that the contractor's quality control records are submitted on time and that results comply with contract requirements.
- If rapid strength concrete (RSC) is used, verify that the contractor prequalifies RSC before use.
- If test panels are specified, check that concrete test panels and slabs are constructed at authorized locations and that test results comply with contract requirements before starting work.

- Verify that material and lubricant-adhesive is tested.
- For joint seal assemblies with a movement range of more than 4 inches, make sure that a manufacturer technical representative is present during installation.
- For asphaltic plug joint seals, verify binder material is tested.
- Witness the contractor's proof testing of structural load bearings.
- If using RSC to construct approach slabs, make sure the contractor constructs trial slab for each concrete mix design. Verify trial slabs are constructed in compliance with finish, cure, and compressive strength requirements as specified in Section 51-5.01D(2)(b), "Rapid Strength Concrete," of the *Standard Specifications.*
- Make sure that temperature monitoring and data recording is done for mass concrete elements and verify that recorded temperatures comply with the specified requirements.

4-5105 Payment

Take the following steps:

- In conformance with the dimensions shown on the plans, measure the quantity of concrete in structures by the cubic yard unless the quantities are designated as final pay quantities.
- Keep records of rejected concrete loads, and provide the reasons, including test data if possible, for such actions. Also keep records of any significant amounts of concrete placed outside of areas or limits for which payment is to be made.

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 ensure 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 the *Independent Assurance Manual.*

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 a link on Design Engineering Services' METS webpage.
- *Material Plant Quality Program*, Division of Construction, Caltrans, available at:

  https://dot.ca.gov/programs/construction/material-plant-quality-program

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
Aggregates for cement treatment	4 weeks
Aggregates for concrete mixture	4 weeks
Aggregates for concrete pavement	60 days

Material	Time
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 up 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, “Methods 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," 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, and verify that corrective actions are taken and documented if repeated deficiencies are detected.

Notify contractor of all acceptance test results within 2 business days of receipt from laboratory. Advise the contractor that all test results are available for their inspection, and provide copies of these test results upon their request. Maintain copies of the test results within the project files 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
BITUMINOUS SEALS					
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)
BITUMINOUS SEALS (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					
Aggregate 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*	2	5	2	11 to 14
Inertial Profiler (AASHTO R 56 & R 57)	7*	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.

* 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 of the 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 can be very useful 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-0101and 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 two cylinders, set of three cylinders, or set of five 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 two, set of three, or set of five, 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 two 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 four spaces are reserved for any project coding consisting of numbers, letters, or a combination.

Note if only one sample card was made for five 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 two 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 four spaces are reserved for any project coding consisting of numbers, letters or a combination.

Note if one sample card is made for the two 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 two 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 four spaces are reserved for any project coding consisting of numbers, letters or a combination.

Note if one sample card is made for the three 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 of the 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 ensures 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 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 Material 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	To 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: Bituminous Seals (*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	CT 339	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: Bituminous Seals (*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: Bituminous Seals (*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: Bituminous Seals (*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: Bituminous Seals (*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: Bituminous Seals (*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: Bituminous Seals (*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: Bituminous Seals (*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: Bituminous Seals (*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.)						
Spread Rate	California Test 339	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 Material 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 Material 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 3600 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 3600 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
WATER-PROOFING 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

Chapter 6 Sampling and Testing

Section 2 Acceptance of Manufactured or Fabricated Materials and Products

Chapter 6 Sampling and Testing

Section 2 Acceptance of Manufactured or Fabricated Materials and Products

6-201 General

This section describes procedures for acceptance of manufactured or fabricated materials and products. This section also describes the types of materials that are considered manufactured materials and provides guidelines for sampling these materials.

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

The contractor is responsible for notifying the resident engineer of the need for inspection and acceptance testing of manufactured materials and products by submitting Form CEM-3101, "Notice of Materials to Be Used," early in the project. Refer to Section 6-202, "Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products," of this manual for details on completing and submitting this form.

The resident engineer needs to be knowledgeable about acceptance methods used for different manufactured or fabricated materials and products, including:

- Source inspection and testing
- Manufacturer certificate of compliance
- Manufacturer certificate of compliance with additional attachments
- Field release of material
- Field samples of manufactured materials or products

When field sampling of manufactured or fabricated materials or products is required, the resident engineer is responsible for the "chain of custody" for material and product acceptance samples. Material acceptance samples must be under the control of Caltrans from the sampling point to when the sample is tested. The chain of custody for material and product samples is an important part of the Caltrans quality assurance program.

6-201A References

- *Independent Assurance Manual*: See Construction's Field Resources for Contract Administration intranet page.

  Or contact IA.Service.Request@dot.ca.gov.

- *Bridge Construction Records and Procedures* manual, *Vol. 2*, Engineering Services:

  https://dot.ca.gov/programs/engineering-services/manuals

- California Test Methods, METS, Caltrans:

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

- AASHTO, ASTM, and other test methods are available at IHS Markit Standards Store website:

  https://global.ihs.com/index.cfm?&index_home=true

- J2 Database, METS, Structural Materials electronic materials management database where each project's test results and Form CEM-3101, "Notice of Materials to be Used," responses are captured along with other METS project-related information and accessible by Caltrans staff. Staff may navigate to the J2 database on the Division of Engineering Services internal METS website.
- Material Plant Quality Program (MPQP), Division of Construction:

  https://dot.ca.gov/programs/construction/material-plant-quality-program

- *Quality Management System,* METS, Structural Materials, methods and procedures to provide consistent quality assurance and source inspection. Staff may navigate to the *Quality Management System* manual on the Division of Engineering Services internal METS website in the J2 database.
- *Overhead Sign Structures Guide,* on the Division of Engineering Services' Signs & Overhead Structures intranet page.

6-202 Responsibilities for Acceptance of Manufactured or Fabricated Materials and Products

The following describe the responsibilities for acceptance of manufactured or fabricated materials and products.

6-202A Contractor

The contractor is responsible for providing materials that comply with the contract specifications. The contractor is responsible for the quality of materials and, if required by the specifications, must provide a notice of materials to be used, shop drawings, certificates of compliance, mill test reports, environmental product declarations, quality control plans, and quality control test results. The contractor must use materials from Authorized Materials Lists, provide fabricated materials from audited facilities, and use materials that comply with Buy America and specified Buy Clean California Act requirements.

6-202A (1) Notice of Materials to Be Used

The contractor is responsible for submitting Form CEM-3101, "Notice of Materials to Be Used," to the resident engineer for all materials to be used on the project. The contractor must provide sufficient notification to the resident engineer on the source,

location, and quantity of materials to be inspected and tested so that the work will not be delayed. Section 6, "Control of Materials," of the *Standard Specifications* requires the contractor to list on Form CEM-3101 all sources of materials and where these materials are available for inspection. Receiving this form in a timely manner is critical to the success of the materials management process.

Form CEM-3101, which includes detailed instructions, is available at:

https://dot.ca.gov/programs/construction/forms

6-202A (2) Certificates of Compliance, Mill Test Reports, Buy America and Buy Clean California Act Requirements

The *Standard Specifications* requires the contractor to submit a certificate of compliance for various materials before they are incorporated into the work. Section 6-2.03C, "Certificates of Compliance," of the *Standard Specifications* states that when a certificate of compliance is required it must be:

- Submitted for each lot of material and clearly indicate which lot is included in the certificate.
- Signed by the producer of the material stating that it complies with the contract.

The intent of the certificate of compliance is to communicate to Caltrans that the contractor has accepted the material and is confident that it complies with the contract specifications. The contractor is responsible for providing the certificate of compliance before incorporating material into the project. The certificate of compliance and any supporting documentation must accompany the material to the job site when materials are delivered.

Table 6-2.3, "Materials Accepted by Certificate of Compliance," in Section 6-203C, "Materials Accepted on the Basis of a Certificate of Compliance," of this manual provides a list of materials requiring a certificate of compliance, as well as any additional documents.

The *Standard Specifications* requires the contractor to provide certified test reports along with the certificate of compliance for various materials. For steel, this test data is commonly known as a mill test report. A certified mill test report is required for each heat and must contain physical and chemical analysis of the material. The requirements for the mill test report vary depending on the section of the *Standard Specifications* the material falls under.

Section 6-1.04, "Buy America," of the *Standard Specifications* provides detailed information on Buy America requirements. Refer to Section 3-604, "Buy America," of this manual for additional information. The following are examples of acceptable language included in the certificate of compliance to verify Buy America compliance:

"All melting and manufacturing processes for the product occurred in U.S."

"100 percent melted and manufactured in the U.S.A."

Section 6-1.06, "Buy Clean California Act," of the special provisions provides detailed information on Buy Clean California Act requirements including

environmental product declarations. Refer to Section 3-606, “Buy Clean California Act,” of this manual for additional information.

6-202A (3) Shop Drawings

The *Standard Specifications* requires the contractor to submit shop drawings for review by Caltrans for certain structures such as structural steel and structural precast concrete. The shop drawings must include both shop details and erection plans. For more information on submittal and authorization of shop details and erection plans, refer to the *Standard Specifications*.

Contractors must submit shop drawings for overhead sign structures. For more information on submittal and authorization of shop drawings, refer to the *Overhead Sign Structures Guide.* Section 4-56, “Overhead Sign Structures, Standards, and Poles,” of this manual contains additional information.

Before Caltrans performs any source inspection, the contractor is required to have a copy of the authorized shop drawings at the location of inspection.

6-202A (4) Quality Control Plans

The *Standard Specifications* requires the contractor to submit a quality control plan for certain types of production. Information on quality control plans for those production types is provided in the *Standard Specifications*:

- Section 11-2, “Welding Quality Control.”
- Section 39-2: “Hot Mix Asphalt.”
- Section 40: “Concrete Pavement”
- Section 41-9: “Individual Slab Replacement with Rapid Strength Concrete”
- Section 56-2: “Overhead Sign Structures”
- Section 59-2: “Painting Structural Steel”
- Section 59-5: “Thermal Spray Coat Structural Steel”
- Section 90-4: “Precast Concrete”

The resident engineer does not allow work to begin until the quality control plan is authorized for that production. For more information on the contents of quality control plans, refer to the *Standard Specifications*.

Specifications for welded products usually require the contractor to submit the fabricator’s welding quality control plan to the resident engineer for authorization before any products are manufactured for Caltrans. For details on quality control plans for welding, refer to Section 180, “Welding,” of *Bridge Construction Records and Procedures*, *Vol. 2*:

https://dot.ca.gov/programs/engineering-services/manuals

6-202B Resident Engineer

The resident engineer must verify that materials entering the work comply with the requirements in the contract specifications.

6-202B (1) Notice of Materials to be Used

The resident engineer must verify that the contractor submits Form CEM-3101, "Notice of Materials to Be Used," for all materials. If the contractor does not submit Form CEM-3101 before the preconstruction conference, provide a list to the contractor during the preconstruction meeting of materials required to be listed on Form CEM-3101.

If the sources of all materials are not known, the contractor may submit a partial list of materials sources on Form CEM-3101 and submit Form CEM-3101 supplements as soon as other sources are known.

METS developed the J2 database for tracking project materials requirements, Form CEM-3101 processing, materials test results, and source inspection. Entering the contract number at the top of the database in the "Projects" box opens that project's main page. Clicking on the "3101 Report" tab opens a list of all the bid items requiring Form CEM-3101 for the project and which Form CEM-3101s have been received. The list shows the name and address of the supplier and the date the Form CEM-3101 was received.

Assistance in developing a list of project materials that require Form CEM-3101 and in navigating the J2 database is available from the Materials Engineering and Testing Services (METS) representative for the project:

https://dot.ca.gov/programs/engineering-services

The contractor's submitted Form CEM-3101 must include the following information:

- The contract number and the contract items for which the material will be used. If the contractor uses a project number different from the Caltrans contract number, include that number.
- The item component name and quantity.
- The name, address, and telephone number of the manufacturer.
- The name, address, and telephone number of the supplier or manufacturer where the material can be inspected.
- If the source of material is outside California, also include the name, address, and telephone number of the contractor or subcontractor placing the order and the order number.

Check Form CEM-3101 for the required information and for completeness. To make sure that all structural materials are listed, a list of materials necessary based on contract bid item is available at:

https://mets.dot.ca.gov/j2_item_categories.php

If the contractor's Form CEM-3101 is incomplete or incorrect, require the contractor to complete the form. When the contractor's Form CEM-3101 has been reviewed and is complete, promptly distribute Form CEM-3101 copies, including one to METS. The resident engineer sends Form CEM-3101 to the materials administrator using one of the following methods:

- Email: MaterialsAdministratorMETS@dot.ca.gov
- Fax: (916) 227-7084
- Postal mail:

  Materials Administrator, Mail Station #5
  Materials Engineering and Testing Services
  5900 Folsom Blvd, Room 517
  Sacramento, CA 95819

METS will make required assignments for sampling, testing, and inspection of materials as noted in Section 6-202C, "Materials Engineering and Testing Services," of this manual.

6-202B (2) Job Site Materials Inspection

Based on assignment of materials inspection from METS to the resident engineer and the information shown on Form CEM-3101, the resident engineer must identify the appropriate district samplers, testers, and inspectors. Following is a partial list of those who may need to be notified to perform material acceptance:

- District staff who will be obtaining samples and tests on each material
- District staff who will be obtaining samples for each material accepted on the basis of a certificate of compliance. Testing is normally done by METS
- Structure Construction for reviewing and authorizing shop drawings for overhead sign structures
- District weights and measures coordinator for inspecting materials plants in accordance with the *MPQP*

6-202B (3) Authorized Facility Audit List

Some structural materials such as structural precast concrete, overhead signs and poles, and steel pipe piling must be fabricated at a facility on the authorized facility audit list of fabricators who have successfully completed Caltrans' facility audit. If these materials are included in the scope of work, make sure that the contractor is aware of these requirements. Information on the authorized facility audit list is available at:

https://dot.ca.gov/programs/engineering-services/

6-202B (4) Materials Production Plants

The resident engineer must assure materials production plants meet specifications before they produce material for Caltrans. Request assistance from the district weights and measures coordinator for inspecting materials plants including:

- Hot mix asphalt plants
- Concrete plants
- Volumetric proportioning plants for rapid strength concrete, polyester concrete, and pavement seal coats

Section 9-1.02, "Measurement," of the *Standard Specifications* indicates the general requirements for weighing, measuring, or metering devices and the requirement to place security seals on material plant controllers. The district weights and measures coordinator will follow the *MPQP* and the contract specifications for material plant authorization.

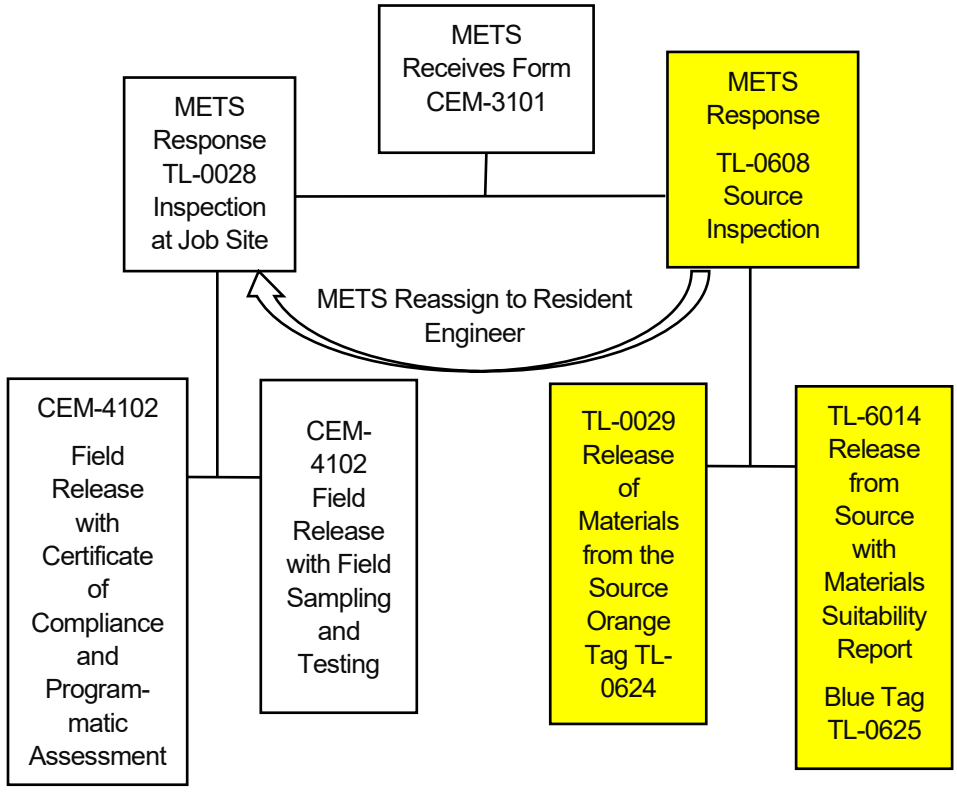
6-202C Materials Engineering and Testing Services

The Materials Engineering and Testing Services (METS) assigns personnel for sampling, testing, and inspecting manufactured materials and products, usually at the source of supply. Manufactured materials and products shown in Table 6-2.3, "Materials Accepted by Certificate of Compliance," in Section 6-203C, "Materials Accepted on the Basis of a Certificate of Compliance," of this manual, are the responsibility of METS but have been delegated to the resident engineer for inspection.

METS assigns the responsibility for sampling, testing, and inspecting manufactured materials and products based on the information submitted on Form CEM-3101, "Notice of Materials to be Used." METS offices in Sacramento, the San Francisco Bay Area, or Los Angeles conduct most of the inspections. METS may assign sampling, testing, and inspecting of manufactured materials and products to the district materials engineer, resident engineer, or a commercial laboratory.

The METS process for inspecting and releasing manufactured or fabricated materials or products is shown in Figure 6-2.1, "Inspection and Release Flowchart—Source Inspection."

Figure 6-2.1 Inspection and Release Flowchart—Source Inspection



6-202C (1) Processing Form CEM-3101

Once Form CEM-3101 is received by the materials administrator, it is routed to the appropriate METS office for processing. Any questions regarding Form CEM-3101 processing by METS may be routed to the project METS representative. Structural materials listed on Form CEM-3101 are processed by the quality assurance and source inspection (QASI) office assigned to that project.

6-202C (2) Form TL-0028, "Notice of Materials to Be Inspected at Job Site"

If it is determined that the material does not require source inspection, METS will assign inspection to the job site by completing Form TL-0028 for that material item. This form indicates that the material item does not require source inspection from Caltrans at this time. METS will send Form TL-0028 to the resident engineer, prime contractor, and suppliers to inform them that source inspection is not required before shipment to the job site.

The resident engineer will release these materials at the job site using Form CEM-4102, "Materials Inspected and Released on Job." Section 6-3, "Field Tests," of this

manual contains details on testing that occurs at the job site. Depending on the material, the resident engineer bases the field material acceptance on various methods. Refer to Section 6-203D, "Field Inspection and Release by the Resident Engineer," of this manual for the field inspection and release procedures.

6-202C (3) Form TL-0608, "Notice of Materials to Be Furnished"

If it is determined that the material requires source inspection prior to shipment to the job site, METS will issue Form TL-0608 to the resident engineer, contractor, and supplier. A hard copy of Form TL-0038, "Inspection Request," is mailed with Form TL-0608 to the supplier. The inspection request form is to be used by the contractor or any subcontractors to inform METS when the material is ready for inspection.

Source inspection by Caltrans is described in Section 6-202C, "Materials Engineering and Testing Services," of this manual and is detailed in the *QASI Manual*:

https://j2.dot.ca.gov/qs/?tab=2&sdiv=METS&off=OSM

6-202C (4) Form TL-0038, "Inspection Request"

Form TL-0038 is used by the contractor or supplier to inform Caltrans that material located away from the job site is ready for inspection. If the contractor has received a Form TL-0608 for an item, Caltrans will be expecting a Form TL-0038 to initiate the source inspection.

Form TL-0038 and instructions for submitting the request are available at:

https://j2.dot.ca.gov/qs/?tab=2&sdiv=METS&off=OSM

It is important to remind the contractor that, in accordance with Section 6-2.01E, "Material Source Inspection and Testing," of the *Standard Specifications,* the inspection request must be submitted:

- At least 3 business days before the requested inspection date for a material source within California.
- At least 5 business days before the requested inspection date for a material source outside California but within the U.S.
- Fifty days before the planned production start for a material source outside the U.S. and notify the resident engineer at least 20 days before the actual start.

The resident engineer may also use Form TL-0038 to request field inspection by METS for structural items such as field welding.

6-202D Assignment to Resident Engineer

METS may assign inspection of manufactured or fabricated materials and products for which they have acceptance responsibility back to the resident engineer. Refer to Section 6-203D, "Field Inspection and Release by the Resident Engineer," of this manual for details on inspection and release.

6-203 Manufactured or Fabricated Materials and Products Acceptance

The resident engineer must verify that materials entering the work meet the contract specifications acceptance criteria. Materials acceptance can be based on:

- Source inspection.
- Product on Authorized Materials List.
- Certificate of compliance.
- Certificate of compliance with accompanying documents.
- Field inspection and release by the resident engineer.

If the material delivered to the job site lacks proper identification, the report of inspection is unconfirmed, or the acceptability of the material is questionable, do not allow materials to be incorporated in the work until they have been found to comply with the specifications. Contact the assigned inspection unit to verify testing or submit samples for new acceptance tests.

6-203A Source Inspection

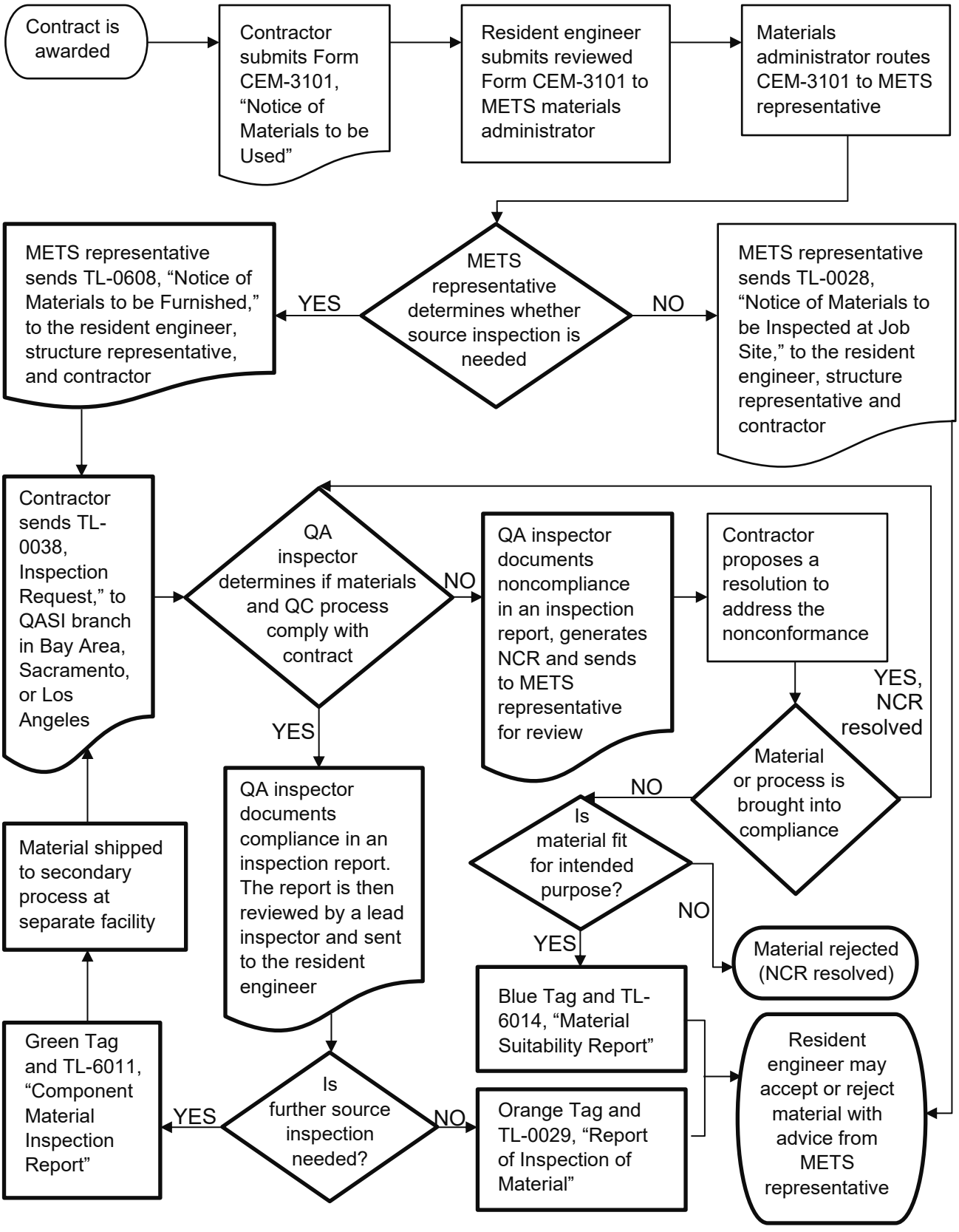
METS is responsible for the source inspection process shown in Figure 6-2.2, "Source Inspection Flowchart." The flowchart includes information on what happens when a material is not in compliance with the specifications, prompting use of a TL-0015, "Quality Assurance Nonconformance Report."

When a material listed on Form CEM-3101 is assigned a Form TL-0608, source inspection is required before the material is shipped to the job site. Table 6-2.1, "Inspection of Fabricated and Manufactured Materials," provides a list of common materials on Caltrans projects and some of the primary source inspection activities. Table 6-2.1 follows Section 6-203A (5), "Source Inspected Materials Acceptance," of this manual.

A METS inspector will travel to the source of the material and perform inspection, sampling, verification testing, and material release as necessary. Complex fabrication, such as with precast prestressed concrete members and structural steel, typically requires inspection during fabrication.

METS must receive all information that could affect materials that are source inspected. Forward all copies of authorized shop drawings as well as notification of approved change orders to the METS representative for the project. Forward to METS copies of approved shop drawings without established distributions, for example, buildings or small structures, and notification of approvals, such as paint color, or change orders. METS should receive copies of all correspondence with contractors or suppliers that may affect the fabrication.

Figure 6-2.2. Source Inspection Flowchart



Some inspections require out-of-state travel. It is important for METS to receive all documents before travel to assure timely inspection and release. For instance, light poles are manufactured at suppliers throughout the U.S.; therefore, it is crucial that authorized shop drawings are available for the METS inspector in time for inspection and release. The travel time for such inspections is significant. Coordination between resident engineer and METS is crucial for timely release of the poles.

In addition to source inspection, METS performs sampling and testing for certain materials for conformance with associated standards as a part of the quality assurance program. The list of additional tests performed by METS is available in detail in the *QASI Manual*.

The main point of contact for the resident engineer for anything related to source inspection is the METS representative assigned to the project. A list of METS representatives is available at:

https://dot.ca.gov/programs/engineering-services/

6-203A (1) Inspection Requests and Dispatching

The contractor is responsible for submitting Form TL-0038, "Inspection Request," to the appropriate METS QASI office with sufficient notice as described in Section 6-2.01E, "Material Source Inspection and Testing," of the *Standard Specifications*. The appropriate office to send Form TL-0038 is available at the METS website:

https://j2.dot.ca.gov/qs/?tab=2&sdiv=METS&unitonly=1&s_tab=smforms&off=OSM

This website allows the contractor to determine the appropriate QASI office by district. The TL-0038 can come from the contractor or subcontractors.

Each QASI office has a dispatcher who receives Forms TL-0038 and schedules inspections accordingly.

6-203A (2) Material Inspection—Sampling and Release

The METS representative assists the resident engineer with management of source-inspected materials. The METS inspector acts as the eyes and ears of the METS representative and resident engineer at the material's source. Inspected materials are identified with a unique inspector lot number that correlates the material with reports and release tags.

The METS inspector assesses the source's quality control methods and reviews the certificates of compliance and any additional documentation such as mill test reports. The METS inspector also performs random visual inspection of the material and any other required inspections such as nondestructive testing. For more information on the types of inspection required for common materials, refer to Table 6-2.1, "Inspection of Fabricated and Manufactured Materials," of this manual and the *QASI Manual*.

If sampling of the material is required at the source, the METS inspector will randomly sample the material at the required frequency and fill out a TL-0101, "Sample Identification Card," to accompany the material to the Transportation

Laboratory. Sampling may be performed in the field by either the METS inspector or field construction staff. The material's certificate of compliance and any additional documents must be sent with the material to the lab as well. If the material is undergoing mechanical testing, the resident engineer can track the testing progress by using the J2 database and clicking on the "SMTL Test Reports" tab for the project.

If the material is found to be acceptable, the inspector identifies it with Form TL-0624, "Inspection Release Tag," commonly known as an orange tag. METS inspectors will not necessarily tag every bundle and piece in a shipment. If there are many components going out in one shipment, it is common that a single orange tag will be placed on the load. The orange tag will correlate to the certificate of compliance and bill of materials with the inspector's unique lot number. This tells the resident engineer what material the tag covers.

After the material is orange-tagged for release, the METS inspector enters the lot number, a description, and quantity of materials inspected on Form TL-0029, "Report of Inspection of Material." A completed copy of Form TL-0029 is sent to the resident engineer for the project records.

Certain materials are included in the METS authorization-to-deliver program. Source inspection for these materials is different from typical procedures in that it includes a recurring audit at a prescribed frequency, with material sampling and testing. If the facility is approved to be in the authorization-to-deliver program, it is authorized to ship material to the job site without receiving a physical tag for the material. A TL-0029AD, "Report of Inspection of Material (Authorization to Deliver)," is produced by METS and sent to the resident engineer and the supplier notifying them that the material is acceptable to be shipped. The resident engineer should not expect to obtain a tag from the material if a TL-0029AD report was received. However, the resident engineer should match the TL-0029AD report with the actual shipped material quantities and certificate of compliance to verify that the material arrives within a reasonable timeframe.

When source-inspected materials arrive on the job site, the attached Form TL-0624 informs the resident engineer to permit use of the materials. The attached form shows the identifying lot number, the inspector's initials, and the date of inspection. If the item does not lend itself to attaching of tags, such as reinforced concrete pipe, the inspector marks the lot number on each separate piece. In some instances, when there is a possibility of losing tags, the inspector both attaches tags and marks a lot number on the pieces. METS inspectors will not necessarily tag every bundle and piece in a shipment, with the exception of reinforced concrete pipe.

It is important to note that the resident engineer must inspect the materials for damage that may have occurred during shipping or storage and for general quality of work and conformance to planned shape or dimensions. Table 6-2.1, "Inspection of Fabricated and Manufactured Materials," of this manual provides examples of types of field inspections for common materials.

The resident engineer may not receive the completed Form TL-0029, "Report of Inspection of Material," until after the materials have arrived at the job site. The

resident engineer must check that the correct material was shipped to the job site by verifying that the lot number and quantity of material shown on Form TL-0029 matches the identifying information, such as Form TL-0624, that was attached to or marked on the materials. Notify the project METS representative of any discrepancies so that an investigation can be conducted.

The resident engineer must inform the assigned METS inspection office if Form TL-0029 is not received within 15 days after receipt of materials.

For inspections made during fabrication, METS will produce an inspection report, unique to the type of inspection, and distribute it to the resident engineer for review and incorporation into the project files. More information on the various types of inspection reports is in the *QASI Manual*.

6-203A (3) Nonconforming Materials at the Source

If the inspector observes that the material does not comply with the specifications at the requested time of release, the manufacturer or fabricator is notified and allowed one work shift to correct. If the material cannot be brought into conformance within the time period, METS will send a TL-0015, “Quality Assurance Nonconformance Report,” (NCR) to the resident engineer within 24 hours of the observation. The resident engineer then notifies, in writing, the contractor of the NCR and requests a written response to resolve the issue.

The purpose of the NCR is to formally document the reason the material does not meet the specifications and to prompt the contractor to propose resolution and prevention measures in the response letter. This report is entered into the J2 database under the “Issues” tab so that the information is available to Caltrans staff outside the project to help avoid future issues statewide.

When the resolution letter is submitted by the contractor, the resident engineer and METS will perform a review. If the resolution is insufficient, the contractor will be notified and allowed to revise the letter and resubmit. If the resident engineer decides that the material is not suitable for the project, it will be rejected and prohibited from incorporation into the project.

If the letter is found to be acceptable, METS will issue a TL-0016, “Quality Assurance—Nonconformance Resolution,” to the resident engineer recommending a resolution and closure of the issue. In some cases, the material is found to be suitable for the intended purpose by the resident engineer, METS, and the engineer of record for project design, but it does not meet the contract specifications. In this case, METS will produce a TL-6013, “Material Suitability Documentation Report,” to document the engineering judgment used to determine the material to be suitable and concurrence from the resident engineer, METS, and engineer of record for project design. Once authorized, the material can be released by the inspector by placing a TL-0625, “Material Suitability Tag,” referred to as a blue tag, onto the material in a similar fashion as with an orange tag. A TL-6014, “Material Suitability Report,” is written in place of a TL-0029, “Report of Inspection of Materials,” and sent to the resident engineer.

- When METS and the resident engineer disagree about whether the material is suitable or unsuitable, the METS Structural Materials senior engineer and the construction engineer discuss and resolve the disagreement. When consensus is not achieved at this level, the issue must be elevated to the appropriate supervisors and a mutual solution reached.
- The blue tag is only a release of the material from the source. The resident engineer may need to prepare a change order to address acceptance of the material. Section 5-303, "Purpose of Change Orders," of this manual includes guidance for deciding whether a change order is needed. When a change order is needed, it must be approved before the material is incorporated into the work. The resident engineer sends METS copies of approved change orders addressing blue tag issues. The project's materials certification memorandum must include material that is approved for use but does not meet original contract specifications.

6-203A (4) Source Inspection Expense Deductions

Because of costs incurred by Caltrans when traveling for source inspection to material sources that are far from the job site, Section 6-2.01E, "Material Source Inspection and Testing," of the *Standard Specifications* provides the details for deductions to be taken when applicable. To determine where inspections have taken place for a project, the resident engineer can review the inspection reports that provide inspection locations.

6-203A (5) Source Inspected Materials Acceptance

The resident engineer and METS share the responsibility for inspection of materials at the source. The resident engineer has the sole responsibility for acceptance of material and may determine that materials are not acceptable for a project based on any of the following reasons:

- Damaged materials: The material may be damaged in shipment or installation.
- Material defects: It is not always practical for METS to make a 100 percent piece-by-piece inspection. The inspection is usually random sampling. The resident engineer or assistant resident engineer should check for visually detectable defects or damage.
- Incorrect wall thickness of metal culvert pipe: A given size of metal culvert pipe may vary in required thickness at various locations with different fill heights. METS inspectors cannot guarantee that a given piece of pipe will be placed at the proper location. They can only check the pipe for specified markings and determine that the measurement is within tolerance for the indicated thickness. Fit of band couplers should also be checked at the job site.
- Incorrect reinforced concrete pipe wall thickness: Some contracts require special wall thickness of reinforced concrete pipe at certain locations in the project, and the METS inspector would not know the specific job site location of that particular

pipe when the pipe is released. The inspector can only determine that it fits one of the types specified.

- Specifications and change orders: The specifications may be difficult to interpret or the source inspector is not aware of a change order.

Another situation not controllable by inspection at the source is the transfer of materials from one contract to another. The inspector can confirm in the original inspection report that a given amount of material with a given lot number was inspected for the first contract. Identifying the material as that received on the first job under the original inspection report and monitoring its transfer from one job to another are responsibilities of the resident engineers involved. Such transfers should not be allowed unless the material is positively identified or is of a type, such as fencing or reinforcing steel, that can be resampled and retested in the event identification is lost or is questionable.

Table 6-2.1, "Inspection of Fabricated and Manufactured Materials," lists manufactured or fabricated materials and products that are usually inspected at the site of manufacture or fabrication and indicates items that are checked by the inspector at the source. Table 6-2.1 also includes items that must be checked or rechecked at the job site to assure that the materials are acceptable. The table does not cover all manufactured or fabricated materials and products but provides typical examples. Verification at the source of fabrication does not preclude acceptance by the resident engineer at the job site. For more details on the inspection procedures, refer to Section 6-3, "Field Tests," of this manual, and the *QASI Manual*.

6-203A (6) Materials Manufactured to Caltrans-Specified Formulation

The *Standard Specifications* requires that certain products be manufactured to state specifications. Occasionally, composition of the specified formulation is changed and the newer specification results in an equal or better product. Materials manufactured under specifications newer than those that apply to a particular project are acceptable for use. METS inspectors release such materials, and resident engineers may permit use of such materials without change orders unless specifically advised to the contrary. State specification numbers for manufacturer materials are shown in the *Standard Specifications* or special provisions.

Paint manufactured under state specifications is sampled at the factory, tested by METS, and identified by lot numbers before shipment to the project.

Table 6-2.1. Inspection of Fabricated and Manufactured Materials (1 of 5)

Product	Items Inspected and Tested by METS	Items to Check at Job Site
Bolts, nuts, and washers	Material sampling and testing including galvanizing, visual inspection.	Visible defects, dimensions, threads, galvanizing, marking for correct type fit of nuts. Make sure high-strength bolts and nuts are used where specified and nuts are lubricated properly. (Refer to *Bridge Construction Records and Procedures*.)
Curing compound (chlorinated rubber type)	Material tests by batch or lot, check marking. (Other types accepted at job site if properly packaged and labeled.)	Proper mixing, marking, check sample. Check for specified type of container and correct marking.
Bearing, elastomeric bearing pads - steel reinforced, PTFE bearing	Material sampling and specified tests, visual and dimensional inspection certification.	Damage, defects, uniformity, dimensions.
Electrical items: controllers, luminaires, signal heads, conductors	Controllers: complete tests and inspection. Luminaires: random tests, visual inspection. Signal heads, switches; visual inspection plans, type, operational check. Conductors: random tests.	Shipping damage, defects, conformance to plans, type, operational check. Check loop detectors for operation under field conditions inspection. See that all conductors are correct type and size.
Epoxy	Materials sampling and specified tests, markings, packaging.	Proper material for intended use, excessive thickening or crystallization, proper mixing.
Forgings, steel	METS inspection and tests upon request from resident engineer. Material tests, visual and dimensional inspection.	Size, uniformity, surface defects, warping (permit no repairs).
Girders, precast prestressed concrete	Material verification, in-process inspection of fabrication (such as forms, steel placement, stressing, concrete) work quality, dimensions, conformance to plans.	Damage, flaws, exposed steel dimensions, finish, cracks, or other defects.

Table 6-2.1. Inspection of Fabricated and Manufactured Materials (2 of 5)

Product	Items Inspected and Tested by METS	Items to Check at Job Site
Girders, structural steel	Material verification, check sample testing, qualifications of welders, inspection during fabrication, nondestructive testing, preparation and painting in the shop, conformance to plans and authorized shop drawings, proper joint preparation for shop-bolted connections.	Damage to members or paint: defects in steel, camber condition of paint, dimensions, condition of holes, straightness and squareness of members.
Joint sealant, Type A field mixed polyurethane or silicone sealant	Material sampling and testing by batch or lot.	Proper components, proper mixing, marking. Damage, work quality, correct movement range (from test report), size and type, lot and batch identification. (Refer to *Bridge Construction Records and Procedures*.)
Joint seal, Type B preformed elastomeric joint seal	Material sampling and testing.	Damage, work quality, correct movement range (from test report), size and type.
Markers, pavement	Tests of each batch or lot, random inspection.	Damage, surface defects.
Mechanical equipment, scales, pump truck inspection stations, roadside rests	Inspection usually assigned to resident engineer. Consult with Structures & Engineering Services, Office of Electrical, Mechanical, Water and Wastewater Engineering, for assistance if required.	Damage, installation details, work quality.

Table 6-2.1. Inspection of Fabricated and Manufactured Materials (3 of 5)

Product	Items Inspected and Tested by METS	Items to Check at Job Site
Metal beam guard rail	METS inspection and testing of galvanizing upon request by resident engineer.	Damage to rail or galvanizing, flaws of rail and galvanizing, dimensions, conditions of holes, for example.
Metal crib wall	METS inspection and testing of galvanizing upon request by resident engineer.	Dimensions, work quality, galvanizing, specified bolts.
Miscellaneous iron and steel, miscellaneous bridge metal, bearing assemblies, rings and covers, frames and grates	Materials sampling and testing as specified, qualification of welders, inspection of fabrication, galvanizing, dimensions.	Damage, welding or fabrication defects, conformance to drawings, galvanizing defects, grinding specified coating.
Paint	Materials sampling and testing by batch or lot.	Lumps, hard setting, color, marking of cans, adherence, surface preparation, lot numbers (same as on inspection report).
Piling, precast prestressed concrete	Material verification, in-process inspection of fabrication (such as forms, steel placement, stressing, concrete) work quality, dimensions, conformance to plans.	Damage, flaws (such as cracks, spalling), painting of strand ends, straightness.
Piling, steel pipe	Material verification, weld inspection of welding if field splices are necessary.	Damage to members, overlooked fabrication details, dimensions.
Pipe, galvanized	Material sampling and testing. Check galvanizing thickness.	Size, uniformity, surface defects (permit no repairs).
Poles, lighting	Material verification, inspection and review of welding and galvanizing, visual and dimensional inspection.	Dimensions, welds, work quality, galvanizing type.

Table 6-2.1. Inspection of Fabricated and Manufactured Materials (4 of 5)

Product	Items Inspected and Tested by METS	Items to Check at Job Site
Prestressing strand	Material sampling and testing, package and storage, visual inspection when possible.	Check strand for rust, damage, surface defects. Check tags for stressing information.
Reinforced concrete pipe	Material verification, witness testing, visual inspection, dimensions, elliptical steel markings. Only for reinforced concrete pipe with diameter greater than 60 inches, unless requested by resident engineer.	Damage, defects, exposed steel, dimensions (specific locations per plans), straightness, concentricity.
Railings, barriers Bridge railing, barrier	Material tests, welder qualifications, welding and fabrication, galvanizing.	Damage to rail or galvanizing; fabrication or galvanizing defect, fit of sleeves, dimensions; types of bolts or nuts furnished.
Reinforcement splices: welded or mechanical couplers	METS sampling and testing, material verification.	Refer to *Bridge Construction Records and Procedures*.
Sign structures	Material verification, qualification of welders, inspection during and after fabrication, dimensions, cleaning and painting or galvanizing.	Damage, general work quality, general conformance to requirements, position of sign panels, final check of electrical equipment for illuminated signs, proper nuts and bolts, properly torqued.
Signs, changeable message	Fabrication, operation, work quality.	Refer to Section 4-56, “Overhead Sign Structures, Standards, and Poles” of this manual.

Table 6-2.1. Inspection of Fabricated and Manufactured Materials (5 of 5)

Product	Items Inspected and Tested by METS	Items to Check at Job Site
Steel flooring and grating	METS inspection and tests upon request from resident engineer.	Work quality, dimensions.
Structural steel	Material verification, qualifications of welders, inspection during fabrication, nondestructive testing, preparation and painting in the shop, conformance to plans and authorized shop drawings, proper joint preparation for shop-bolted connections.	Damage to members or paint: defects in steel or in welds; overlooked fabrication details; camber condition of paint; dimensions; condition of holes; proper bolts and nut markings; proper torquing; straightness and squareness of members.

6-203B Materials Accepted on the Basis of Authorized Materials List

The *Standard Specifications* identifies materials that must be on an Authorized Materials List. The list is available at:

https://dot.ca.gov/programs/engineering-services/

The engineer must make sure materials or products listed in Table 6-2.2, "Materials Acceptance Based on Authorized Materials List," are shown on the appropriate Authorized Materials List before the material is used on the project. Materials shown on the Authorized Materials List may also require a certificate of compliance or sampling and testing for acceptance.

6-203C Materials Accepted on the Basis of a Certificate of Compliance

In accordance with Section 6-2.03C, "Certificates of Compliance," of the *Standard Specifications*, the engineer may permit the use of certain materials before sampling and testing if accompanied by a certificate of compliance.

Acceptance based on certificates of compliance is used for products for which the industry has demonstrated a high degree of reliability in meeting specifications. METS performs a programmatic assessment on a periodic basis of materials that do not receive source inspection.

METS notifies the resident engineer when material from any producer is not acceptable on the basis of a certificate of compliance. The resident engineer must notify the contractor when material cannot be accepted based on a certificate of compliance and require submittal of samples for testing before use on the project.

Table 6-2.2. Materials Acceptance Based on Authorized Materials List (1 of 3)

Material or Product	Authorized Materials List
Alternative sound wall system	
Channelizers	Signing and delineation materials
Chemical adhesive Drilling and bonding dowels	Chemical adhesives or cartridge epoxies
Crack sealant	Flexible pavement crack treatment material
Concrete admixtures	Chemical admixtures for concrete
Concrete Cementitious material	Cementitious material
Concrete Innocuous aggregate	Innocuous aggregates for concrete
Concrete anchorage devices	Concrete inserts
Corrosion protection system	Corrosion protective coverings
Corrosion protection covering for splices	Corrosion protective coverings
Delineators	Signing and delineation materials
Detectable warning surface	Detectable warning surface
Earth retaining system	Earth retaining systems
Electrical Battery backup external cabinet	External battery backup system cabinet
Electrical LED signal modules	LED traffic signals
Epoxy powder	Fusion-bonded epoxy powder
Markers	Signing and delineation materials
Mechanical couplers	Steel reinforcing couplers
Organic zinc-rich primer	Organic zinc-rich primer list
Pavement markers	Signing and delineation materials
Pavement traffic stripe and marking tape	Signing and delineation materials
Plastic blocks	

Table 6-2.2. Materials Acceptance Based on Authorized Materials List (2 of 3)

Material or Product	Authorized Materials List
Post-tensioning prestressing system	Pre-approved systems (full list and details)
Precast portland-cement-based repair material	Precast portland-cement-based repair material
Reflectors	Signing and delineation materials
Reinforcement Headed bar	Headed bar reinforcement
Reinforcement Resistance-butt-welded splices	
Retroreflective • Retroreflective sheeting for barricades • Retroreflective bands for portable delineators • Retroreflective sheeting for construction area signs • Retroreflective sheeting for channelizers • Reflectors for Type K temporary railing • Retroreflective cone sleeves • White and orange-colored retroreflective stripes for plastic traffic drums • Portable signs Type VI, retroreflective, elastomeric roll-up fabric	Signing and delineation materials
Signs Retroreflective sheeting	Signing and delineation materials
Signs Fiberglass-reinforced plastic panels	Signing and delineation materials
Silane waterproofing	Silane reactive penetrating sealers
Temporary crash cushion Sand-filled	Highway safety features

Table 6-2.2. Materials Acceptance Based on Authorized Materials List (3 of 3)

Material or Product	Authorized Materials List
Temporary traffic control devices Category 2	Acceptable, crashworthy Category 2 hardware for work zones
Temporary traffic control devices Category 3	Highway safety features
Thread locking systems	Anaerobic thread locking systems
Undercoating for ungalvanized sign structures	
Warm mix asphalt	Warm mix asphalt—approved technologies

Certificates of compliance should contain the following information:

- Name of company.
- Lot number traceable to a specific lot.
- A statement naming the applicable type and brand, and that the materials meet the requirements of the *Standard Specifications*, the special provisions, or both.
- Contract number.
- Signature of responsible officer of the company.

Materials accepted based on a certificate of compliance arrive on the job site without inspection by METS and Form TL-0029, "Report of Inspection of Material." When required by the *Standard Specifications* or the special provisions, verify that these materials have a certificate of compliance and any required additional backup documentation, such as mill test reports for steel, pressure treating reports for timber, and concrete test reports, to show that the materials comply with the specifications. Table 6-2.3, "Materials Accepted by Certificate of Compliance," shows materials in the *Standard Specifications* that are accepted based on a certificate of compliance.

In addition to the materials listed in Table 6-2.3, in accordance with Section 6-2.03C, "Certificates of Compliance," of the *Standard Specifications*, a certificate of compliance is required for material produced outside the United States.

Contact the project METS representative regarding any feedback or additional detail for programmatic assessment or systematic concerns regarding certain material types.

When material delivered with a certificate of compliance is improperly certified, or any part of it is found not to comply with specifications, reject the entire shipment and notify METS immediately.

Procedures for sampling and testing materials accepted by certificate of compliance vary depending on the material. Following are some details covering the sampling of materials accepted by certificate of compliance.

Table 6-2.3. Materials Accepted by Certificate of Compliance (1 of 12)

Material/Product	Remarks (Including Requirements for Additional Backup Information Required with Certificate of Compliance)
Alternative earth retaining systems	Must state that the supplied material complies with the index criteria for the system at the time of prequalification.
Asphalt	Certificates of compliance must include the following: 1. Name and location of the supplier. 2. Grade of the asphalt. 3. The date and time of shipment. 4. A unique shipment number, such as a bill of lading number or manifest number. 5. A statement confirming that the transport vehicle was checked before loading and was found acceptable for the asphalt shipped. 6. The following wording: *" (Supplier name) hereby certifies that the asphalt product accompanying this certification was produced in accordance with the California Department of Transportation's Certification Program for Suppliers of Asphalt, and that this product complies in all respects with the requirements of the applicable specifications for the asphalt product identified on this document.* *I hereby certify by my signature that I have the authority to represent the supplier providing the accompanying asphalt product."*
Asphaltic emulsion	Certificate of compliance must include the following: 1. Shipment number and shipment date. 2. Source refinery, consignee, and destination. 3. Type and description of material with specific gravity and quantity. 4. Contract or purchase order number. 5. Signature by the manufacturer of the material and a statement that the material complies with the contract.
Asbestos cement pipe	
Asbestos sheet packing	
Asphalt modifier	Test results required with each truckload.
Asphalt rubber joint sealant	A certified test report of the results for the required tests performed within 12 months before the proposed use.
Backer rods	Must include manufacturer's statement of compatibility with the joint sealant to be used.
Barbed wire	

Table 6-2.3. Materials Accepted by Certificate of Compliance (2 of 12)

Material/Product	Remarks (Including Requirements for Additional Backup Information Required with Certificate of Compliance)
Blast cleaning material	
Bonding agent for repairing spalled surface area	Submittal of certificate of compliance required for contracts of less than 60 working days.
Bonding material	
Brick	
Cable-type restrainers Lock nuts	Certificate of compliance must be submitted with a copy of each required test report.
Cast iron pipe	
Cast iron maintenance access rings and covers	
Chemical adhesive for bonding tie bars and dowel bars in concrete pavement	
Chemical adhesive for structures	Certificate of compliance must state compliance with ICBO AC58 and Caltrans. Augmentation/Revisions to ICBO AC58.
Concrete Admixture	Certificate of compliance from the manufacturer must certify that the admixture furnished is the same as that previously authorized for the Authorized Materials List.
Concrete Cementitious material	Certificate of compliance must include the source name and location. If the cementitious material is delivered directly to the job site, the certificate of compliance must be signed by the cementitious material supplier. If the cementitious material is used in ready-mixed concrete, the certificate of compliance must be signed by the concrete manufacturer. If blended cement is used, the certificate of compliance must include a statement signed by the blended cement supplier that shows the actual percentage of supplementary cementitious material, by weight, in the blend.
Concrete Curing compound	Certificate of compliance must include: 1. Test results for the tests specified in Section 90-1.01D(6), "Curing Compound," of the *Standard Specifications*. 2. Certification that the material was tested within 12 months before use.

Table 6-2.3. Materials Accepted by Certificate of Compliance (3 of 12)

Material/Product	Remarks (Including Requirements for Additional Backup Information Required with Certificate of Compliance)
Concrete Minor concrete	Before placing minor concrete from a source not previously used on the contract, a certificate of compliance stating that the minor concrete to be furnished complies with the contract requirements, including the specified minimum cementitious material content.
Ceramic tile	
Chain link fencing and railing	Certificate required for protective coating system.
Concrete anchorage devices	
Concrete pipe Circular reinforced direct design method, less than 60 inches in diameter	Certificate of compliance must: 1. Be signed by the manufacturer's quality control representative. 2. State that all materials and work quality comply with the specifications and authorized shop drawings.
Copper pipe	
Corrugated metal pipe	
Crack sealant	Certificate of compliance must include: 1. Manufacturer's name 2. Production location 3. Product brand or trade name 4. Product designation 5. Batch or lot number 6. Crack treatment material type 7. Contractor or subcontractor name 8. Contract number 9. Lot size 10. Shipment date 11. Manufacturer's signature
Crash cushions	
Crumb rubber modifier	Test results required with each truckload.
Culvert markers	
Delineators	Certificate of compliance required for: • Metal target plates • Enamel coating • Retroreflective sheeting

Table 6-2.3. Materials Accepted by Certificate of Compliance (4 of 12)

Material/Product	Remarks (Including Requirements for Additional Backup Information Required with Certificate of Compliance)
Dowel bar baskets	
Drop inlet grates and frames	
Drain tile	
Drip irrigation line	
Elastomeric bearing pads Plain	Certified test results for the elastomer. METS samples and tests bearing pads.
Elastomeric bearing pads Steel-reinforced	Certified test results. METS samples and tests bearing pads.
Electrical Battery backup system	Certificates of compliance are required for: • External cabinet • Batteries
Electrical Conductor	
Electrical Conduit (galvanized and plastic)	
Electrical Equipment	
Electrical Pull boxes (concrete and plastic)	
Electrical Service cabinets	
Epoxy	
Epoxy powder coating for dowel bars and tie bars	METS samples and tests epoxy coating.
Erosion control	Certificate of compliance is required for: • Straw • Fiber • Rolled erosion control product • Fasteners

Table 6-2.3. Materials Accepted by Certificate of Compliance (5 of 12)

Material/Product	Remarks (Including Requirements for Additional Backup Information Required with Certificate of Compliance)
Erosion control (continued)	Certificate of compliance with attachments is required for: • Tackifier • Bonded fiber matrix Polymer-stabilized fiber matrix Certificates of compliance attachments include: 1. Safety data sheet 2. Product label 3. List of applicable, nonvisible pollutant indicators for soil amendment and stabilization products as shown in the table "Pollutant Testing Guidance Table" in the Caltrans *Construction Site Monitoring Program Guidance Manual* 4. Report of acute and chronic toxicity tests on aquatic organisms conforming to EPA methods 5. List of ingredients, including chemical formulation 6. Properties of polyacrylamide in tackifier including: (1) percent purity by weight, (2) percent active content, (3) average molecular weight, and (4) charge density.
Expansion joint filler	
Fiberglass pipe	Certificate of compliance must be submitted with laboratory test results.
Filler material for repairing spalled surface areas	Submittal of certificate of compliance required for contracts of less than 60 working days.
Gabions	If PVC coating is shown, a suitable UV resistant additive must be blended with the PVC and the additive must be shown on the certificate of compliance.
Geocomposite drain	Certificate of compliance must certify that the drain produces the specified flow rate. The certificate must be accompanied by a flow capability graph for the geocomposite drain showing flow rates and the externally applied pressures and hydraulic gradients. Verification must be by an authorized laboratory for the flow capability graph.
Geosynthetics	Test sample representing each lot and minimum average roll value.

Table 6-2.3. Materials Accepted by Certificate of Compliance (6 of 12)

Material/Product	Remarks (Including Requirements for Additional Backup Information Required with Certificate of Compliance)
Glass beads	Certificate of compliance by lot or batch and test data from an independent laboratory.
Glue laminated timbers and decking	
Guide markers	
Irrigation hose	
Irrigation pipe	Certificate of compliance required for: • Polyethylene pipe Plastic pipe supply line for pipe with wall thickness of the bell less than the specified minimum wall thickness of the pipe
Joint filler material	
Joint seals (Type A and AL)	Certified test report for each batch of sealant.
Joint seal (Type B)	Certificate of compliance required for: • Elastomeric joint seal • Lubricant-adhesive Certificate of compliance must be submitted with certified test report for each lot of elastomeric joint seal and lubricant-adhesive. Test reports must include the seal movement range, the manufacturer's minimum uncompressed width, and test results. METS samples and tests joint seal.
Joint seal Alternative joint seal assemblies	For alternative joint seal assemblies, a certificate of compliance must be submitted for each shipment of joint seal materials. The certificate must state that the materials and fabrication involved comply with the specifications and the data submitted in obtaining the authorization for the alternative joint seal assembly. METS samples and tests joint seal assemblies.
Joint seal Joint seal assemblies	METS samples and tests joint seal assemblies.
Lime	Certificate of compliance must include a statement certifying the lime furnished is the same as on the Authorized Materials List.

Table 6-2.3. Materials Accepted by Certificate of Compliance (7 of 12)

Material/Product	Remarks (Including Requirements for Additional Backup Information Required with Certificate of Compliance)
Machine spiral wound PVC pipeliners	Certificate of compliance for each reel of PVC strip must include: 1. Name of manufacturer 2. Plant location 3. Date of manufacture and shift 4. Cell classification 5. Unit mass 6. Average pipeliner stiffness and profile type
Markers	Certificate of compliance required for: • Metal target plates • Enamel coating • Retroreflective sheeting
Masonry block	Certificate of compliance required for: • Concrete masonry units • Aggregate for grout • Grout
Micro surfacing emulsion	
Mulch	
Open steel flooring and grating	
Overside drains	Certificate of compliance based on steel materials, aluminum materials or plastic materials.
Parking area seal material	
Pavement markers	
Plastic lumber	Certificate of compliance for each shipment of plastic lumber, that must be accompanied by a laboratory test report.
Plastic traffic drums	
Plastic pipe for drainage	Certificate of compliance must include average pipe stiffness, resin material cell classification, and date of manufacture. For corrugated polyethylene pipe, manufacturer's copy of plant audits and test results from the National Transportation Products Evaluation Program for the current cycle of testing for each pipe diameter furnished.

Table 6-2.3. Materials Accepted by Certificate of Compliance (8 of 12)

Material/Product	Remarks (Including Requirements for Additional Backup Information Required with Certificate of Compliance)
Portable changeable message sign	
Precast concrete Cementitious material used in precast concrete products	Certificate of compliance must be signed by the precast concrete product manufacturer.
Precast concrete Box culverts	Certificate of compliance must signed by the manufacturer's quality control representative for each shipment.
Precast concrete members	Certificate of compliance is for materials incorporated in the work, and for testing and inspections that have been performed.
Precast raised traffic bars	
Preformed compression seal for concrete pavement	
Preformed membrane sheet	Must include type of sheet and the conditioner or primer application rates.
PTFE bearing materials	
Rapid strength concrete	Certificate of compliance is required for each delivery of aggregate, cementitious material, and admixtures used for calibration tests. The certificate of compliance must state that the source of the materials used for the calibration tests is the same source as to be used for the planned work.
Reinforcement	You may request that the contractor submits with certificate of compliance: 1. Copy of the certified mill test report for each heat and size of reinforcing steel showing physical and chemical analysis. 2. Two copies of a list of all reinforcement before starting reinforcement placement.
Reinforcement Epoxy-coated	Certificate of compliance for each shipment of epoxy-coated reinforcement must be submitted with: 1. Certification that the coated reinforcement complies with ASTM A 775/A 775M for bar reinforcement or ASTM A 884/A 884M, Class A, Type 1, for wire reinforcement. 2. All certifications specified in ASTM A 775/A 775M for bar reinforcement or ASTM A 884/A 884M for wire reinforcement. METS samples and tests epoxy coating.

Table 6-2.3. Materials Accepted by Certificate of Compliance (9 of 12)

Material/Product	Remarks (Including Requirements for Additional Backup Information Required with Certificate of Compliance)
Reinforcement Epoxy-coated prefabricated reinforcement	Certificate of compliance for each shipment of epoxy-coated prefabricated reinforcement must be submitted with: 1. Certification that the coated reinforcement complies with ASTM A 934/A 934M for bar reinforcement or ASTM A 884/A 884M Class A, Type 2 for wire reinforcement. 2. All certifications specified in ASTM A 934/A 934M for bar reinforcement or ASTM A 884/A 884M for wire reinforcement. METS samples and tests epoxy coating.
Reinforcement Epoxy-coating patching materials	Certificate of compliance for the patching material must include certification that the patching material is compatible with the epoxy powder to be used.
Reinforcement Headed bar	Certificate of compliance for each shipment of headed bar reinforcement must be submitted with: 1. Mill test reports for the: a. Bar reinforcement b. Head material 2. Production test reports 3. Daily production logs METS samples and tests headed bar.
Reinforcement Splice material	Certificate of compliance for each shipment of splice material must be submitted with: 1. Type or series identification of the splice material, including tracking information for traceability. 2. Grade and size number of reinforcement to be spliced. 3. Statement that the splice material complies with the type of mechanical splice on the Authorized Materials List. 4. For resistance-butt-welded material: a. Heat number b. Lot number c. Mill certificates METS samples and tests reinforcement splices.
Sheet metal	

Table 6-2.3. Materials Accepted by Certificate of Compliance (10 of 12)

Material/Product	Remarks (Including Requirements for Additional Backup Information Required with Certificate of Compliance)
Sign panels	Certificates of compliance required for: • Aluminum sheeting • Retroreflective sheeting • Screened-process colors • Nonreflective, opaque, black film • Protective-overlay film
Silicone joint sealant	A certified test report of the results for the required tests performed within 12 months before the proposed use.
Slotted edge drain	
Snow poles	
Snow plow deflectors polyethylene material	
Soil amendment	
Steel crib wall	
Steel pipe piles	The certificate of compliance must be signed by the plant's quality control representative. The quality control representative must be on record with Structural Materials. Certificate of compliance must include: 1. Statement that all materials incorporated in the work and all required tests and inspections of this work have been performed as described. 2. Certified mill test reports for each heat number of steel used in pipe piles being furnished. 3. Test reports for tensile, chemical, and any specified nondestructive test must be based on test samples taken from the base metal, steel, coil, or from the manufactured or fabricated piles. 4. Calculated carbon equivalent. The carbon equivalent may be shown on the mill test report.
Structural plate culverts	Certificate of compliance required for: • Structural metal plate pipe • Arches • Pipe arches Metal liner plate pipe

Table 6-2.3. Materials Accepted by Certificate of Compliance (11 of 12)

Material/Product	Remarks (Including Requirements for Additional Backup Information Required with Certificate of Compliance)
Structural shape steel piles	Certificate of compliance must include a statement that all materials incorporated in the work and all required tests and inspections of this work have been performed as described.
Structural composite lumber used in falsework	
Structural steel thermal spray coat Wire feedstock	
Styrofoam filler	
Subsurface drain	
Temporary concrete washout	Certificate of compliance required for: • Gravel-filled bag • Plastic liner
Temporary fence (Type ESA)	Certificate of compliance required for: • High visibility fabric • Safety caps for metal posts
Temporary linear sediment barrier	Certificate of compliance required for: • Fiber roll • Safety cap for metal posts • Silt fence fabric • Sediment filter bag • Foam barrier • Gravel-filled bag fabric
Temporary railing (Type K)	
Thermoplastic traffic stripes and pavement markings	Certificate of compliance by lot of batch and test data report from an independent laboratory. Obtain a minimum 1-foot length of stripe test sample.
Tie bars	METS samples and tests epoxy coating.
Tie bar baskets	METS samples and tests epoxy coating.
Timber products (treated and untreated)	Certificate of compliance for timber and lumber must state the species of the material to be shipped and include a certified grading report. If treated, certified treating report.
Threaded tie bar splice couplers	

Table 6-2.3. Materials Accepted by Certificate of Compliance (12 of 12)

Material/Product	Remarks (Including Requirements for Additional Backup Information Required with Certificate of Compliance)
Turf sod	
Two-component paint traffic stripes and pavement markings	Certificate of compliance by lot or batch. Obtain a 50-foot test section before application of paint.
Underdrains	Certificate of compliance required for: • Type of pipe • Tubing • Fitting
Waterproofing fabric	
Waterstop	Certificate of compliance for waterstop material must state compliance with paragraph 6 of Army Corps of Engineers CRD-C 572.
Welded wire fabric	
Wire mesh fencing	
Wood Structures	Certificate of compliance for timber and lumber stating the species of the material to be shipped and including a certified grading report. If timber is treated, include a certified treating report. Certificate of compliance for glued laminated timbers and decking.

6-203C (1) Asphalt

Certification for asphalt must comply with Caltrans' *Certification Program for Suppliers of Asphalt*. Program requirements, procedures, and a list of approved suppliers, are available on the METS website:

https://dot.ca.gov/programs/engineering-services/

When asphalt arrives at the job site or at the plant accompanied by a certificate of compliance, accept the shipment for use and sample and test for acceptance during use. When shipments of asphalt arrive without certificates of compliance, sample the asphalt and do not allow use before receiving acceptance test results.

All samples of asphalt, along with the necessary forms and tickets, are sent to METS at Engineering Services. Ship sample cans two at a time, in the cardboard cartons used for shipping samples of the completed mix. Take samples in the amount and frequency shown in the tables in Section 6-1, "Sample Types and Frequencies," of this manual.

Asphalt is very hot; therefore, for safety reasons, the acceptance samples must be sampled by the contractor. The resident engineer must witness the contractor taking

acceptance samples. The resident engineer must determine when the sample is to be taken and then observe that the sample is taken in accordance with California Test 125, “Methods of Test for Sampling Highway Materials and Products Used in the Roadway Pavement Structure Sections,” or sampling requirements specified in contract special provisions. Take possession of the sample from the contractor and transport it to a Caltrans office or the testing laboratory.

After obtaining a sample from a plant storage tank, write the shipment number on Form TL-0101, “Sample Identification Card.”

METS sends test results to the district materials engineer and to the resident engineer.

6-203C (2) Asphalt Rubber Latex Joint Filler

Submit samples in 1-quart friction-top cans. Sample after the contents of the drum have been stirred thoroughly and brought to a uniform consistency and before the setting powder has been added. Note the batch number and the shipment number on Form TL-0101.

6-203C (3) Two-Component Joint Sealing Compounds

This material is usually in 2-gallon pails. Each pail requires a manufacturer’s lot number. Before sampling, stir thoroughly. Samples should be taken in the amount and frequency shown in the tables in Section 6-1, “Sample Types and Frequencies,” of this manual.

6-203C (4) Cement

For cement delivered directly to the job site by the manufacturer, require one certificate of compliance for each shipment.

A single certificate for each brand may certify the cement used in ready-mixed concrete by the vendor of the concrete, to cover all deliveries in a single day. It must show:

- The name or brand of cement.
- Mill source.
- The total number of cubic yards of concrete delivered under the certificate.
- A complete list of individual deliveries, identified by delivery slip number or other suitable identification.

A single certificate may cover all deliveries of precast products in a single lot. It must show the name or brand of cement and the length of each size of pipe or the number of precast units of other types represented.

METS inspects precast products, including pipe, made at a plant other than that of the contractors at the job site. When such inspection is complete, the resident engineer is relieved of responsibility for obtaining certificates of compliance and sampling of cement. The inspector at the precast product plant will handle cement inspection approximately as outlined for ready-mixed concrete.

Certificates of compliance for cement are inspected and filed by the resident engineer. In the event of a cement test failure, forward copies of certificates to METS.

Sample cement in accordance with the frequencies shown in Section 6-1, “Sample Types and Frequencies,” of this manual, and in accordance with California Test 125, “Methods of Test for Sampling Highway Materials and Products Used in the Roadway Pavement Structure Sections.”

Where plant facilities include a cement auger, the cement samples may be obtained by a pipe-sleeve sampling device or by any other convenient method.

A full 8 pounds is sampled at one time, not in smaller increments. Close the bag immediately, leaving room for the cement to shift. Place the sealed bag in a second plastic bag with the white copy of Form MR-0518, “Job Cement Samples Record.” Form MR-0518 should show the certificate of compliance serial number, cement brand and type, name of mill or vendor, date, time sampled, and contract number.

After identification, box the cement samples in corrugated cartons designed to hold single, 8-pound samples or in concrete cylinder cartons, which will hold six samples. Ship no more than six samples in any one container.

Mark the shipping carton “Cement Sample,” and ship it to METS.

Test reports of cement are issued by METS. Acceptability of current shipments from the mill will be shown on the report, but the reports may not actually include results of samples taken from a specific project. The test reports, however, are applicable to each contract identified on a test report. When a project has special requirements for cement, or if there are other nonroutine conditions, submit special samples with instructions that they be tested and reported for the specific project.

6-203C (5) Paint

Sample all paint in the field, except paint specified as commercial quality, and send the samples to METS for testing in accordance with the frequency shown in Section 6-1, “Sample Types and Frequencies,” of this manual.

For bridges and other major structures, do not allow the paint to be used until the test results of field samples are available. For other miscellaneous painting, properly inspected and identified paint may be used pending test results.

Send paint samples from the field to METS as soon as it is received on the project. During the progress of the job, take special check samples when the paint exhibits hard settling or if contamination of paint is suspected.

Proper sampling to obtain a representative portion of the paint is mandatory.

Use the following sampling methods:

- For bridges and other major structures, or whenever large quantities are involved, send an unopened 5-gallon bucket to METS. METS will return unused portions to the job.
- For smaller samples:

1. Pour the top liquid into a clean container as large as the one being sampled.
2. Stir the settled portion of the paint with a paddle, gradually reincorporating the decanted liquid until all has been added.
3. "Box" the paint by pouring it back and forth between the two containers at least five or six times or until the paint is mixed thoroughly.
4. Take a gallon sample immediately.

Send all samples to METS, along with all pertinent information. Use Form TL-0101, "Sample Identification Card."

When the paint is Caltrans-furnished, check samples will not be required.

6-203C (6) Pavement Traffic Stripe and Marking Materials

California Test 406, "Method of Test for Field-Sampling of Pavement Marking Materials," describes procedures for obtaining samples of pavement-marking materials from a factory-sealed bag, bulk container, or stripe-application equipment. Circumstances at the job site often affect where to gather the sample. Field-striping inspectors must follow the procedures in California Test 406 to assure that representative samples are taken of pavement-marking materials.

Field sampling must be initiated by the striping inspector or the resident engineer under the following conditions:

- The material is more than 1 year old, based on the date of manufacture.
- Product tampering or adulteration is suspected.
- Adequate proof that the product has been pretested and approved is not provided, for example, batch approval paperwork is missing or there are product or batch number discrepancies on containers or paperwork.

Where large quantities of pavement-marking materials are being applied, random quality assurance sampling of these materials is advisable.

Samples of pavement-marking materials in unopened factory-sealed bags are preferred. Factory-sealed bags are labeled with the manufacturer's name and batch number, which makes identification easier. When sampling glass beads and thermoplastic, collect the following sample quantity to assure a representative sample:

- One unopened 50-pound bag of glass beads of the same manufacturer and lot number being used in the striping operation.
- One unopened 50-pound bag of thermoplastic of the same manufacturer and lot number being used in the striping operation.

For paint, bulk containers can be sampled only when the material is first homogeneously mixed using appropriately sized mixing equipment. For bulk containers of paint, obtain a 1-quart sample. Multiple samples are necessary when sampling paint directly from the application equipment to assure that the product is

homogeneously mixed. Each sample must be approximately 1 quart and submitted separately.

Label samples of pavement-marking materials according to where and how they were gathered at the job site. Include pertinent information on Form TL-0101, "Sample Identification Card," and send samples to METS for testing.

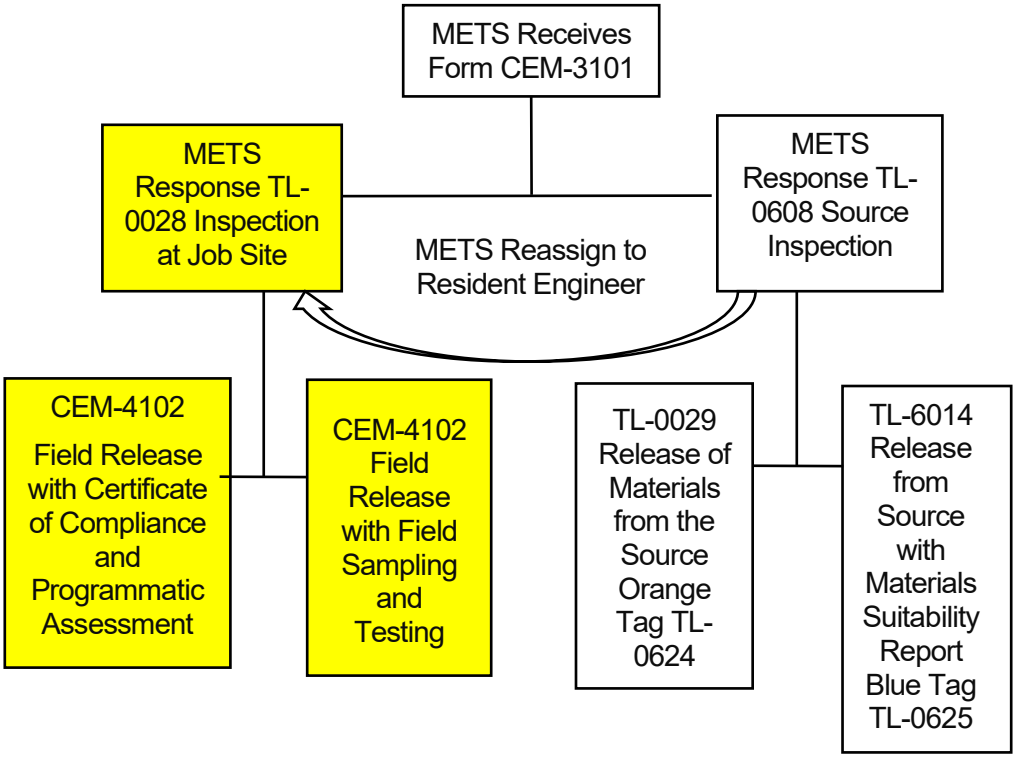
6-203C (7) Reinforcement

Refer to Section 4-52, "Reinforcement," of this manual for details.

6-203D Field Inspection and Release by the Resident Engineer

METS may assign inspection of manufactured or fabricated materials and products for which they have acceptance responsibility back to the resident engineer. The process to be followed for inspection at the job site is shown in Figure 6-2.3, "Inspection and Release Flowchart—Inspection at Job Site."

Figure 6-2.3. Inspection and Release Flowchart—Inspection at Job Site



METS assigns inspection responsibility to the resident engineer using Form TL-0028, "Notice of Materials to Be Inspected at Job Site."

Upon receipt of Form TL-0028, the resident engineer should inform the contractor that the material will be inspected, and if required, sampled, on the job site. When

testing of material is required, inform the contractor of the approximate testing turnaround time so that the contractor can obtain the material to allow for sampling and testing before the work begins.

Materials may be accepted based on required certificates of compliance or sampling and testing and visual inspection. When material will be accepted and released at the job site by use of a certificate of compliance, the required certificate of compliance should accompany the material to the job site and be retained in the project files. Sample materials in accordance with the tables at the end of Section 6-1, “Sample Types and Frequencies,” of this manual, or as requested by METS.

Field inspect and release materials assigned by METS at the job site using Form CEM-4102, “Material Inspected and Released on Job.” Refer to Section 6-3, “Field Tests,” of this manual for details.