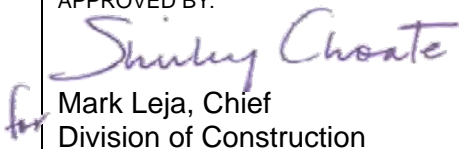


<b>MANUAL CHANGE TRANSMITTAL</b>		NO. <b>13-6</b>
TITLE: Department of Transportation <i>Construction Manual</i>	APPROVED BY:  for Mark Leja, Chief Division of Construction	DATE ISSUED: June 27, 2013
SUBJECT AREA Table of Contents and various sections of the <i>Construction Manual</i>	ISSUING UNIT Division of Construction	
SUPERSEDES CPB 09-16	DISTRIBUTION All Requested Manual Holders	

This manual change transmittal delivers the revisions of Chapter 4, Sections 11, 19, 40, 92, and Chapter 5, Section 2 of the *Construction Manual*. Updated sections may contain updated language, information, corrections, and references resulting from updates to the 2010 *Standard Specifications*, and from policy, and procedural changes. Change bars in the margins of the revised sections indicate text that was changed or added.

Please update your manual according to the table below.

Section	Incorporates	Remove Old Page(s)	Insert New/Revised Page(s)
Table of Contents	None	TOC.1 thru TOC.2	TOC.1 thru TOC.2
Chapter 4, Section 11, "Quality Control and Assurance"	None	4-11.1	4-11.1
Goldenrod, Chapter 4, Section 19, "Earthwork"	None	4-19.i	4-19.i thru 4-19.ii
Chapter 4, Section 19, "Earthwork"	None	4-19.1 thru 4-19.14	4-19.1 thru 4-19.17
Goldenrod, Chapter 4, Section 40, "Concrete Pavement"	None	4-40.i	4-40.i
Chapter 4, Section 40, "Concrete Pavement"	Part of CPB 12-3, "Pavement Safety Edge"	4-40.1 thru 4-40.16	4-40.1 thru 4-40.17
Goldenrod, Chapter 4, Section 92, "Asphalts"	None	4-92.i	4-92.i
Chapter 4, Section 92, "Asphalts"	None	4-92.1 thru 4-92.9	4-92.1 thru 4-92.8
Goldenrod, Chapter 5, Section 2, "Funds"	None	5-2.i	5-2.i
Chapter 5, Section 2, "Funds"	CPB 09-16, "Managing Construction Project Budgets"	5-2.1 thru 5-2.5	5-2.1 thru 5-2.5

#### **Section 4-11, “Quality Control and Assurance”**

- Replaces prior Section 4-11, “Mobilization,” to align with the 2010 *Standard Specifications*.
- New section provides guidance for resident engineers and staff to monitor the contractor’s quality control activities for specific items described in Section 11, “Quality Control and Assurance,” of the 2010 *Standard Specifications*.

#### **Section 4-19, “Earthwork”**

- Provides updated *Standard Specification* references.
- Adds information and references regarding new *Standard Specification* Section 19-8, “Subgrade Enhancement Geotextile,” and Section 19-9, “Shoulder Backing.”
- Adds new web page for *Subgrade Enhancement Geosynthetic Design and Construction Guide*.
- Changes SI units to US customary units.

#### **Section 4-40, “Concrete Pavement”**

- Revises section title to align with 2010 *Standard Specifications*.
- Updates references to align with 2010 *Standard Specifications*.
- Updates cross reference within *Construction Manual*.
- Reorganized to align with 2010 *Standard Specifications*.
- Converts SI units to US customary units and updates figures accordingly.
- Incorporates part of CPB 12-3, “Pavement Safety Edge.”
- Adds guidance concerning contractor's quality control plan, just-in-time-training, test strip, early crack mitigation system, coefficient of thermal expansion, rumble strips, thickness coring improvements, and additional payment deduction information.

#### **Section 4-92, “Asphalt”**

- Updates references to align with 2010 *Standard Specifications*.
- Updates link to the pavement climate map.
- Provides link to *Tack Coat Guidelines*.

#### **Section 5-2, “Funds”**

- Updates references to align with 2010 *Standard Specifications*.
- Updates terminology to align with 2010 *Standard Specifications*.
- Updates cross references to other sections of the *Construction Manual*.
- Replaces Section 5-203 with content from CPB 09-16, “Managing Construction Project Budgets.”
- Deletes Example 5-2.1, “Request for Additional Funds.”

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This manual is being updated to reflect changes from the 2006 to the 2010 *Standard Specifications*. Bracketed section numbers refer to the 2006 *Standard Specifications*.

## Section 11 Quality Control and Assurance

## Section 11 Quality Control and Assurance

### 4-1101 General

### 4-1101 General

Section 11, “Quality Control and Assurance,” of the *Standard Specifications* describes the requirements relating to the contractor’s quality control activities during construction for specific items of work. This includes handling correspondence, submittals, reports, quality control (QC) plans, QC records, and certificates of compliance. It also includes sampling and testing of materials and inspection of work in progress.

The general approach to quality control and quality assurance is that the contractor is responsible for the quality control of materials and workmanship used in the work. Caltrans is responsible for verifying the quality of materials and workmanship used in constructing the project. The sum of the contractor’s quality control and Caltrans’ quality verification is quality assurance.

### 4-1102 Before Work Begins

### 4-1102 Before Work Begins

Before work begins, check project specifications to determine if a contractor-provided QC manager and QC inspector are required for specific items of work.

If a QC manager and QC inspector are required, ensure that the contractor provides people who are qualified under applicable specifications and gives you their names and contact information.

Meet with the QC manager and QC inspector to discuss their duties and responsibilities as described in the specifications. Inform them that their quality control activities may at times need to be coordinated with Caltrans’ ongoing quality verification activities, as described throughout this manual. Discuss and answer questions that arise.

### 4-1103 During the Course of Work

### 4-1103 During the Course of Work

During the course of work do the following:

- Verify that the required QC manager and QC inspector perform duties as specified. Ensure that correspondence, submittals, reports, QC plans, QC records, and certificates of compliance are handled as specified. Ensure that the quality control sampling, testing, and inspection are done to Caltrans’ standards and in a timely manner.
- Refer to Chapter 6, “Sampling and Testing” of this manual for additional guidance in ensuring materials and workmanship used in the work comply with specifications.

### 4-1104 Measurement and Payment

### 4-1104 Measurement and Payment

For measurement and payment details, review contract specifications.

## Section 19 Earthwork

### 4-1901 General

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- 4-1904F Shoulder Backing

This manual is being updated to reflect changes from the 2006 to the 2010 *Standard Specifications*. Bracketed section numbers refer to the 2006 *Standard Specifications*.

## Section 19 Earthwork

### 4-1901 General

Earthwork includes operations connected with roadway excavation, repair of slope failures, blasting, structure excavation, backfill, ditch excavation, compaction, embankment construction, grading, borrow excavation, placement of subgrade enhancement geosynthetic (SEG), and placement of shoulder backing. For earthwork requirements, refer to Section 19, “Earthwork,” of the *Standard Specifications*. The special provisions usually include additional earthwork requirements. Also refer to Section 14-11.02C [Section 10], “Dust Control,” and Section 16, “Clearing and Grubbing,” of the *Standard Specifications*.

Many potential problems are discovered during all phases of construction staking, so it is essential that the resident engineer and assistant resident engineers maintain good lines of communication with the survey party chief. For the same reason, assistant resident engineers should also maintain good communication with the contractor’s grade checkers and supervisory personnel.

### 4-1902 Before Work Begins

Resident engineers and assistant resident engineers must do the following to prepare for earthwork operations:

#### 4-1902A Roadway Excavation

- Review the project plans, special provisions, right-of-way agreements, environmental reports, and other data about earthwork. Advise the contractor of any features that may require special handling. Take steps to ensure that environmentally sensitive areas are protected.
- Before any excavation, under California government code 4216, the contractor must notify the regional Underground Service Alert (USA) notification center by calling 811 or submitting an electronic ticket request at least 2 days before excavating. To ensure that the contractor has notified the regional USA notification center, request the contractor provide the ticket number issued by the USA center. Caltrans is not affiliated with USA so Caltrans is not notified to mark out Caltrans underground facilities. To ensure that existing Caltrans underground facilities are identified before allowing the contractor to excavate, contact the local electrical maintenance regional manager for help in locating Caltrans facilities. To help identify any Caltrans facilities within the right-of-way, such as irrigation systems, signal and lighting systems, ramp metering systems, traffic monitoring stations and communication conduits, obtain the latest utility “as-built” from the electrical maintenance unit.
- Review materials information.
- Make a preliminary check of earthwork quantities. Decide how quantities will be measured for partial payments. See “Measurement and Payment” in this section.

## Section 19 Earthwork

### 4-1901 General

### 4-1902 Before Work Begins



- Review the status of utility relocation work. Advise the contractor of any changes that may affect the work. Refer to Section 3-518C, “Non-Highway Facilities,” of this manual for more details on utilities.
- Ensure the clear marking of features and facilities that are to be preserved. Review and verify the contractor’s submitted list of existing irrigation system deficiencies.
- When the contract requires trench excavation, obtain from the contractor a detailed plan showing the design of shoring, bracing, sloping, or other provisions for worker safety. Ensure either that a registered civil or structural engineer signs the plan or that it conforms to the shoring system standards established by the *Construction Safety Orders* (CSOs) of the Division of Occupational Safety and Health (Cal/OSHA).
- Plans submitted by the contractor of the shoring details for excavations on or affecting railroad property must be satisfactory to the railroad company involved. To meet this requirement, an engineer who is registered as a civil or structural engineer in the State of California must sign the plans (whether or not such plans deviate from Cal/OSHA standards). Submit the plans to the Office of Structure Construction in the same manner as for falsework drawings. The Office of Structure Construction will obtain the railroad company’s approval and notify the resident engineer. For additional details see the Office of Structure Construction’s *Bridge Construction Records and Procedures* manual, Volume II, and the *California Trenching and Shoring Manual*. After review by the Office of Structure Construction and approval by the railroad company, return one set of the plans to the contractor with a written statement that, “The plans are approved under Section 5-1.23B(2) [5-1.02], “Shop Drawings,” of the *Standard Specifications*.
- Discuss with the contractor the schedule of earthwork operations, sources of materials, equipment capacities, and any potential hauling problems involving public traffic. Ensure that the contractor’s plan of operation complies with any specified order of work, environmental agreements, and pollution control requirements.
- Ensure the contractor’s plan to control water pollution has been approved and implemented before beginning work. Refer to Section 13, “Water Pollution Control,” of the *Standard Specifications*.

#### 4-1902B     Blasting

##### *4-1902B (1)     Safety Considerations*

All blasting work must be conducted in strict accordance with the CSOs or a properly approved alternate safety plan. An alternate safety plan is required when a 45-foot clear zone cannot be maintained around the loading area, such as a blasting area adjacent to traffic. The CSOs contain the required elements of an alternate safety plan. These elements include low-sensitivity explosive materials, initiation systems that cannot be affected by stray current or radio frequency energy, a system to detect lightning and electric storms, and barriers to prevent entry by vehicular traffic.

In addition to reviewing any blasting plan the contract requires, discuss the planned blasting operation with the contractor. Address the following areas of concern before blasting begins:

- Blast area security—Review the procedures the contractor proposes to ensure they are adequate to protect the public from unauthorized entry into the blast area

during the loading, arming, and detonating of the explosives. Often this review will require the contractor to consider more than automobile traffic. Consideration should include recreational activities such as boating, hiking, and biking or production activities such as farming and ranching. These types of activities may utilize unusual entry routes.

- Electrical storms—No explosive can be considered “safe” should lightning strike directly or nearby. Always consider lightning when planning to use explosives. During a review of the electrical storm section of the contractor’s safety plan, include an evaluation of the plan’s objective and the procedures and equipment to be used.
- Radio transmissions—Review the contractor’s proposal for controlling or eliminating the possibility of a premature detonation due to radio transmissions (including transmissions from cellular telephones).
- Warnings and signals—Review the warnings and signals to be used and, if an unsafe condition should be observed, the method by which the blast can be stopped.
  1. The audible signals (as shown in the CSOs) are a widely used standard and intended to inform workers in the area that blasting is in progress. These signals are not intended to be meaningful to the public. The use of these signals is the preferred method of communication within the work area.
  2. Signs, guards, and flaggers should be used for public communications. In many situations, the contractor may need a separate means of communication and control for public traffic. If radio communications will be used for site monitoring or traffic control, ensure the contractor adheres to the safe distance tables in the CSOs. Adhering to safe distances becomes critical when “rolling roadblocks” or “traffic breaks” are to be used.
- Onsite authority—Cal/OSHA regulations require that all blasting operations be under the direct control of a licensed blaster. The contractor should identify this person as the person who has final authority over the blasting and who will be responsible for giving the “all clear” following a post-detonation inspection of the blast area.
- The relationship between the resident engineer and the licensed blaster is different from the relationships normally encountered on most contracts. By law and regulation, the licensed blaster is responsible for and is the final authority on the conduct of blasting operations. The resident engineer may only intervene in the case of a violation of the CSOs or public safety. When intervening, the resident engineer may only suspend the operation until the hazards are abated or the contractor (blaster) conforms to the safety orders.
- Misfires—Misfires are very unusual occurrences, but when they occur, they pose serious safety problems. These problems have the potential to escalate rapidly when public traffic is involved. Ensure the adequacy of the contractor’s contingency plan for misfires.

#### *4-1902B (2) Routine Duties*

Review the special provisions for additional requirements or restrictions related to blasting. Sometimes presplitting of rock excavation is required, and considerable detail covering this work is included in the contract. The special provisions may also include

other requirements such as ground motion limits and preblast surveys of nearby buildings.

The resident engineer should also perform the following routine duties, among others:

- Ensure the blaster understands the survey stakes sufficiently to avoid placing explosives beyond slope tolerances.
- Order the discontinuance of any method of blasting that leads to overshooting or destruction of property or natural features.
- Ensure that all legally required warning signs are in place.

#### 4-1902C Structure Excavation and Backfill

To ensure the integrity of a structure, resident engineers and assistant resident engineers must pay considerable attention to structure excavation and backfill. Various categories of structure excavation and backfill and various methods of measurement and payment exist. Often, the payment limits will not match the physical limits used in the construction of a facility. Before beginning work, it is essential to study the contract plans, *Standard Plans*, *Standard Specifications*, special provisions, and the work site. Also, take the following steps:

- Before excavation, review the plans and stakes to determine the following:
  1. Whether the structure will clear other facilities.
  2. Whether the structure will function as planned in this location or should be adjusted.
  3. Whether sufficient data is available for quantity calculations.
- To install culverts in an embankment, ensure the embankment is at the elevation specified.
- Decide whether a camber is required in a culvert or other drainage structure. If so, give the survey crew or the contractor, or both, the necessary data.
- Before backfilling, inspect structures and ensure that any required strutting or bracing, as shown on the plans, is in place.
- Test backfill material for compliance with specifications and test compaction.

#### 4-1902D Ditch Excavation

Before ditch excavation, review the plans and the site to determine if original ground needs to be cross-sectioned. Most ditches will require slope stakes and, in even ground, you can use slope stake information alone to calculate quantities. If cross sections are necessary, the survey party can accomplish that work at the same time as slope staking.

#### 4-1902E Embankment Construction

Carefully examine areas upon which embankments are to be constructed. Include a review of the materials information and an onsite observation during clearing.

Review permits, environmental studies, and requirements to ensure that the contractor meets all commitments, including any measures pertaining to providing necessary access roads. Where work will affect areas beyond those approved for construction purposes or involves an environmentally sensitive area, consult with the district or regional environmental office.

Look for the following:

- Lush vegetative growth in local areas, seepage, and springs indicating groundwater.
- Trees, brush, or fences leaning downhill, indicating slippage of the surface material.
- Rolling, hummocky terrain, twisted trees, or lack of vegetation in otherwise timbered areas, indicating a large slide.

When foundation problems are known during the project's design, normally the contract will cover treatment of such areas. However, when serious problems exist that the contract does not cover, consult with the district materials engineer or the geotechnical engineer, or both.

The following are some of the most common major foundation problems and the types of solutions frequently recommended:

- The weight of the embankment displaces or consolidates material in the foundation causing settlement. This condition is corrected by the following:
  1. If it is economically feasible, remove the plastic material.
  2. Placing strut fills or buttress fills on either or both sides of the embankment to act as a counterweight. The fills resist any upward movement of the foundation material adjacent to the embankment.
  3. Constructing the embankment at a controlled rate so that any anticipated settlement will take place over time and allow hydrostatic pressures to dissipate.
  4. Constructing surcharges on the completed embankment to accelerate settlement. Settlement platforms or piezometers, or both, monitor rates of settlement. They may be installed and used under the direction of the district materials unit.
- Loss of stability may occur when the embankment forms a dam and impounds water, causing saturation. This may result in sloughing of part or all of the fill. This condition is corrected by the following:
  1. To provide drainage, placing a filter material blanket over the area that is to receive embankment. Stripping foundation material may be necessary.
  2. Constructing ditches or underdrains at the upper side of the fill to intercept water. This method is effective only if the underdrain or ditch intercepts and removes all the seepage water.
- The weight of a sidehill embankment causes movement on a slippage plane in the underlying foundation. This type of embankment failure is characterized by the mass movement of a large portion of the fill. This condition is corrected by the following:
  1. Constructing a stabilization trench through the slippage plane. Stabilization trenches, located beneath the embankment, are constructed in wet areas to intercept and remove water from deep, unstable embankment areas. These trenches may be major installations involving large quantities of excavation, filter material, and drainage pipe.

2. Installing horizontal drains to drain water from the slippage plane.
3. Changing a line or grade so that the roadway is in cut or on a smaller embankment, thus reducing the load on the slippage plane.

The contractor may often need to use combinations of the above methods for the most troublesome foundation problems.

Before the construction of embankments, also do the following:

- When consolidation of the embankment's foundation can be estimated and will be appreciable, adjust the width to be staked. When applicable, remember to include any such change in quantity calculations.
- If the foundation material will be displaced and consolidated, undertake additional measures. Place a line of "telltale" or "heave" stakes 9 to 24 feet outside of and generally parallel to the toe of the fill slope. Set these stakes to line and elevation by normal survey methods so that they will indicate both vertical and horizontal movement of the ground. In addition, inclinometers or slope indicators and settlement platforms may be used. For installing these devices, contact the district materials unit. Ensure that adequate cover is placed to protect settlement platforms from damage by the grading equipment. Schedule regular monitoring and recording.

#### 4-1902F Borrow Excavation

Review the contract for specific types of borrow the contractor will use. Also, in the resident engineer's pending file, review environmental and other requirements and commitments. This includes compliance with the Surface Mining and Reclamation Act, permits and right-of-way agreements, and other items that may affect borrow excavation.

#### 4-1902G Subgrade Enhancement Geosynthetic

Review the contract for the specific type of SEG. The layout plans should show the limits of SEG (width and length). The typical cross sections should clearly show the location of SEG within the pavement or embankment section. If separation geotextile is used with an SEG, the pavement cross section should show the location of separation geotextile which is typically placed at the subgrade interface (below the SEG). To determine SEG material compliance, refer to Section 88-1.02D, "Material," of the *Standard Specifications*. For further information on SEG, refer to *Subgrade Enhancement Geosynthetic Design and Construction Guide* at:

[http://www.dot.ca.gov/hq/maint/Pavement/Offices/Pavement\\_Engineering/Pavement\\_Foundations.html](http://www.dot.ca.gov/hq/maint/Pavement/Offices/Pavement_Engineering/Pavement_Foundations.html)

#### 4-1902H Shoulder Backing

Review the limits, slopes, and other design details as shown on the contract plans. Shoulder backing should not be used as embankment material to repair erosion or subsidence in existing slopes, for side slope reconstruction, for backfill behind dikes, or to construct the required minimum horizontal distance from edge of shoulder to hinge point (hinge width) for guardrails, dikes, and barriers

Shoulder backing should not be used in for overlays greater than 0.50 ft. in thickness, and in roadside ditches or gutters. Admixtures must not be used unless recommended

by the District Materials Engineer and if their use is permitted in the environmental document and regulatory permits.

For further information on shoulder backing refer to “Pavement Tech Notes: Shoulder Backing” at:

[http://www.dot.ca.gov/hq/maint/Pavement/Standards\\_and\\_Guidance/PDF/ShoulderBackingGuideline.pdf](http://www.dot.ca.gov/hq/maint/Pavement/Standards_and_Guidance/PDF/ShoulderBackingGuideline.pdf)

#### **4-1903 During the Course of Work**

Inspect the earthwork operations identified below during the work.

##### **4-1903A Roadway Excavation**

Consider the following areas when inspecting roadway excavation:

##### **4-1903A (1) Hauling Material**

For the requirements for hauling material, refer to various sections of the contract and to Section 3-519B, “Load Limits,” of this manual. Section 7-1.04 [19-1.02], “Public Safety,” of the *Standard Specifications* further covers the hauling of earth, specifically with respect to spillage of material.

##### **4-1903A (2) Unsuitable Material**

Section 19-1.01B [19-2.02], “Definitions,” of the *Standard Specifications* defines unsuitable material as “. . . material encountered below the natural ground surface in embankment areas or below the grading plane in excavation areas. . .” For unsuitable material, the resident engineer’s duties include the following:

- Examine all basement material and all natural ground upon which embankments are to be constructed. Advise the contractor of the areas and depths of material to be removed.
- Before removing unsuitable material that is not shown on the plans or specifications, determine the method of payment for excavation and disposal:
  1. If payment will be at contract prices, record adequate measurements for calculating quantities.
  2. If the contractor requests payment to be made as extra work, obtain the request in writing. Prepare and process a change order, and keep the necessary records relating to extra work.
- Normally, unsuitable material may be placed in embankment or contour areas.
- Examine areas where the contractor has removed unsuitable material, and before backfilling, decide on any necessary drainage or other corrective action.
- Advise the contractor of the type of material that will be suitable backfill. Observe the operation to ensure it complies with specifications.
- In addition to routine data, record in the daily report all pertinent discussion with and orders to the contractor regarding unsuitable material.

##### **4-1903A (3) Slides and Slipouts**

Perform the following steps when handling slides and slipouts:

- Examine slopes for areas of potential slides. Decide on any corrective action necessary. Corrective action may include any of the measures suggested in the

#### **4-1903**

#### **During the Course of Work**



paragraph below. For detailed analysis and recommendations for major problems, consult with the district materials unit and geotechnical engineers.

- Examine slides and slipouts to determine their probable cause. Decide on any corrective work necessary. Corrective action for a slide may require totally or partially removing the slide and flattening slopes or installing horizontal drains or underdrains, or both. For small areas, consider constructing bulkheads or retaining walls. For large areas, consider constructing benches to reduce traffic hazards from falling material. When benches are constructed, provide access roads for future maintenance.
- Corrective action for a slipout may require totally or partially removing and reconstructing the embankment with more suitable material. Also, consider constructing fill struts, stabilizing trenches, and installing subsurface drainage facilities.
- When correcting slides and slipouts requires work in areas not already available for state use on the project, any or all of the following actions may be necessary before the work may proceed: 1) obtain new or revised permits; 2) conduct new environmental studies; and 3) meet new environmental compliance requirements. Review all previously identified haul roads and flattened slopes to determine if they involve impacts not disclosed by existing environmental documentation. If the needed area extends beyond that approved for construction or may affect an environmentally sensitive area, consult with the district or regional environmental office.
- Before removal or corrective operations, determine the method of payment:
  1. If the contractor requests the removal of slides and slipouts to be paid for as extra work, obtain this request in writing. When the resident engineer decides this removal should be paid as extra work, state this decision in the change order memorandum. Then prepare and process a change order when an ordered change or extra work is involved.
  2. When payment is by item price for roadway excavation, measure the additional quantities and enter them on appropriate source documents that clearly identify the limits of the slides or slipouts.
- Any applicable method or combination of methods of compensation may be used to pay for removing slides or slipouts. See Section 5-306C, "Methods of Payment," of this manual for compensation methods.
- Decide where the contractor should deposit the material resulting from slides and slipouts. When practicable, use all the material for embankments or for flattening slopes or contour grading.
- Take before-and-after photographs of the slide area.

#### 4-1903A (4) Slopes

The engineer responsible for earthwork must review the slope stakes and ensure missing stakes are replaced in accordance with Section 5-1.26 [5-1.07], "Construction Surveys," of the *Standard Specifications*. Also, see Section 3-5, "Control of Work," of this manual and Chapter 12, "Construction Surveys," in the *Surveys Manual* for more information on staking. In addition, the resident engineer must perform the following steps:

- Make sufficient measurements to verify the proper start of slopes.
- Make sufficient spot-checks to verify the correct slope tolerances.
- Check the slope rounding for compliance with the contract. While the top of the slope is still reachable with equipment, decide whether the contractor should do additional slope rounding or contour grading.
- Ensure that the construction of any special items for erosion control complies with the contract. This review must include items on the contractor's approved plan for controlling water pollution.
- Ensure all top-of-slope or toe-of-slope ditches will drain.
- Ensure that embankment widening complies with the contract plans for installing guard railing.
- Examine slopes for material that blasting has shattered or loosened. Order the removal of this material.

#### 4-1903A (5) *Surplus Material*

The resident engineer's responsibility for surplus material and related actions will vary considerably depending on the terms of a particular contract. Generally, for those contracts that include payment for embankment construction within the payment for roadway excavation, determine as early as possible whether there will be a surplus (or deficiency) of material. For contracts that provide separate payment for embankment, ensure only that the contractor satisfies the conditions in Section 5-1.20B(4) [7-1.13], "Contractor-Property Owner Agreement," of the *Standard Specifications*.

The following are some of the factors to analyze when determining whether there will be an unplanned surplus (or deficiency) of roadway excavation:

- Determine as adequate or not the amount of embankment estimated for subsidence of original ground, considering possibly different field conditions than those the design engineer anticipated.
- Variations of slopes, even within specified tolerances, can significantly affect quantities.
- Be alert to differences between pay quantities and the actual amount of roadway excavation as a result of curve correction. On some projects, this difference can significantly affect a surplus (or deficiency) of material.
- Decide whether the planned grading factors (shrinkage or swell) need to be adjusted based on actual conditions. The factors may be adjusted in any way the resident engineer judges to be appropriate. Appropriate judgments are based on the following:
  1. Previous experience.
  2. Measurement of definable portions of excavation and resulting embankment.
  3. In-place densities in excavation compared to in-place densities in embankment.

In estimating the actual grading factor, also consider consulting with geotechnical engineers in the district materials unit who have local experience.



When the amount of any unplanned surplus is known, make plans for its ultimate disposal. Normally, do not order or permit any disposal before embankments are complete, and do not relieve the contractor of the obligation to complete all embankments before disposal.

The actions necessary for unplanned surplus will vary, depending on whether the project already has a planned surplus with available disposal areas, or whether the project was planned as a balanced project with no readily available or economically feasible disposal sites. Consider factors such as the location of the surplus within the project and whether the surplus can be disposed of within the right-of-way.

The contractor may place surplus material within or alongside an embankment, between an embankment and a right-of-way line, or in the loops and gores of interchange areas. Remember that such placement is subject to the requirements for constructing embankments. Also, ensure material is not disposed of above the grade of the adjacent roadbed unless the resident engineer specifically issues a written authorization. Select disposal sites that will not interfere with drainage, will benefit future development, and will improve appearance or stability.

When unplanned surplus material can be disposed of within the project, decide whether it will be economically more feasible either to order changes in earthwork immediately or to perform the disposal after all embankments have been completed.

When unplanned material will be removed from the project, immediately begin arrangements for disposal unless planned disposal sites will accommodate the excess. Such arrangements must include a review of environmental agreements to ensure compliance.

Before submitting ordered changes to the contractor, consult with the construction engineer on the proposed disposal of unplanned surplus. Consider disposing the surplus on excess parcels if such disposal will improve the parcels' value.

When appropriate, enter the cost or anticipated cost of disposal in the contract records to produce an accurate contingency balance.

#### *4-1903A (6) Deficiency of Material*

When the engineer's analysis of quantities indicates an unplanned deficiency of embankment material, determine whether to make up the shortage by obtaining local borrow, increasing excavation, or by obtaining imported borrow. Make this determination whether or not the contract includes an item of imported borrow. Also, consider factors such as economic feasibility, safety, environmental requirements, and material quality.

Obtaining material from outside the project's limits may require the processing of a "public interest determination." Refer to Section 3-6, "Control of Materials," of this manual for more information about this requirement.

Notify the project manager of any major deficiencies (or surpluses) so that adjustments can be made for future projects.

Keep adequate measurements and records to support payment.

#### *4-1903A (7) Selected Material*

The contractor cannot use selected material for any purpose other than that designated unless the resident engineer first determines ample material remains for the planned work.

If it is feasible and economically advantageous to the state, initiate a change order to substitute the selected material for planned aggregate subbase.

Do not order the contractor to stockpile the selected material unless stockpiling is planned, economical, or necessary for the movement of traffic.

#### *4-1903A (8) Excessive Groundwater*

When excessive ground water is encountered at subgrade, the resident engineer's duties include the following:

- Contact the district hydraulics engineer, geotechnical engineer, or both, to discuss the materials information and the area's known groundwater depths. Also, discuss with these experts any viable alternatives for stabilizing the area.
- Advise the contractor of the situation, and work with the contractor to determine the payment method for implementing the desired alternative.
- Prepare and issue a change order, if necessary.

#### 4-1903B Structure Excavation and Backfill

Consider the following when inspecting for both structure excavation and backfill:

##### *4-1903B (1) Structure Excavation*

The resident engineer's duties include the following during structure excavation:

- Observe the excavation to ensure that sloping or shoring conforms to the contractor's approved detailed plan or to the sloping or shoring requirements in the CSOs.
- To anticipate changes resulting from the foundation's condition, periodically inspect the excavation. When the foundation's condition is not stable and requires further investigation, contact the district geotechnical engineer to discuss the materials information and a viable foundation investigation. In consultation with the geotechnical engineer, direct the contractor to conduct a foundation investigation, including digging test pits, making test borings, and conducting foundation bearing tests. This additional work will be paid as extra work.
- Before fine grading begins, order any necessary additional excavation.
- Enter in the daily report any orders to increase excavation, and enter sufficient data in the appropriate records to support additional payment.
- Pay for additional quantity by measuring such quantity and including it in the appropriate contract records when no extra work is involved.
- Observe fine grading to ensure compliance with requirements for grade and culvert beddings.

##### *4-1903B (2) Structure Backfill*

The resident engineer's duties include the following during structure backfill:

- Inspect the backfill to ensure it is brought up uniformly and in the specified layer thickness.
- When slurry cement backfill is used, ensure that it is adequately fluid and is placed so that it completely fills the area around the culvert. One of the advantages of slurry cement backfill is that it provides adequate support on the underside of pipes where compaction of ordinary backfill material is difficult. The contractor must avoid “floating” the culvert.
- If backfilling steel culverts, reinforced concrete, or other metal products, ensure the contractor adds only nonchloride admixtures to slurry cement backfill to accelerate the setting time. Chloride-containing admixtures, used to hasten curing, increase the corrosion potential of the steel or reinforced concrete structure. In addition, slurry cement backfill or controlled low-strength material cannot be used as structure backfill for aluminum or aluminized steel pipe culverts.
- Ensure that all conditions described in the specifications are met before permitting “ponding” and “jetting.” “Ponding” means flooding the backfill material for a period of time (by erecting dams or dikes) so that water will pond on the material. “Jetting” means forcing water into the layer of backfill material through a small diameter pipe. Ponding alone is not permissible because it does not give uniform or adequate consolidation. Pressure jets must be inserted at the bottom of the backfill material at close, uniform intervals.
- Prohibit the use of any compacting equipment or methods that may displace or damage structures or otherwise adversely affect foundations or adjacent embankments.
- Order compaction tests (except for slurry cement backfill) to ensure compliance with the contract. Also, determine the frequency of such testing, ensuring sufficient frequency to determine compliance with requirements. Determine frequency based on variables such as the nature of the material and the efficiency of the contractor’s methods. At the beginning of backfilling, take sufficient tests to establish the amount of effort required to attain the required compaction.
- Ensure the contractor places compacted impervious material where erosion of backfill material or seepage through backfill material may occur. This approach is particularly important at culvert inlets.
- Ensure the contractor places pervious backfill material as specified.
- When imported material is used as structure backfill for metal products such as steel pipe, culverts, or reinforced concrete, the imported backfill must be at least as noncorrosive as the native soil material. Consequently, the special provisions should specify corrosive parameters for the imported fill that are less corrosive than that of the native soil. This requirement applies to imported soil, lightweight aggregate fill, and controlled low-strength material. Contact the Office of Materials Engineering and Testing Services for assistance with corrosion recommendations.

#### 4-1903C Ditch Excavation

Ensure ditches are excavated to the required lines and grades. Require any areas excavated below grade to be backfilled according to the specifications. When ditches are to be lined with concrete or shotcrete, require the contractor to prepare the foundation in accordance with Section 53, “Shotcrete,” or Section 72, “Slope Protection,” of the *Standard Specifications*.

#### 4-1903D Embankment Construction

The resident engineer's duties include the following during embankment construction:

- As material is placed, ensure the thicknesses of the layers meet specifications. Also, ensure the contractor fills voids between rocks in each layer with earth or other fine material. Record such observations in the daily report.
- Ensure the contractor does not place rocks, broken concrete, or other solid materials larger than 4 inches in areas where piles are to be placed or driven.
- During hillside construction or where the section changes from embankment to excavation, ensure that benching into existing material is adequate for proper keying of embankment material to original ground. Decide whether benching should exceed 6 feet. If widening eliminates the need for end dumping from above, increase the benching width to provide room for compacting equipment. Advise the contractor accordingly, and measure the additional excavation for payment.
- Observe end dumping, and prohibit its continued use as soon as normal embankment methods can be used.
- Ensure the contractor removes from embankment areas all debris from clearing, unless the special provisions allow otherwise. In heavy grading operations, small gullies and canyons may be filled with loose material during pioneering and haul road construction. During this phase, close observation is necessary so that such areas can be recorded for future correction.
- During embankment construction, measure the cross-fall to ensure it does not exceed specifications.
- Ensure embankment slopes comply with specified tolerances.
- Ensure surcharges and settlement periods comply with contract requirements.

#### 4-1903E Compaction

Compaction directly affects the supporting strength of soil. The less the compaction, the lower the supporting power when the material is saturated. The contractor must choose the method for achieving the required compaction, and the engineer must not direct the compaction operation.

The contractor may choose to use wetting agents, provided no detrimental effects result.

The resident engineer's and assistant resident engineer's duties include the following during compaction:

- Measure the compaction to ensure compaction meets specifications. Test at the frequency necessary for control. Take into account the uniformity of the material and the uniformity of the particular operation. Generally, if the operation is uniform and well within specifications, testing frequencies may be decreased. For non-uniform operations, borderline results, or both, increase testing frequencies.
- Observe compaction testing to ensure it complies with contract requirements. Advise testing personnel of the specific limits of the testing area.

- If the contractor chooses to excavate basement material to facilitate compaction, examine the underlying material before the area is backfilled. Decide whether the layer of material below the excavated basement material should be compacted. In general, if sufficient loose material exists to allow settlement of subsequent layers, order compaction of the underlying material by change order.

To attain the required compaction, ensure that the contractor sufficiently dries material that contains excessive moisture. Also, ensure that the resulting embankment is firm and stable.

#### 4-1903F Borrow Excavation

During borrow excavation, the resident engineer's duties include the following:

- If necessary, make measurements and also keep adequate records for progress and final payment.
- When material is to be paid for by the ton, ensure there are sufficient moisture samples to determine pay quantities.
- Ensure the contractor submits the necessary documents covering possible local material sources. For details, see Section 3-6, "Control of Materials," of this manual.

#### 4-1903G Subgrade Enhancement Geosynthetic

SEG material can be damaged easily if mishandled during construction. During placement of SEG, the resident engineer should ensure that the product has been installed correctly by adhering to the following installation requirements:

- SEG shall be placed directly on a cleared surface along the alignment to the limits shown on the plans. The surface to receive the geogrid or geotextile, immediately prior to placing, shall conform to the elevation tolerance and cross slopes as specified in the plans.
- The subgrade to receive the SEG must conform to the compaction and elevation tolerance specified in Section 25-1.03, "Subgrade," of the *Standard Specifications* and these special provisions and shall be free of loose or extraneous material and sharp objects that may damage the SEG during installation.
- SEG must be handled and placed in accordance with the manufacturer's recommendations and must be positioned longitudinally along the alignment and pulled taut to form a wrinkle-free mat on the prepared surface.
- Adjacent borders of adjacent rolls of the geogrid or geotextile must be overlapped a minimum of 2 feet in the direction as ordered by the resident engineer. All roll ends must be overlapped a minimum of 2 feet in the direction of the spreading of the aggregate subbase material. As determined by the resident engineer, an overlap larger than 2 feet may be required for lower-strength subgrade (R-value < 5).
- On curves, the geotextile or geogrid must be cut to conform to the curves. A minimum overlap of 1.5 feet shall be provided for adjacent geotextile or geogrid cut sides. The overlap must be held in place by staples, pins, or piles of fill of the materials to be placed on the geotextile or geogrid, or as directed by the resident engineer.

- Construction equipment must not operate directly upon the geogrid or geotextile. A minimum of 6 inches of fill cover is required prior to operation of construction vehicles over the geotextile or geogrid.
- The amount of SEG placed on subgrade must be limited to that which can be covered with aggregate subbase or base material within 72 hours.
- Special care must be taken in the handling of geogrids manufactured from polypropylene at temperatures at or below 0 °F.
- Stockpiling of materials directly on the SEG is not allowed. Once a sufficient working platform has been constructed, all remaining materials must be placed and compacted in accordance with special provisions and the Standard Specifications. A minimum cover of 6 inch of fill material must be maintained between the geotextile or geogrid and the equipment to prevent damage to the geotextile or geogrid. Until this sufficient working platform has been constructed, compaction must be achieved by using either smooth wheel (without vibratory action) or rubber-tired rollers. Sheepsfoot or other types of compactor equipment employing a sheepsfoot shall not be used. Excessive turning of vehicles must not be allowed on the aggregate subbase or aggregate base material placed directly over the geotextile or geogrid.
- Geotextile or geogrid damaged beyond repair during placement must be replaced by placing a new geosynthetics over the damaged area. The geotextile or geogrid overlap from the edge of the damaged area must be a minimum of 3 feet.
- Geotextile or geogrid must be laid at the proper elevation and alignment as shown on the plans or as directed by the resident engineer. Geogrid must be oriented such that the roll length runs parallel to the roadway alignment.

#### 4-1903H      Shoulder Backing

- Test the shoulder backing materials for meeting the specification. Ensure the compaction is adequate. Make sure the shoulder backing is completed within 5 days after placement of adjacent new surfacing.

### **4-1904      Measurement and Payment**

The following measurement and payment information covers roadway excavation, structure excavation and backfill, and ditch excavation.

#### 4-1904A      Roadway Excavation

The resident engineer's duties include the following regarding measurement and payment for roadway excavation:

- Usually, the design calculations to determine quantities of roadway excavation are suitable to be incorporated directly into the project records as source documents. Check the accuracy of these calculations. Also check whether slope rounding and quantities for contiguous ditches (as shown in the *Standard Plans*) have been included.
- Before beginning work, check the accuracy of original ground elevations using slope stake locations. It may also be necessary to take field cross sections or run profile lines to check original ground elevations.

### **4-1904**

### **Measurement and Payment**



- Check the roadway template and subgrade elevations. Include in the project records all documentation substantiating roadway excavation quantities. It should be easy to trace back from the total pay quantity to the source documents.
- When all roadway excavation is complete, reconcile the total quantity with the total of the partial payments. It is important to determine early in the project, and as closely as possible, the total pay quantity for roadway excavation. This early determination, coupled with the periodic adjustment of partial payment totals (as described in the following paragraph), will help prevent overpayment.
- During the work, choose a method to measure roadway excavation quantities for partial payment. One method commonly used is “load count.” Load count involves determining daily production by reaching an agreement on the capacity of hauling equipment and by using the contractor’s daily load tally. To make a preliminary determination of unit capacity, you can use the following methods:
  1. Using previous experience.
  2. Measuring volumes of hauling equipment.
  3. Weighing a loaded hauling unit and converting results into volume of material in the cut.
- As work progresses check actual conditions as frequently as possible. As a single cut is completed, compare volume in that cut to volume represented by load counts from the cut. It may also be possible to cross-section partially completed excavations, calculate work done, and compare the result to load count totals. When these checks indicate over or underpayments, make up the difference in the current partial payment. You may adjust the capacities of hauling equipment so that future partial payments based on load count are more accurate.
- Unless otherwise specified, payment for embankment is included in payment for other items of work. However, the quantities of material in embankments must be known to determine whether a surplus or deficiency of excavated material will exist. On a project involving significant amounts of earthwork, predicting a surplus or a deficiency of roadway excavation should be a primary concern in the early stages and throughout the project. (Refer to the discussion regarding subsidence and grading factors under 4-1903A(5), “Surplus Material” in this section.) During the work, it is just as important to periodically measure the constructed embankment as it is to periodically measure the completed excavation. These periodic measurements are usually the most accurate way to determine the actual grading factor. Whether or not it is important to be able to accurately predict the overall grading factor will depend on the job situation and potential problems associated with developing a surplus or a deficiency of material.
- When the contractor disposes of surplus material, additional haul distances may occur. It may be appropriate to pay for additional hauling cost as extra work. Use a mass diagram as a useful tool for determining haul distances.

#### 4-1904B     Structure Excavation and Backfill

To determine methods and limits for calculating structure excavation and backfill pay quantities, and payment clauses, review the special provisions, the *Standard Plans*, and Section 19-2.04 [19-3.08], “Payment,” of the *Standard Specifications*. Note that the payment for structure excavation and backfill is included in the payment for some

structures and culverts. Before excavation, determine if it is necessary to profile or cross-section original ground in structure excavation areas.

#### 4-1904C Ditch Excavation

To determine whether ditches and gutters are to be paid for as ditch excavation or roadway excavation, review the specifications, plans, and *Standard Plans*.

Measure the pay quantities of ditch excavation using the average end area method. Before excavation, determine if it is necessary to profile or cross-section original ground.

#### 4-1904D Borrow Excavation

Before beginning work and when borrow is paid for by volume, cross-section all known borrow areas that are dedicated to the project. If the borrow source is not known, or borrow source is used for various projects, then calculate the volume of the borrow based on the material deficiency. The material deficiency is calculated as the difference of cut and fill based on the cross-sections of the embankment and the roadway excavation shown on the plan. If it is necessary to change the method of measurement from volume to weight, write a change order specifying the conversion factor.

#### 4-1904E Subgrade Enhancement Geosynthetic

SEG is measured and paid by the square yard of the surface. The Department does not pay for additional geosynthetic used for overlaps.

#### 4-1904F Shoulder Backing

Measuring and paying for shoulder backing by the station is not permitted.

Shoulder backing is paid by ton. For payment, use the factor 145 lb/ft<sup>3</sup> or 0.0725 ton/ft<sup>3</sup> when volume is known. If a more accurate factor of conversion is needed, determine the actual dry density of the shoulder backing material being used.



## Section 40 Concrete Pavement

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This manual is being updated to reflect changes from the 2006 to the 2010 *Standard Specifications*. Bracketed section numbers refer to the 2006 *Standard Specifications*.

### Section 40 Concrete Pavement

### Section 40 Concrete Pavement

#### 4-4001 General

#### 4-4001 General

This section covers concrete pavement including:

- Preparation of concrete pavement subgrade
- Production of the concrete
- Concrete pavement equipment requirements
- Placing, finishing, and curing of the concrete pavement
- Construction of joints
- Protection of the pavement
- Performing concrete pavement crack treatment

Plant inspection specialists and testing personnel usually perform inspection and testing duties at the concrete batch plant. However, in addition to onsite inspection, mix design and plant inspection are part of the resident engineer's responsibility. Good communication between plant and inspection specialists and assistant resident engineers is essential. Inspectors and assistants must inform the resident engineer of test results in a timely manner.

This section covers mostly onsite inspection duties. For information on producing and transporting concrete, see Section 4-90, "Concrete," of this manual.

#### 4-4002 Before Work Begins

#### 4-4002 Before Work Begins

##### 4-4002A General

- Review the plans and specifications to determine the requirements for concrete pavement, including submittals, quality control and assurance, materials, construction, and payment provisions.
- Coordinate and hold a prepaving conference with the specified contractor's personnel prior to paving activities, including any test strips. Discuss the contractor's methods for performing each element of the work.
- Decide if crossings will be necessary for the convenience of public traffic and whether rapid strength concrete (RSC) should be used for such crossings. Advise the contractor accordingly.
- When long hauls are involved, review the contractor's proposed placement method to ensure that adequate time will be available.
- Discuss pavement areas to receive safety edge with the contractor and construction methods to be utilized.

- For concrete pavement widenings placed adjacent to existing pavements, ensure the existing pavement lane or shoulder is ground before new concrete is placed. New concrete pavement must match the ground existing surfaces and meet specified smoothness requirements.
- Arrange for plant inspection and testing personnel to be present at the plant before startup.

#### 4-4002B Submittals

- Verify that Form CEM-3101, "Notice of Materials to be Used," includes concrete pavement materials. Refer to Section 6-202, "Responsibilities and Procedures for Acceptance of Materials," of this manual for additional information.
- Review the contractor's proposed concrete mix design for conformance with specification requirements. The contractor's mix design submittal is to include a copy of their American Association of State Highway and Transportation Officials (AASHTO) accreditation for their laboratory determining the mix proportions and laboratory test reports including modulus of rupture information. Refer to Section 4-90 of this manual for information on concrete mix designs. Assistance with the concrete mix design review may be obtained from the district materials engineer.
- Ensure the aggregate material source complies with Section 7-103D (2), "Surface Mining and Reclamation Act," of this manual.
- Obtain the contractor's quality control plan that details the methods the contractor will use to ensure the quality of the work. Review the quality control plan for conformance with specification requirements. Ensure that the quality control plan has met or exceeded the quality control testing requirements specified in the contract. If requested by the contractor or desired by the resident engineer, hold a meeting to discuss the quality control plan which addresses each element affecting pavement quality including those specified in Section 40-1.01D(4), "Quality Control Plan," of the *Standard Specifications*. Pay extra attention to the contractor's plan for ensuring proper placement of contraction joints, dowel bars, and tie bars. The district materials engineer may be available to provide subject matter expertise at these meetings.
- Obtain certificates of compliance when tie bars, threaded tie bar splice couplers, dowel bars, tie bar baskets, dowel bar baskets, chemical adhesive for drilling and bonding tie bars and dowel bars, silicone joint sealant, asphalt rubber joint sealant, preformed compression seal, backer rods (including the manufacturer's statement of compatibility with the sealant to be used), joint filler material, and epoxy powder coating items are to be used in concrete pavement.
- For jointed plain concrete pavements, ensure the early age crack mitigation system information is provided a minimum of 24 hours in advance of each paving shift.
- Obtain calibration documentation and operational guidelines for frequency measuring devices for concrete consolidation vibrators.
- For cold weather conditions, obtain contractor's plan for protecting concrete pavement.
- Obtain the name of the contractor's independent third-party air content testing laboratory when the project is located in a freeze-thaw area.

- Obtain manufacturer's recommendations and instructions for storage and installation when threaded tie bar splice couplers, chemical adhesive for drilling and bonding tie bars and dowel bars, silicone liquid sealant, asphalt rubber liquid sealant, preformed compression seals, and joint filler material items are to be used in concrete pavement.
- For concrete pavement crack treatment, ensure the following:
  1. High molecular weight methacrylate samples are submitted well in advance of the work.
  2. Where sealant is to be removed, the contractor has submitted the proposed removal plan in conformance with the specifications.
  3. Submittal of a public safety plan, a placement plan, and material safety data sheets in conformance with the specifications.
  4. Depending on the location of the work, additional requirements may apply to the public safety plan including an airborne emissions monitoring plan prepared by a certified industrial hygienist.
  5. A representative test area is constructed and acceptable results are obtained prior to starting crack treatment.
  6. Project specific requirements are discussed with the contractor in advance to avoid surprises and disagreements.
- For compression seals, obtain the manufacturer's data sheet used to develop the recommended preformed compression seal based on the joint seal dimensions.

#### 4-4002C Training

- Ensure that just-in-time-training is conducted in conformance with contract provisions.
- Ensure that joint sealant and compression seal installation training is delivered to contractor and Caltrans personnel prior to installation of joint sealant or compression seals.

#### 4-4002D Concrete Field Qualification and Pavement Test Strip

- Ensure that field qualification of proposed mix proportions is performed by an ACI-certified "Concrete Laboratory Technician, Grade 1." Obtain copies of certifications for project records. Review concrete field qualification information for conformance with contract requirements.
- For continuously reinforced concrete pavement, verify that the contractor performs coefficient of thermal expansion sampling, specimen fabrication, and testing as specified.
- For projects with concrete pavement volumes exceeding 2000 cubic yards, ensure a test strip is constructed for evaluating compliance with specification acceptance criteria including smoothness, dowel bar and tie bar alignment, thickness, and final finishing. Test strips not meeting requirements are rejected. Additional test strips are required if the contractor changes the intended method of placement or concrete mix proportions or where a test strip has been rejected. Ensure arrangements are made to evaluate the test strip within 3 business days of placement.

**4-4003  
During the  
Course of Work**

**4-4003 During the Course of Work**

4-4003A Prepaving

- Before the start of paving, check the accuracy of the final grade stakes.
- Inspect the subgrade to ensure compliance with the specified tolerances for compaction and elevation. Ensure that any low areas are identified in a way that will result in placing additional concrete as specified. Such additional thickness is considered paid for as part of the lower layer and must not be included when calculating pavement thickness and payment (refer to the specifications for cement-treated base, lean concrete base, and treated permeable bases). Note these areas in daily reports with stationing and offset information.
- To maintain the concrete pavement at the thickness specified, the contractor may adjust the planned finished grade provided two conditions are met:
  1. All lower layers have been constructed to at least the minimum required elevations.
  2. Such adjustments do not result in abrupt changes in grade or adversely affect smoothness. General practice is to limit any such adjustment so that the planned finished grade does not change more than 0.04 foot in 60 feet longitudinally.
- When slip-form pavers are used, inspect the grade on which the paver will ride to determine if the grade is smooth enough to prevent abrupt vertical changes in the finished surface. When a wire controls the grade and alignment of the paver, check the wire for any obvious variations. Ensure that the wire is tensioned sufficiently to prevent measurable sag between supporting stakes. If you anticipate any problems, advise the contractor. Keep in mind that the contractor is responsible for the thickness and smoothness of the pavement.
- Identify where the contractor will post quality control charts.
- Ensure any specified bond breaker material, curing seal, or other required treatment has been applied and maintained on the underlying material in conformance with contract requirements. These materials may also be helpful for determining pavement thicknesses when examining pavement cores.
- Examine the equipment or tools to be used. When obvious inadequacies exist, advise the contractor and record the details in the daily report. Do the following in examining equipment or tools:
  1. For side-form construction:
    - a. Examine the forms to ensure specified attributes, including those for composition, weight, dimensions, and rigidity. Ensure that the forms are cleaned and oiled before each use.
    - b. Ensure that installation of the forms complies with specifications. Order any necessary corrective work before the placement of concrete.
    - c. Inspect the paving equipment for specification compliance.
  2. For slip-form construction, examine the paver for the specified attributes.
  3. Regardless of which method of construction is used, ensure that the contractor uses proper consolidation techniques that produce uniform concrete without

segregation. Where vibrators are used, ensure they are operated in conformance with contract requirements.

4. To ensure compliance with the requirements for protecting pavement, examine all equipment that will bear on previously completed pavement.

- Ensure a sufficient water supply has been developed for the work.
- Before concrete placement, ensure that the subgrade is uniformly moist, but free from standing or flowing water.
- When required, ensure that tie bars and dowels are on hand and conform to specifications.
- Ensure that equipment for constructing joints is onsite and that it conforms to specifications.
- Ascertain the curing method the contractor proposes to use. When curing compound will be used, discuss the labeling and packaging requirements for acceptance of the compound with the contractor. Obtain a certificate of compliance, including required test results, for each batch of curing compound.
- Ensure that equipment and materials meeting the requirements of Section 90-1.03B(3), "Curing Compound Method," or Section 90-1.03B(4), "Waterproof Membrane Method," of the *Standard Specifications* are onsite.
- If paving or finishing operations will extend beyond daylight hours, ensure that adequate lighting facilities are on the project before paving begins.

#### 4-4003B Paving

- Maintain good communication between field personnel inspecting the placing portion of the paving operation and plant inspection personnel, so that problems related to mixing or hauling may be addressed and corrected effectively.
- Refer to Section 4-90, "Concrete," of this manual for a discussion of transporting concrete and receiving load tickets at the delivery point.
- Observe the concrete as it is placed for improper proportions or inadequate mixing. In the daily report, record the reasons for any concrete rejection and the approximate amount involved.
- At the start of each day's work, ensure that the specified date stamp is used to mark the new pavement.
- Ensure acceptance testing is performed on concrete pavement in accordance with Section 40-1.01D(13)(a), "General" of the *Standard Specifications* and Section 6-1, "Sample Types and Frequencies," of this manual for the identified quality characteristics.
- For California Test 523, "Method of Test for Flexural Strength of Concrete," select a location to store concrete beams. A good location is one convenient to a water source and removed from any traffic. Require the contractor to supply sufficient sand or earth for burying the beams. Arrange for the contractor also to supply labor for assistance with transporting and burying the beams. Note the safety precautions in the test method.
- Ensure sufficient beam samples are molded for modulus of rupture acceptance testing based on lot size and age strength requirements. Make additional sets of

beams to determine acceptable flexural strength when pavement crossings will be open to public traffic or to job traffic earlier than normally permitted. Ensure fabricated beams are properly handled, cured, and transported prior to testing.

- Where air entraining admixtures are required, perform verification testing and use quality control testing for acceptance for air content of concrete pavement. Follow the contractual procedure specified in Section 40-1.01D(13)(f), “Required Use of Air-Entraining Admixtures,” of the *Standard Specifications*.
- Review control chart information and ensure the contractor is following their quality control plan including action and suspension limits.
- Obtain updated quality control charts on each day of paving.
- For continuously reinforced concrete pavements, verify that the contractor performs coefficient of thermal expansion sampling and specimen fabrication, and submits specimens as specified.
- Ensure that the contractor furnishes the required tachometer. Also, be sure the contractor does the vibrating at the locations and in the frequencies and amplitudes specified. Be alert for inoperative units, and ensure they are replaced immediately.
- Observe the operation of equipment that bears on existing pavements to ensure that no cracking or other damage occurs. If damage occurs, order immediate corrective action.
- Ensure that dowels and tie bars are not displaced during the pour.
- When joints are to be formed rather than sawed, be sure joint material is placed as specified.
- Ensure that the contractor constructs a transverse construction joint if the time interval between two successive concrete loads is greater than the specification allowance. Ensure such joints are constructed at permissible contraction joint locations.
- Encourage the contractor to construct the pavement so it meets requirements for profile index, straightedge, and edge slump before final finishing.
- Measure the pavement’s width at the beginning of and periodically after paving. While the required width applies to both upper and lower surfaces, the bottom width can be greater than specified to reduce edge slump.
- Ensure that end anchors are constructed at all required locations and to the dimensions shown on the plans. Be sure transverse contact joints are constructed and tie bars and dowels are placed as shown on the plans. When required, ensure that pressure relief joints are constructed as specified and shown on the plans.

#### 4-4003C Finishing Pavement

- Ensure that the contractor performs preliminary finishing according to specifications and in a way that imparts the desired surface characteristics.
- During concrete finishing observations, consider the following information:
  1. Pavement can be durable with inadequate texture or be well textured and not have enough durability to retain the texture.
  2. Mixing water with surface mortar during finishing reduces surface durability. This mixture may “bleed” water that has not evaporated that was added to the



surface to make finishing easier, or water that was added to prevent hairline cracking and checking.

3. If any of the concrete visible during finishing is more dilute than the mortar of the freshly placed concrete, too much water is being mixed into the surface. Telltale signs of the unacceptable practice include the following:
    - a. Soupy mortar during finishing.
    - b. Excess laitance.
    - c. Small scallops in the slab's edge.
    - d. Areas still soft and wet in the finished surface while the surrounding area has turned firm and lost its watery sheen.
  4. Standing bleed water may appear on the surface under certain conditions shortly after pavement is placed. To avoid mixing bleed water with surface grout, complete preliminary finishing before bleeding progresses to this degree.
  5. Water applied for the convenience of finishing, not otherwise needed to produce the specified product, is contrary to specifications regarding water use for retempering.
- Ensure that the contractor performs the final finishing as specified and in a way that results in a finished surface with the desired characteristics.
  - When sufficient rain may fall to damage fresh pavement, stop pavement placement or ensure that other steps are taken (such as placing a covering) to prevent damage.
  - Before texturing, ensure that the contractor rounds the pavement edges to specified radii. Observe texturing for compliance with requirements. Ensure the contractor performs initial texturing with a broom or burlap drag so as to produce striations parallel to the centerline.
  - Ensure that burlap drags are used as specified and kept sufficiently clean to avoid unsightly irregularities in the texture. Brooms used must also be kept sufficiently clean to avoid significant irregularities. Final texturing must be done with spring-steel tines that produce grooves parallel to the centerline. Grooves not straight and parallel to the centerline are unacceptable. Ensure that the cross section of the steel tines complies with specifications. Inspect the pavement surface to ensure that grooves meet the specified depth.
  - Before and after the application of curing seal, ensure that the contractor keeps the pavement surface moist as specified.
  - Ensure the contractor uses either the waterproof membrane method or curing compound method specified in Section 90-1.03B, "Curing Concrete," of the *Standard Specifications*. During observations, also note the following:
    1. Waterproof membrane:
      - a. Ensure the contractor sprays the concrete with a mist of water until the concrete has set before placing the membrane.
      - b. Examine the waterproof membrane to see that it meets specifications. For assistance, consult the district materials engineer.



- c. Ensure that membrane material is placed and secured and that any damaged sheeting is repaired as the specifications require. Make sure that the contractor adheres to the specified curing period.

2. Curing compound:

- a. Ensure that the contractor applies the curing compound uniformly at the specified time. See that sawed cuts or other disturbed areas receive additional curing compound. Your inspection should ensure the following attributes for the compound:
    - (1) It is not contaminated, diluted, or altered before application.
    - (2) It is mixed thoroughly before application.
    - (3) It is applied when concrete surfaces are still visibly moist.
    - (4) The curing film remains unbroken for the specified duration of curing.
  - b. Perform measurements and calculations for the curing seal's application rate. To determine the rate, you may use California Test 535, "Determining the Application Rates of Concrete Curing Compounds in the Field." Record the measurements in the daily report.
- Ensure concrete pavement joints are constructed in conformance with Section 40-1.03E, "Joints" of the *Standard Specifications*; the contractor's quality control plan; and, when applicable, the contractor's early crack mitigation system. Longitudinal and transverse contraction joints must be sawed before cracking occurs and after the concrete is hard enough to saw without spalling, raveling, or tearing. The contractor is responsible for determining the exact time of sawing. Ensure that concrete debris, water residue, and paste are immediately removed during saw cutting operations and that slurry from the sawing operation is immediately washed from the joint and removed. Where spalling, raveling, and tearing are observed, ensure the contractor performs repairs in conformance with Section 40-1.03Q(2), "Repair of Spalls, Raveling, and Tearing," of the *Standard Specifications*.
  - Ensure concrete pavement temperature is maintained above 40°F during the initial 72 hours after placement.

4-4003D Post-Paving

- Identify where core locations are to be taken by the contractor to verify proper placement of dowel bars and tie bars and proper concrete consolidation around these bars. Verify specified tolerances have not been exceeded.
- Visually examine concrete pavement surface once the cure period is complete. Identify any partial depth cracks or working cracks (full-depth) within the pavement slabs. If necessary, order the contractor to obtain concrete cores to further evaluate. Ensure partial depth cracks are treated with a high molecular weight methacrylate resin in accordance with Section 40-6, "Concrete Pavement Crack Treatment," of the *Standard Specifications*. Ensure working cracks within 0.5 foot of either side of a planned contraction joint are treated in accordance with Section 40-1.03Q(3), "Repair of Cracks," of the *Standard Specifications*. Pavement slabs with working cracks more than 0.5 foot from a planned contraction joint require the removal and replacement of slab or slab portions.

- Measure the finished surface with a straightedge, especially at contact joints, to determine compliance with specifications. The pavement's final surface must comply with both straightedge and profilograph requirements.
- Observe the contractor's pavement profiling operation. Ensure that the profilograph is calibrated and that the contractor operates it in accordance with California Test 526, "Operation of California Profilograph and Evaluation of Profiles." The profilograph operator must be qualified in accordance with Caltrans' *Independent Assurance Manual*. The contractor is responsible for controlling and performing necessary intermediate steps to produce final profilograms indicating the pavement surface is within the profile index specified. When corrective grinding is performed, it must conform to Section 42-3, "Grinding," of the *Standard Specifications*. Read the final profilograms in a timely manner. Inform the contractor if the profile index is acceptable or if further grinding is required. Record details of the contractor's profilograph operation, corrective measures, and final results in the daily report. Ensure the contractor submits the final profilograms to the specified email address.
- With the district materials engineer, arrange to measure the coefficient of friction (California Test 342, "Surface Skid Resistance with the California Portable Skid Tester"). Do not open pavement to traffic unless the coefficient of friction has been obtained.
- Note the following for coefficient of friction:
  1. Areas with uniform surface texture require testing only at representative locations to ensure that the required coefficient of friction has been provided. Test areas with visibly smoother texture as completely as necessary to ensure compliance or delineate areas that must be corrected.
  2. Tests made at temperatures below 40°F will yield low results; therefore, do not rely on such tests as indications of failure. However, you may use values higher than the required minimum to indicate compliance even if you made measurements below 40°F.
  3. To determine if the contractor's method of texturing is capable of producing the specified results, perform some tests as soon as possible after paving begins. Note that tests performed before the concrete is 7 days old are not valid for acceptance. Whenever early tests are performed, advise the contractor that such areas are subject to retesting. If the contractor has used the pavement for hauling or conducted an operation that could reduce the friction factor from the one originally determined, retest such areas before opening them to public traffic.
  4. Areas not meeting coefficient of friction requirements must be corrected by grooving or grinding in conformance with Section 42, "Groove and Grind Concrete," of the *Standard Specifications*. Retest the corrected sections as necessary to verify the coefficient of friction value has been met.
- After any required corrective grinding, determine locations where coring for thickness will be performed by the contractor. Observe coring operations and obtain drilled corings in properly identified plastic bags from the contractor. Use cores to determine acceptance of concrete pavement thickness. For more details about pavement thickness measurements, refer to Section 4-4004, "Measurement

#### **4-4004 Measurement and Payment**

and Payment.” Do not allow coring machines on fresh concrete while any danger exists of damaging the concrete. Wait at least 72 hours as a minimum.

- Ensure any required rumble strips are ground into the concrete pavement after the minimum specified time and strength have been obtained. Ensure the completed rumble strip conforms to the tolerances for alignment, spacing, depth, length, and width. Ensure noise restrictions are met.
- For concrete pavement crack treatment, ensure application takes place after any corrective grinding. Ensure surface to be treated is properly cleaned and adjacent areas such as pavement joints, drains, and openings are protected. Refer to Section 40-6.03, “Construction,” of the *Standard Specifications* for other placement provisions.

#### **4-4004 Measurement and Payment**

Using the dimensions shown on the plans, calculate the quantity of concrete pavement to be paid for. Use curve corrections to make sure that calculations account for curves in alignment. Make deductions from contract payments for deficient pavement thickness.

##### 4-4004A Measurement of Pavement Thickness

Cores taken in each primary unit of pavement at the minimum specified rate and cores in primary unit areas taken at the contractor’s request are referred to as “primary cores.”

Primary cores do not include cores taken for secondary thickness measurements. These cores and those taken to determine the limits of secondary units are referred to as secondary cores.

Before coring begins in primary units, designate areas where coring is excluded. Limit excluded areas to the following:

- Dig-out spots in the subgrade.
- Thickened slabs at bridge approaches.
- End anchors.
- Local areas where authorized modifications to the planned pavement thickness have been permitted.

Do not exclude portions of the primary unit where equipment had difficulty or where unauthorized deviations from planned pavement thickness occurred.

##### *4-4004A (1) Location of Primary Cores*

Do the following to locate primary cores:

- For each pavement thickness on each day’s paving, determine the net area, in square yards, of pavement placed, excluding the area of structures and other areas on which pavement is not placed during that day. The resulting measurement is the area of the primary unit. Divide the area of the primary unit by 1200 square yards and take the next highest whole number. The resulting number is the number of primary cores to be taken, unless the contractor requests additional ones.
- Divide the net length of the primary unit by the number of primary cores to be taken in that unit. The resulting distance is the primary coring interval.

Locate the first core in any primary unit by starting at either end of the unit (preferably proceeding in the direction of increasing stations), and select a lane at random. Select any factor from the longitudinal factors shown in Table 4-40.1, "Calculation Factors to Locate Cores," and multiply the factor by the primary coring interval. The result is the distance from the beginning of the primary unit to the first core. (Any random method of selecting the longitudinal location of the first core is within the intent of the specification.) Determine the lateral location of the first core by selecting a value from the lateral column shown in Table 4-40.1 and measuring that distance from the right-hand edge (when looking ahead) of the lane selected.

Table 4-40.1  
Calculation Factors to Locate Cores

Longitudinal (Factor)	Lateral (Feet)
0.6	6
0.1	10
0.2	2
0.9	9
0.5	5
0.7	7
0.4	4
0.8	8
0.3	3

- In turn, locate the remaining primary cores in the lanes. Space them uniformly, from the first core in the unit, at longitudinal intervals equal in length to the primary coring interval for the unit. Then locate them laterally within each lane as used for the first core by applying successive values from the lateral factors in Table 4-40.1. All values in the table are to be used successively for each primary unit throughout the project after the value for the first core in the unit is selected at random. The location of each core should be spotted on the pavement within "pacing accuracy" longitudinally and within about 1 foot laterally.

#### 4-4004A (2) Location of Secondary Cores

To determine the limits of secondary units, locate cores in approximately the center of each adjacent panel.

#### 4-4004A (3) Thickness Variation

For all cores, determine the pavement thickness variation by subtracting the specified thickness of pavement from the thickness determined by core measurements. Record excess thickness by using a plus sign and deficient thickness by using a minus sign.

4-4004B Calculation of Deductions in Payment to the Contractor for Deficient Thickness

Take these steps when calculating deductions based on deficient thickness:

*4-4004B (1) When None of the Primary Cores are Deficient in Thickness by More Than 0.05 Foot*

When no primary cores are deficient in thickness by more than 0.05 foot, make an adjustment as follows:

- To determine the average thickness deficiency, if any, for the primary unit, average the thickness variations of all primary cores. Record this value to the nearest 0.01 foot. If the average thickness deficiency is less than 0.01 foot, make no deficiency adjustment. If the average thickness deficiency is more than 0.01 foot, continue with the steps below.
- To obtain the deficiency adjustment in dollars per square yard, use the table in Section 40-1.04, "Payment," of the *Standard Specifications*. The average thickness value is to be rounded to the nearest hundredth of a foot for averages from 0.01 foot to 0.05 foot when using the pay adjustment table.
- To obtain the total amount of payment to deduct for the primary unit, multiply the deficiency adjustment by the total area of the primary unit in square yards.

*4-4004B (2) When One or More of the Primary Cores are Deficient in Thickness by More Than 0.05 Foot*

When one or more cores are deficient in thickness by more than 0.05 foot, determine the limits of the deficiency by taking a secondary core in adjacent panels. Continue taking a secondary core in adjacent panels, expanding as necessary, until the deficient area is bounded by panels with deficient thickness of 0.05 foot or less. The bounded area is referred to as a secondary unit. Reject the secondary unit area for noncompliance pursuant to Section 5-1.30, "Noncompliant and Unauthorized Work," of the *Standard Specifications*. Exclude the secondary unit areas from payment and deduction calculations. In the calculation to determine average thickness of the primary unit, use the average thickness of all secondary cores outside the secondary unit to replace the thickness of the initial primary core within that secondary unit.

To determine the primary unit deduction, multiply the primary unit area, excluding any secondary unit areas, by the appropriate factor (if any) in the table titled "Pay Adjustments for Deficient Thickness" within Section 40-1.04, "Payment," of the *Standard Specifications*.

To determine the total deduction, add the deductions for primary units and the cost of all secondary cores, including those taken outside secondary unit areas.

Below is an example illustrating the procedure for measuring the pavement for thickness and calculating deductions for thickness deficiencies. The procedures and the dollar figures used for deductions from payments to the contractor used in the example are based on Section 40-1.01D(13)(e), "Concrete Pavement Thickness," and Section 40-1.04, "Payment," of the *Standard Specifications*.

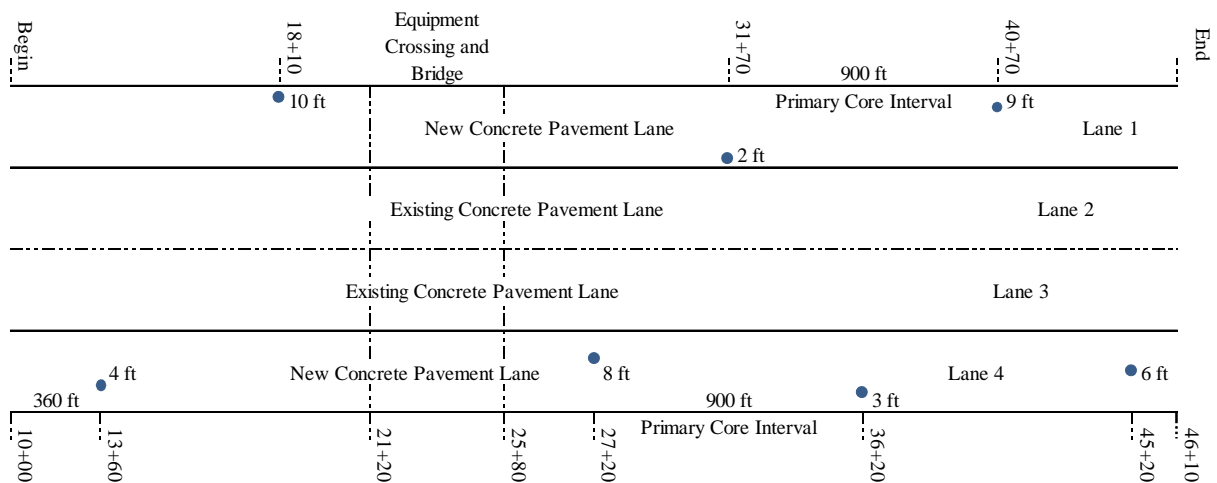
Assume the following:

The contractor paved two lanes (1 and 4) from Station 10+00 to Station 46+10. An equipment crossing and a bridge within the limits of the day's run caused "skips" in the length paved totaling 460 feet (from Station 21+20 to

Station 25+80). The actual length paved was 6300 feet (3150 feet x 2 lanes). The total area paved on this date was 8400 square yards.

The engineer calculated the number of cores required for thickness measurements in the primary unit ( $8400/1200 = 7$ ) and the core interval ( $6300/7 = 900$ ). To determine the location of the first core, the engineer chose the outside lane (4), at random and used the seventh set of numbers at random, from Table 4-40.1, "Calculation Factors to Locate Cores." The first core was taken at a longitudinal distance of 360 feet from the beginning and at a lateral distance of 4 feet from the right edge of the lane. Subsequent cores were taken at a core interval of 900 feet, excluding skip areas, proceeding from lane 4 to lane 1. Figure 4-40.1, "Primary Cores," illustrates the primary unit and the locations of all the primary cores.

**Figure 4-40.1**  
**Primary Cores**



- Length of primary unit = 6300 ft  $\{[(4610-1000) - (2580-2120)] \times 2\}$
- Number of cores = Area/Core Frequency =  $(6300 \text{ ft} \times 12 \text{ ft} \times 1 \text{ sqyd} / 9 \text{ sf}) / (1200 \text{ sqyd/core}) = 7$  cores
- Primary core interval =  $6300 \text{ ft} / 7 \text{ cores} = 900 \text{ ft/core}$
- Location of the first primary core:  
In this example the outside lane (4) is chosen (at random), and the seventh set of numbers (at random) from Table 4-40.1 is used. The first core is taken at a longitudinal distance from the beginning of 360 ft ( $0.4 \times 900 \text{ ft}$ ). The first core is taken 4 ft from the right edge of the lane.

The core thickness variations for the respective numbered cores were determined as follows:

Core Number	Stationing and Lane	Core Offset	Thickness Variation
1.	Sta. 13+60 Lane 4	4 ft off right edge	-0.03 ft
2.	Sta. 27+20 Lane 4	8 ft off right edge	+0.02 ft
3.	Sta. 36+20 Lane 4	3 ft off right edge	+0.03 ft (use +0.02 ft)
4.	Sta. 45+20 Lane 4	6 ft off right edge	-0.03 ft
5.	Sta. 18+10 Lane 1	10 ft off right edge	-0.04 ft
6.	Sta 31+70 Lane 1	2 ft off right edge	-0.00 ft
7.	Sta 40+70 Lane 1	9 ft off right edge	-0.07 ft

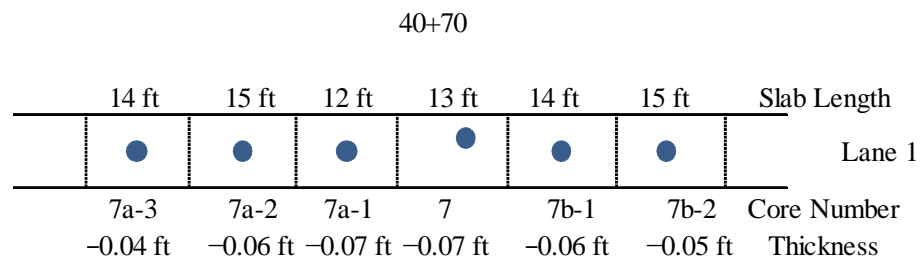
Core 3 is more than 0.02 foot greater than the specified thickness, so + 0.02 foot was used in the calculation to determine thickness deficiency in the primary unit in accordance with Section 40-1.01D(13)(e), “Concrete Pavement Thickness,” of the *Standard Specifications*.

Core 7 was deficient by more than 0.05 foot. Because of this deficiency, the next step was to determine the dimensions of the secondary unit from secondary thickness measurements.

To determine the limits of the secondary unit, the resident engineer ordered secondary thickness measurements in the panels adjacent to the panel where Core 7 was taken. Subsequent thickness measurements were in panels adjacent to panels with thickness deficiencies of more than 0.05 foot. This process continued until the secondary unit was bounded by panels in which the secondary measurements were deficient in thickness by 0.05 foot, or less. Cores in each of these panels were taken in the center of the panel.

Figure 4-40.2, “Secondary Cores,” illustrates the thicknesses of the secondary cores taken.

**Figure 4-40.2**  
**Secondary Cores**



Core Number	Thickness Variation
7a-1	-0.07 ft
7a-2	-0.06 ft
7a-3	-0.04 ft
7b-1	-0.06 ft
7b-2	-0.05 ft

The panels in the secondary unit area represented by cores 7, 7a-1, 7a-2 and 7b-1 were measured and found to be 54 feet in length and represent 72 square yards.

The engineer averaged thickness variations of the secondary thickness measurements outside the secondary unit area. The resulting value was used in the calculation in lieu of the thickness variation for Core 7 to determine the average thickness deficiency of the primary unit area. The core thickness variations in the panels surrounding the secondary unit are tabulated below.

Core Number	Thickness Variation
7a-3	-0.4 ft
7b-2	-0.5 ft

The average of the thickness variations in the above table is -0.045 feet. This average was rounded to -0.05 foot, and used for the thickness variation for Core 7 in the primary unit.

Using -0.05 foot for the Core 7 thickness deficiency, the engineer calculated the average thickness deficiency (cores 1 through 7) for the primary area to be -0.016 foot. This average was rounded to -0.02 foot and used for the thickness deficiency for the primary unit.

The remaining area of the primary unit, after the area of the secondary unit was subtracted, was as follows:

$$8400 - 72 = 8328 \text{ square yards.}$$

The deduction from payment to the contractor for thickness deficiency in the primary area in accordance with Section 40-1.04, "Payment," of the *Standard Specifications* was calculated as follows:

$$8328 \text{ square yards} \times \$2.30/\text{square yard} = \$19,154.00$$

The secondary unit area was later removed, reworked, and replaced. A single core was then taken to determine thickness variation and found to be -0.01 foot. A deduction was then taken on the remedied secondary unit as follows:

$$72 \text{ square yards} \times \$0.90/\text{square yard} = \$64.80$$



In addition to the deductions for pavement thickness deficiencies in the primary and secondary units, a deduction from payment to the contractor was made for the cost of all secondary thickness measurements. The cost of secondary thickness measurements was the cost of cores 7a-1 through 7a-3, 7b-1 through 7b-2, and 7c-1 (core taken after replacement of secondary unit).

#### *4-4004B (3) Contractor's Requests for Additional Thickness Measurements*

If, after the primary coring is performed, the contractor requests additional thickness measurements in any primary unit, treat the request as a request for doubling the frequency of coring in the primary unit area. Locate the additional cores in a manner similar to that used for locating the primary cores. This approach will halve the interval distance between primary cores. To calculate the deficiency adjustment, do not separately consider additional cores that are deficient in thickness by no more than 0.05 foot. Instead, include these cores with the original primary cores. If additional cores are deficient in thickness by more than 0.05 foot, determine the limits of the secondary areas.

Do not grant permission to a request from the contractor for selective coring. However, if the contractor requests additional thickness measurements before the performance of any of the primary coring, you may shorten the length of the coring interval for the primary unit accordingly. For example, the contractor may request a rate of one core for each 600 feet of traffic lane rather than one core for each 900 feet. The request will have the effect of increasing, not necessarily doubling, the number of cores.

Deduct from the payment to the contractor the cost of additional thickness measurements that resulted from the contractor's request.

If a contractor requests more than one round of additional cores, consult with the construction field coordinator before granting permission.

#### 4-4004C Handling of Skips in the Original Day's Pour and Secondary Areas to Be Removed and Replaced

Skips (such as gaps left for traffic or equipment crossing, short distances between adjacent bridges, and secondary areas to be removed and replaced) are ultimately poured at a later date. The net area of such pavement placed in any one day technically becomes a primary unit area and, as such, is subject to the specifications regarding thickness measurements. Use judgment regarding which of these areas warrant thickness coring. In general, any area excluded from final coring should be small, and you must have other measurements to confirm that the thickness of the pavement is not deficient.

#### 4-4004D Handling Deficient Areas Not Cored

When you have specific knowledge of areas deficient in thickness and you have records of the extent of such deficiency, exclude these areas from the random coring. Make the deficiency adjustment on the average thickness deficiency in the same manner as for areas that have been cored.

#### 4-4004E Administration

Notify the contractor in writing of the date and place where coring will be performed. Follow up orally, if necessary, to be certain the contractor knows when and where coring will take place.

After measuring and recording pavement thickness, retain the cores until final agreement is reached on payment for the concrete pavement, usually after the contractor returns the proposed final estimate.

The personnel who measure core thickness prepare the coring records, which include information about core location and measured thickness. The original records and one copy are given to the resident engineer, who retains the original and forwards the copy to the contractor. Personnel from the district materials laboratory will keep one copy; another copy goes to METS in Sacramento.

Use Form TL-3096, "Pavement Core Record," which must include sketches showing the location of the cores. Separate reports should be prepared and identified for secondary area measurements. These reports will help determine the cost to the contractor for secondary coring and provide a clear record of secondary areas. Follow the same distribution of copies described in the previous paragraph for primary unit reports.

#### 4-4004F Other Payment Items

Coring for determining acceptance of dowel bars and tie bar placement is to be conducted in a similar manner as that of thickness, except use revised lot sizes based on the specified frequencies. If dowel or tie bars are placed outside the specified tolerances or cores show air voids around the bars, obtain additional cores to determine the limits of unacceptable work. Determine the areas that will require removal. If authorized as specified in Section 40-1.01D(13)(g), "Dowel Bar and Tie Bar Placement," of the *Standard Specifications*, apply deduction in payment on represented areas that are allowed to remain in place using amounts specified in Section 40-1.04, "Payment," of the *Standard Specifications*. Note that the adjusted areas to be used include the slab dimensions adjacent to the joint identified.

Certain areas may also receive multiple payment deductions (i.e. thickness, dowel bars, or tie bars/reinforcement deductions). These are to be applied to the representative area and will be added to the other deductions.

### Section 92    Asphalts

#### 4-9201    General

- 4-9201A    Performance Grade Asphalt
- 4-9201B    Asphalt Rubber Binder
- 4-9201C    Certification Program for Suppliers of Asphalt
- 4-9201D    Quality Assurance

#### 4-9202    Before Work Begins

- 4-9202A    Devices for Measuring Asphalt Volume
- 4-9202B    Tack Coat

#### 4-9203    During the Course of Work

- 4-9203A    Plant Operations
- 4-9203B    Pavement Operations

#### 4-9204    Contract Administration

- 4-9204A    Acceptance Test Results
- 4-9204B    Stop Production
- 4-9204C    Certificates of Compliance
- 4-9204D    Compensation Adjustments for Price Index Fluctuation

#### 4-9205    Measurement and Payment

This manual is being updated to reflect changes from the 2006 to the 2010 *Standard Specifications*. Bracketed section numbers refer to the 2006 *Standard Specifications*.

### Section 92 Asphalts

#### 4-9201 General

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

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

*Construction of Hot Mix Asphalt Pavements*, published by the Asphalt Institute, contains information on the uses of various types of asphalts and the design and production of hot mix asphalt.

#### 4-9201A Performance Grade Asphalt

Performance-grade asphalts and performance-grade polymer-modified asphalts are selected to meet expected climatic conditions as well as traffic speed and volume adjustments. Performance-grade asphalt binders and performance-grade polymer-modified asphalt binders are tested to meet physical properties directly related to field performance of the pavement at extreme temperatures. An asphalt binder specified as performance grade PG 64-10 has the physical properties needed for field performance of pavement at an average 7-day maximum pavement temperature of 64°C and at a minimum pavement temperature of -10°C.

Because of heavy traffic, the performance-grade asphalt binder specified for a climate region of the state may be “bumped” a grade. The pavement climate map is available on the Office of Pavement Engineering website:

[http://www.dot.ca.gov/hq/maint/Pavement/Offices/Pavement\\_Engineering/PDF/Pavement\\_Climateregions\\_100505.pdf](http://www.dot.ca.gov/hq/maint/Pavement/Offices/Pavement_Engineering/PDF/Pavement_Climateregions_100505.pdf)

Performance-grade asphalt information is available on the Office of Pavement Engineering website:

[http://www.dot.ca.gov/hq/maint/Pavement/Offices/Pavement\\_Engineering/PG\\_Binder.html](http://www.dot.ca.gov/hq/maint/Pavement/Offices/Pavement_Engineering/PG_Binder.html)

#### 4-9201B Asphalt Rubber Binder

Only two performance-grade asphalt binder grades are used as the base binder for asphalt rubber binder (ARB). Typically, the ARB base binder chosen for a project will be an asphalt grade less than what is specified for a Caltrans pavement climate region because of the additional binder stiffness provided by the crumb rubber modifier.

### Section 92 Asphalts

#### 4-9201 General

#### 4-9201C Certification Program for Suppliers of Asphalt

The *Certification Program for Suppliers of Asphalt* specifies requirements and procedures to help ensure that quality asphalt is produced for Caltrans projects. This certification program is system-based and incorporates reviews and statistical evaluations of a supplier's product and testing program. The certification program also includes historical data analysis of supplier and Caltrans random testing of producer-supplied samples, as well as test results from quality assurance samples taken at project sites.

#### 4-9201D Quality Assurance

The Caltrans quality assurance program specifies that acceptance samples taken at project sites must be used for acceptance of asphalt. For asphalt acceptance sampling, the plant inspector and the hot mix asphalt paving inspector have to be qualified on Appendix D, "Bituminous Materials," of California Test 125, "Method for Sampling Highway Materials and Products Used in the Roadway Structural Sections." Refer to the *Independent Assurance Manual: Procedures for Accreditation of Laboratories and Qualification of Testers* for California Test 125 qualification.

Asphalt binder and tack coat are very hot, so for safety, the Caltrans inspector must only witness the contractor obtaining the necessary asphalt samples before taking control of the samples.

### **4-9202 Before Work Begins**

#### **4-9202 Before Work Begins**

Section 92, "Asphalts," of the *Standard Specifications* requires the contractor to comply with the *Certification Program for Suppliers of Asphalt*. Perform the following before work begins:

- Verify that Form CEM-3101, "Notice of Materials to Be Used," includes asphalt. Refer to Section 6-202, "Responsibilities and Procedures for Acceptance of Materials," of this manual for additional information.
- Verify that the asphalt binder supplier is on the Caltrans approved supplier list.
- If the asphalt supplier is not on the Caltrans approved supplier list, notify the contractor that before use, asphalt binder samples must be taken from each truckload and tested in accordance with Section Q, "Requirements for Suppliers Supplying Asphalt Without a Certificate of Compliance," of the *Certification Program for Suppliers of Asphalt*.

#### 4-9202A Devices for Measuring Asphalt Volume

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

#### 4-9202B Tack Coat

When asphalt is used for tack coat:

- Review *Tack Coat Guidelines* for information about application rates and general information. *Tack Coat Guidelines* are available at:  
<http://www.dot.ca.gov/hq/construc/publications/tackcoatguidelines.pdf>
- Ensure that the contractor will use a distributor truck that meets the requirements of Section 93-1.03C [93-1.03], "Application," of the *Standard Specifications*.

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

#### **4-9203 During the Course of Work**

Material acceptance sampling frequencies and testing frequencies shown in Section 6-1, "Sample Type and Frequencies," of this manual are not the same. Ship samples to Materials and Engineering Testing Services (METS) at the minimum testing frequency shown in Section 6-1, and store the remaining samples in case additional acceptance testing is necessary.

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

Section 39-1.06, "Dispute Resolution," of the *Standard Specifications* contains a dispute resolution process for hot mix asphalt. The dispute resolution process allows the contractor to dispute any acceptance test result within 5 days of receiving the result. It is important to split sample materials and for Caltrans to take possession of and store the split samples. If a dispute occurs, the independent third party laboratory uses split samples of disputed material for evaluation. To be used by the independent third party, split samples must be in the possession of and stored by Caltrans. Stored split samples may be discarded 5 days after the contractor has received the associated acceptance test result.

##### 4-9203A Plant Operations

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

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

Notifies the contractor and engineer immediately if asphalt binder testing has not been completed for a supplier not on the approved suppliers list.

Unless the resident engineer approves, does not allow use of asphalt from a nonapproved supplier before receiving Caltrans test results.

- Ensures that certificates of compliance are received with each truckload of asphalt binder delivered to the plant. Confirms that the source of asphalt is the same source as shown on Form CEM-3101, "Notice of Materials to Be Used," and for hot mix asphalt that the same source is shown on Form CEM-3511 "Contractor Job Mix Formula Proposal."

Each certificate of compliance must show:

1. Name and location of supplier.
2. Grade of the asphalt.
3. The date and time of shipment.

#### **4-9203**

#### **During the Course of Work**

4. A unique shipment number, such as a bill of lading or manifest number.
5. A statement confirming that the transport vehicle was checked before loading and was found acceptable for the asphalt shipped.

The certificate of compliance must include the following wording:

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

- Notifies the resident engineer immediately if there appears to be a change in the source of asphalt binder.
- Witnesses the contractor obtaining split samples of asphalt binder.
- Ensures that the contractor samples in accordance with California Test 125, "Methods for Sampling Highway Materials and Products Used in the Roadway Structural Sections."
- Samples asphalt binder at the frequency shown in Section 6-1, "Sample Type and Frequencies," of this manual.
- To comply with the requirements of the Caltrans quality assurance program, samples asphalt binder in the presence of the engineer and ensures that the sample is in the possession of and stored by Caltrans for proper chain-of-custody control.
- Completes Form TL-0101, "Sample Identification Card," for each sample of asphalt binder taken, following the directions printed in this forms book and as directed in Section 6-2, "Acceptance of Manufactured Material and Sampling Methods," of this manual. Ships the random samples to METS for testing as detailed in the section.

#### 4-9203B Paving Operations

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

- Ensures that the asphalt supplier is on the Caltrans approved supplier list or that asphalt samples have been taken from each truckload and tested in accordance with Section Q, "Requirements For Suppliers Supplying Asphalt Without a Certificate of Compliance," of the *Certification Program for Suppliers of Asphalt*. Notifies the contractor and resident engineer immediately if asphalt binder testing has not been completed for a supplier not on the approved suppliers list.

Unless the resident engineer approves, does not allow use of asphalt from a non-approved supplier before receiving Caltrans test results.

- Ensures that the distributor truck used for tack coat complies with the requirements in Section 93-1.03C [93-1.03] "Application," of the *Standard Specifications*.
- When tack coat is a contract item, it is good practice to measure the volume and temperature of asphalt in the distributor truck before discharge and to make a volumetric and temperature measurement whenever a partial load leaves the work. These actions result in a good check against scale weights, and the second



measurement may be used if the contractor fails to submit a weight ticket for the unused asphalt.

- Ensures that tack coat is applied properly by following the application section in *Tack Coat Guidelines*.
- Witnesses the contractor obtaining split samples of asphalt used as tack coat and ensures that the contractor samples in accordance with California Test 125, “Methods of Test for Sampling Highway Materials and Products Used in the Roadway Structural Sections.”
- Samples asphalt used for tack coat at the frequency shown in Section 6-1, “Sample Type and Frequencies,” of this manual.
- To comply with the requirements for the quality assurance program, asphalt samples must be taken by the contractor, witnessed by Caltrans, and be in the possession of and stored by Caltrans for proper chain-of-custody control.
- Completes Form TL-0101, “Sample Identification Card,” for each sample of tack coat taken, following the directions printed in this forms book and as directed in Section 6-2, “Acceptance of Manufactured Material and Sampling Methods,” of this manual. Ships the random samples to METS for testing as detailed in the section.
- Ensures that certificates of compliance are received with each truckload of tack coat used in the work. Confirms that the source of tack coat is the same source as shown on Form CEM-3101, “Notice of Materials to Be Used.” Each certificate of compliance must show:
  1. Name and location of supplier.
  2. Grade of the asphalt.
  3. The date and time of shipment.
  4. A unique shipment number, such as a bill of lading or manifest number.
  5. A statement confirming that the transport vehicle was checked before loading and was found acceptable for the asphalt shipped.

The certificate of compliance must include the following wording:

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

- Notifies the resident engineer immediately if there appears to be a change in the source of tack coat.

#### **4-9204 Contract Administration**

The resident engineer ensures that the asphalt used in the work meets the specifications and that payment adjustments are made when required. The resident engineer performs the following contract administration to ensure asphalt quality.

#### **4-9204 Contract Administration**

#### 4-9204A Acceptance Test Results

Ensure that acceptance testing is being performed at the minimum frequencies shown in Section 6-1, “Sample Type and Frequencies,” of this manual. Record test results on form CEM-3701 “Test Result Summary,” so that minimum acceptance testing frequency is easily verified and documented.

- If any acceptance test result is outside the specified limits listed in Section 92-1.02 [6-1.04] “Materials,” of the *Standard Specifications*, notify the contractor in writing that the material may be defective. Ask the contractor if corrective action has been taken based on quality control test data for the time period the acceptance sample was taken. Attach a copy of the test result indicating that material is outside specification limits.
- For hot mix asphalt, the contractor may dispute an acceptance test result within 5 days of receiving the test result by notifying the engineer in writing, according to Section 39-1.06, “Dispute Resolution,” of the *Standard Specifications*. Try to resolve testing or sampling issues at the project level before involving an independent third party.
- If an acceptance test is outside the acceptance specification limits, verify that METS is testing the most recent acceptance sample for compliance with the specifications. When there are failing acceptance tests, do not follow minimum acceptance sample frequencies shown in Section 6-1, “Sample Type and Frequencies,” of this manual for conducting the next acceptance test.

#### 4-9204B Stop Production

- For hot mix asphalt, if two consecutive acceptance test results do not comply with the specifications, notify the contractor to stop the work. Inform the contractor in writing that the material represented by the two out-of-specification acceptance tests is defective according to Section 39-1.05 [6-1.04], “Acceptance Criteria,” of the *Standard Specifications*, and that the defective material is rejected and must be removed or remedied in accordance with Section 5-1.30 [5-1.09], “Noncompliant and Unauthorized Work,” of the *Standard Specifications*. Attach a copy of the test result indicating that material is outside specification limits.
- When the work has been stopped because two consecutive acceptance test results do not comply with the specifications, require the contractor to:
  1. Provide written documentation of corrective action taken to correct the cause of out-of-specification material.
  2. Take samples in the engineer’s presence, and split the samples into four parts. To avoid placing additional out-of-specification material, do not take samples on an active project.
  3. Test one part of the split sample for compliance with the specifications to verify that the corrective action taken by contractor has corrected any problem. If both Caltrans and contractor’s test results are within specifications and are not significantly different (that is, test results within multi-laboratory precision), the contractor has demonstrated compliance with the specifications and may resume production.
- As above, the contractor may dispute the second out-of-specification acceptance test result within 5 days of receiving the test result by notifying the engineer in

writing in accordance with Section 39-1.06, “Dispute Resolution,” of the *Standard Specifications*. Try to resolve testing or sampling issues at the project level before involving an independent third party.

- When two consecutive acceptance tests are outside the acceptance specification limits, notify METS to test all samples collected between the two out-of-specification acceptance tests. Start testing samples backward from the first out-of-specification acceptance test until the test result obtained is within specification limits. Notify the contractor in writing of additional acceptance tests results conducted to ascertain the extent of the defective material. Tell the contractor that material represented by out-of-specification material is defective and rejected and must be removed or remedied in accordance with Section 5-1.30 [5-1.09], “Noncompliant and Unauthorized Work,,” of the *Standard Specifications*.
- The contractor may notify the engineer in writing that defective material will be remedied or left in place at reduced compensation. Consult with the district materials engineer and the Pavement Program, Office of Asphalt Pavements about acceptance of the contractor-proposed remedy. Document material remediation or reduced pay by issuing a contractor-requested change order, including the action taken on final project materials certification. Refer to Section 6-108, “Project Certification,” of this manual for material certification and the requirement to list all nonconforming materials.

#### 4-9204C Certificates of Compliance

For certificates of compliance for asphalt:

- Verify that the source and grade of asphalt used as asphalt binder or tack coat has not changed during the course of the work, except with engineer’s approval.
- Verify that the appropriate number of certificates of compliance have been received to cover the quantities of asphalt binder and tack coat used in the work. Calculate the tons of asphalt binder required based on the percentage of binder in the hot mix asphalt placed, and compare the result with the amount covered by the certificates of compliance. For tack coat summarize the daily tons used and compare to the amount covered by the certificates of compliance.
- Document action taken on final project materials certification if certificates of compliance are missing. Refer to Section 6-108, “Project Certification,” of this manual for material certification and the requirement to list all non-conforming materials.

#### 4-9204D Compensation Adjustments for Price Index Fluctuation

For compensation adjustments for price index fluctuation, perform the following for asphalt binder and asphalt used as tack coat:

- Process a change order to allow for payment adjustments—increase or decrease—based on total estimated potential payment adjustment.
- Calculate the amount of paving asphalt used monthly in hot mix asphalt and tack coat.
- If the index for the current month has fluctuated by more than 5 percent from the index for the month in which the bid opening for the project occurred, calculate the asphalt payment adjustment including the adjustment on the monthly estimate.

**4-9205  
Measurement and  
Payment**

**4-9205 Measurement and Payment**

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

- When making volumetric measurements of asphalt used as tack coat, measure the temperature, and apply the proper factors for converting volume to mass.
- If applicable, when asphalt is used in hot mix asphalt and dispute resolution determines the contractor’s test results are correct, Caltrans pays the independent third party testing costs. When the contractor’s test results are correct, the resident engineer adjusts payment and contract time under Section 8-1.07 [8-1.09], “Delays,” of the *Standard Specifications*.

### Section 2 Funds

#### **5-201 General**

#### **5-202 Managing Funds**

#### **5-203 Obtaining Additional Funds**

5-203A G-12 Funds Request

5-203B California Transportation Committee Supplemental Funds Request

#### **5-204 Segregation of Quantities for Fund Apportionment**

5-204A General

*5-204A (1) Requirements for Specific Types of Funding*

5-204A (1a) Federal Funds for State Highway Projects

5-204A (1b) Federal or State Funds for Local Assistance Projects

5-204A (1c) Local Funds for State Highway Projects (Cooperative Projects)

This manual is being updated to reflect changes from the 2006 to the 2010 *Standard Specifications*. Bracketed section numbers refer to the 2006 *Standard Specifications*.

### Section 2 Funds

#### 5-201 General

Caltrans aims to complete construction projects within the planned scope, allotted time, and projected budget. The project allotment includes a contingency fund for unforeseen expenses or unknown factors encountered during construction. Occasionally, the magnitude and cost of unforeseen expenses or unknown factors are greater than the budgeted amount. In such instances, the contract allotment may be supplemented with additional funds to complete the project as originally planned. The California Transportation Commission (CTC) adopted resolutions G-11 and G-12 in 1978 to allocate funds for emergency contracts (G-11) and to delegate authority for Caltrans to adjust project allocations and modify project descriptions (G-12). Those resolutions have been amended and superseded over the years. The processes are still referred to as G-11 and G-12. This section explains the processes for managing project funds and obtaining additional project funds. Refer to Section 5-5, “Emergency Contract Administration,” of this manual for the G-11 process.

#### 5-202 Managing Funds

The resident engineer is responsible for managing the project construction costs within the current allotment, which includes item payments, Department-furnished materials, contingencies, and supplemental work. The resident engineer must track project expenditures, forecast future costs, determine the need for additional funds, and immediately notify the construction engineer of any apparent funding shortfalls. The resident engineer must not allow work to proceed that would require the encumbrance of additional funds before those funds have been approved and added to the project allotment.

The resident engineer must update the project contingency balance continuously as changes occur and whenever additional costs are initially identified. For example, payment for item overruns will come from the contingency fund, and extra money from item underruns will be returned to the contingency fund.

#### 5-203 Obtaining Additional Funds

When the resident engineer determines that additional funds are needed, the resident engineer must consult with the construction engineer. Both engineers should discuss additional funds and potential alternatives to complete the project within budget.

An assessment of financial status must show that the existing contingency balance will prove insufficient to complete the project within the approved contract scope. Do not request additional funds to settle disputes that are not yet resolved.

### Section 2 Funds

#### 5-201 General

#### 5-202 Managing Funds

#### 5-203 Obtaining Additional Funds

The resident engineer and the construction engineer must next meet with the construction field coordinator and the project manager to discuss the funding need and alternatives. For emergency contracts or for maintenance funded contracts, include in these early discussions the district maintenance major damage coordinator or the district maintenance engineer respectively, and the funding program advisor.

#### 5-203A G-12 Funds Request

If it is decided that the best alternative is to request additional funds, the construction engineer must then write a “Construction Phase Request for Supplemental G-12 Funds” memorandum to request additional funds and send it to the project manager. The memo must include sections entitled “Financial Status of the Contract,” and “Justification for the Request.” The “Financial Status of the Contract” section must include information on the present contract allotments and estimated probable final expenditures for contract items, supplemental work, contingency fund, Department-furnished material and expenses, and any previously approved additional funds. The “Justification for the Request” section must contain a clear explanation of the reason for additional funds to complete the project within the scope indicated in the approved contract. The justification must answer the following questions:

- Why are additional funds needed?
- What work will be performed with the additional funds?
- What alternatives have been considered to mitigate the unforeseen expenses?

The construction engineer ensures that informational copies of the request are e-mailed to the construction field coordinator and the appropriate funding program advisor. For an example of the memorandum, refer to the Division of Construction intranet site at:

<http://pd.dot.ca.gov/construction/contractmanagement/cmpage.htm>

The project manager manages the project G-12 funding capacity. The project manager completes the request for additional funds using the information in the request from the construction engineer. The project manager provides any additional information needed to complete the request, including any participation concurrence from other funding partners, and if applicable, an explanation of previously approved funding requests.

After the project manager coordinates getting the district signatures, the project manager e-mails the “Construction Phase Request for Supplemental G-12 Funds” to the G-11/G-12 mailbox:

[G11-G12-Funds Request/HQ/Caltrans/CAGov](#)

The budget analyst in the Division of Budgets reviews and processes the request. Upon concurrence, the budget analyst forwards it to the Division of Construction change order engineer and informs the appropriate funding program advisor as needed. Rejected G-12 memos are returned to the project manager for revision.

The change order engineer reviews each G-12 memo for completeness, signature authority, compliance with policy, and ensures that it addresses the following issues:

- Existing and projected financial status.
- Justification for the G-12 funding.



- Clearly defined scope of work.
- Consideration of sufficient alternatives.

When the change order engineer concurs with the G-12 memo, it is sent to the construction field coordinator and the project management coordinator for review and approval. After the coordinators approve the request, a copy of the fully executed request is kept in the change order engineer files and a copy is returned to the Division of Budgets. The budget analyst in the Division of Budgets adjusts the project allocation by supplementing the expenditure authorization, notifies the Division of Accounting to update AMS Advantage, and notifies the district construction office to update the contract administration system. When the updates are complete, the resident engineer can authorize performance of the work contemplated by the G-12 memo.

If rejected by the change order engineer, the budget analyst, or one of the coordinators, the change order engineer notifies the project manager of the rejection so that the district can consider alternatives. The project manager should work with the district construction staff, the construction coordinator, and the project management coordinator to develop a new funding strategy; or the project manager can appeal to the supplemental funds request (SFR) executive committee. The project manager ensures that preparation of the appeal follows district policy and e-mails it to the SFR executive committee at the G-11/G-12 mailbox.

Appeals for G-12 funds are directed to the Division of Transportation Programming, which facilitates the monthly SFR executive committee meeting. The SFR executive committee considers each G-12 funds request appeal. The district project manager and the construction and project management coordinators present their positions to the SFR executive committee. If the SFR executive committee approves the appeal, the Division of Budgets processes the G-12 funds request. If the SFR executive committee denies the G-12 funds request appeal, the project manager works with the district construction staff and construction field coordinator to develop a new project completion strategy.

#### 5-203B California Transportation Commission Supplemental Funds Request

If G-12 authority is insufficient to cover the work contemplated, a California Transportation Commission vote will be necessary to obtain any additional funding.

The procedure for obtaining approval from the California Transportation Commission is described in Appendix A-2 of the funds request instructions on the Division of Transportation Programming internet site:

[http://www.dot.ca.gov/hq/transprog/allocation\\_new.htm](http://www.dot.ca.gov/hq/transprog/allocation_new.htm)

### **5-204 Segregation of Quantities for Fund Apportionment**

#### 5-204A General

The recording of total quantities of materials used on a project determines the final payment to contractors. However, this recording does not complete the data necessary to prepare the final billing when projects involve several different funding sources independent of state highway funds. Therefore, resident engineers must review the expenditure authorization (EA) for each project before work begins and be alert to the necessity for segregating quantities for fund apportionment. Details about cost segregation are covered in Section 9-1, "Construction Contract Administration for

### **5-204 Segregation of Quantities for Fund Apportionment**

Projects Funded by Others,” and Section 5-309, “Federal Segregation Determination on Change Orders,” of this manual.

Construction projects may be funded from many different fund sources. These include the following state administered sources:

- The Interregional Transportation Improvement Program (ITIP).
- The Regional Transportation Improvement Program (RTIP).
- The State Highway Operation and Protection Program and Minor Projects (SHOPP & Minor).

Other funding sources for construction projects include the following:

- Federal Demonstration Funds.
- Local tax measure funds.
- Local developer fees.
- State and local partnership funds, or even private funds.

The project funding may come from a single source or from a combination of the above sources. The arrangements for multiple funding sources may involve each party paying a percentage of the project or each party paying for specific items or locations of work.

It is essential that the resident engineer understand the project’s funding make-up and understand the agreement that establishes the funding and payment arrangements. This knowledge is important in the maintenance of records throughout the project, including records for quantities, cost increases, change orders, and final apportionment. The resident engineer may need to notify, and get concurrence from, the appropriate funding source when the work changes. The project manager should make this funding information available to the resident engineer, who should then establish a contact with the funding source.

#### *5-204A (1) Requirements for Specific Types of Funding*

Following are the requirements for specific funding types:

##### *5-204A (1a) Federal Funds for State Highway Projects*

Segregate the costs for federal participation only for major change orders (as defined in Section 5-311A, “Division of Construction Approval,” of this manual), maintenance work, and work financed by others. Refer to Section 5-3, “Change Orders,” of this manual for details about cost segregation. Quantity or cost segregation for all other planned work is handled on a percentage basis according to the detailed estimate. No special reporting is required by the field personnel.

##### *5-204A (1b) Federal or State Funds for Local Assistance Projects*

Segregate the quantities and costs between various funds for all local assistance projects.

##### *5-204A (1c) Local Funds for State Highway Projects (Cooperative Projects)*

Quantities must be segregated for the report of expenditures and for the final billing to contributing agencies. The resident engineer must submit to the accounts receivable and program accounting unit of the Division of Accounting Services a final statement of all quantities or costs incurred as a result of agreements with contributing agencies.

| Segregate in sufficient detail the quantities and costs (whether covered by change order or resulting from normal variations) so that an accurate final breakdown can be made and the proper costs applied to each funding agency. The report should reference the original and subsequent funding agreements and any change orders or other items that altered the work.