

<b>MANUAL CHANGE TRANSMITTAL</b>		NO. <b>20-3</b>
TITLE: Department of Transportation <i>Construction Manual</i>	APPROVED BY:  Rachel Falsetti, Chief Division of Construction	DATE ISSUED: <b>08-04-2020</b>
SUBJECT AREA  Sections 3-9, 4-12, and 4-40	ISSUING UNIT  Division of Construction	
SUPERSEDES Sections 3-9, 4-12, and 4-40 of July 2019	DISTRIBUTION  All Requested Manual Holders	

The purpose of this manual change transmittal is to announce updates and corrections to the Caltrans *Construction Manual*. The following section or sections have been updated to reflect new policy and supersede the corresponding section of the *Construction Manual* as previously published. Updated sections are available at <https://dot.ca.gov/programs/construction/construction-manual> and are indicated by the date listed in the right-hand column on that page. Section changes are identified by change lines in the left or right margins of this document.

### **Section 3-9, “Payment”**

Section 3-903C, “Tentative Agreements,” identifies the use of CEM Form-4907, “Tentative Daily Extra Work Agreement,” for daily tentative agreement with the contractor on labor, equipment, and materials used in extra work at force account for approved change orders. This form is to be used in place of district forms to assure statewide consistency.

### **Section 4-12, “Temporary Traffic Control”**

Changes throughout include guidance for the revisions and additions to the temporary traffic control devices in Section 12, “Temporary Traffic Control,” of the *Standard Specifications*.

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

Section 4-4003B, “Paving,” is updated to reflect current standards and methods for making and curing concrete test specimens for flexural strength. The process follows California Test 523, “Method of Test for Flexural Strength of Concrete (Modulus of Rupture),” which conforms to ASTM C31, “Standard Practice for Making and Curing Concrete Test Specimens in the Field.”

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### **Section 9 Payment**

#### **3-901 General**

This section covers measurement and payment of bid item work and change order work, partial payments, and payment to the contractor after contract acceptance. The contract provides the following methods to make payment for all work performed:

- Payment for bid item work at unit prices. The contractor establishes the fixed prices of the bid items included in the contract. Fixed prices of bid items should not be confused with the costs to produce the work. Loss of profit, damage, repair, cost escalation, or other unanticipated changes of item costs are the sole responsibility of the contractor unless specifically provided for in the contract.
- Adjustments to contract prices (known as payment adjustments).
- Payment for change order work. Before payment can be made for change order work, the resident engineer must issue an approved change order as described in Section 5-3, “Change Orders,” of this manual. For additional information regarding Caltrans policies on change order work, refer to Section 3-403, “Changes and Extra Work,” of this manual. The methods specified for paying for change order work are bid item prices, force account, agreed price, and specialist billing.
- Deductions and withholds are temporarily or permanently taken from monies due under the contract.

#### **3-902 Measurement**

Contract work, as bid on by the contractor, is measured and paid for as bid items. Bid items are measured for payment as units. The unit for each bid item is shown in the Bid Item List as “unit of measure.” Bid items may be measured by units of count, length, area, volume, weight, or lump sum. The Bid Item List also includes the estimated quantity of each bid item. Resident engineers and assistant resident engineers must determine, by measurement and calculation, the quantities of the various bid items actually performed by the contractor.

##### **3-902A Method of Measurement**

Check the “measurement” and “payment” clauses in the specifications for the required method of measurement for each bid item. Use the specified method to measure quantities. For more information about measuring quantities for specific bid items, refer to Chapter 4, “Construction Details,” of this manual.

A change in the unit or the method of measurement changes the contract. Do not change the unit or the method of measurement unless the change is provided for in a change order.

### 3-902B Accuracy

Measure and calculate bid item quantities to a degree of accuracy consistent with the unit price of the item. Give early consideration to the accuracy desired so that all personnel on a given project will measure and calculate uniformly. The general rule is to measure to a degree of accuracy that, when calculated, the resulting value will be within 0.2 percent to 0.5 percent. A \$50,000 item should be measured and calculated to result in payment within about \$100.

### 3-902C Source Documents

Enter measurements and calculations for bid item quantities on permanent record sheets that are commonly referred to as “source documents.” Include on each source document the appropriate bid item number, the location of installation (if applicable), the necessary measurements and calculations, and the name of the person preparing the document. Check source document calculations independently, and enter the name of the checker on the document.

Check source document calculations as soon as possible, preferably before the quantity is entered on a progress pay estimate. Always check them before entry on the proposed final estimate. Whenever possible, measure, calculate, and check bid item quantities as the work on a bid item is completed. Resident engineers must assign responsibility for checking calculations to assistant resident engineers in the same manner that other project responsibilities are assigned.

Enter into the system for progress payment the quantities from the source documents. For a description of the progress payment process, refer to Section 5-1, “Project Records and Reports,” of this manual.

### 3-902D Audit Trail

State the source of any figure, calculation, or quantity shown on the source document. For instance, a quantity may be the result of a field measurement, scale weights, a count, or a calculation based on planned dimensions.

Create a clear and easily followed trail for the total pay quantity in the proposed final estimate back to the first measurement or calculation for each bid item.

Consider organizing source documents for each bid item so an easily followed audit trail exists. Category 47, “Drainage Systems,” in Section 5-102, “Organization of Project Documents,” of this manual, provides a very good system, especially for large projects, for organizing source documents for drainage related bid items. Category 48, “Bid Item Quantity Documents,” in the same manual section, describes the numbering system to be used for source documents for other bid items.

### 3-902E Weighing Equipment and Procedures

The following describes the duties and responsibilities of the people involved in weighing and measuring materials and the procedures for ensuring accurate weighing and measuring:

### 3-902E (1) Personnel

The process of determining bid item quantities by weighing and measuring includes the following personnel:

- The resident engineer
- Assistant resident engineers
- The district weights and measures coordinator
- The Division of Construction weights and measures coordinator

In addition to Caltrans personnel, the following people are involved in the weighing and measuring process:

- County sealers of weighing and measuring devices
- Representatives of the California Department of Food and Agriculture, Division of Measurement Standards
- Private scale technicians performing *Material Plant Quality Program (MPQP)* testing.

### 3-902E (2) Responsibilities

All Caltrans personnel must be alert for conditions that contribute to failure to obtain the accurate weight and measurement of materials. The following describes the typical duties and responsibilities for verifying compliance with the specifications for weighing and measuring:

#### 3-902E (2a) Resident Engineers

The resident engineer must do the following:

- Verify accurate weighing and measuring through inspection.
- Routinely determine that proper weighing procedures are used.
- Record, or verify recording of, spot-checks of weighing procedures in daily reports.
- Require the contractor to correct any malfunctioning weighing or measuring device.
- Order the resealing and retesting of scales and meters as often as necessary to assure accuracy.
- Determine when weighmaster certificates are to be used. Order the use of weighmaster certificates except when the number of loads is very small or conditions preclude proper weighing procedures. In the daily report, record the reasons for not using weighmaster certificates.

#### 3-902E (2b) District Weights and Measures Coordinator

The district weights and measures coordinator must do the following:

- Provide technical assistance to the resident engineer and assistant resident engineers.
- Provide information to resident engineers regarding the adequacy of scales and the validity of seals.
- When requested by the resident engineer, witness the testing of scales or meters in compliance with the requirements of the *MPQP*.
- Furnish copies of the *MPQP* report to each project using material plants tested in accordance with the *MPQP*.
- Furnish and attach an MPQP Approval Sticker to tested scales.
- Maintain a file on the current status of all scales that are commonly used for weighing materials for Caltrans projects in the district.
- On request, provide scale status information to adjacent districts.
- Perform spot-checks of weighing and measuring devices and procedures in the district, and furnish written reports to the resident engineer.
- Determine whether any weighing or measuring problems should involve the California Department of Food and Agriculture, Division of Measurement Standards. Request any such involvement through the Division of Construction weights and measures coordinator.

### 3-902E (2c) Assistant Resident Engineers

Assistant resident engineers act for the resident engineer and, depending on the authority delegated to them, do the following:

- Observe the installation of scales installed primarily for use on a given project. Decide whether such scales and appurtenances meet the requirements of the specifications. When necessary, request assistance from the district weights and measures coordinator.
- Inspect and observe the general condition of all scales used on the project. If the scales are in questionable condition, request advice from the district weights and measures coordinator.
- Request a material plant approval report from the district weights and measures coordinator. If a seal or approval sticker is not valid, require the contractor to have the scales tested before use.
- Witness scale testing. Determine that the scales have been tested to the capacity for which they are being used on the project. Request that the district weights and measures coordinator observes the procedure.
- Whenever a scale is moved, overhauled, or shows obvious deficiencies, require the scale to be restored to normal operating condition and then retested.
- To observe the weighing of materials, visit the scale house or plant periodically. If necessary, request technical assistance from the district weights and measures

coordinator. Check the scale sheets and weighmaster certificates to verify that they are being used properly.

- Spot-check tare and gross weights to see that weighmasters are using the correct tare. Verify that the weighmaster is licensed for the scale location.
- Observe all meters that are required under the contract, and verify that they have been tested and sealed.
- Collect weighmaster certificates at delivery. A Caltrans employee should be present at the work site to collect weighmaster certificates. Sign or initial the weighmaster certificate to indicate that the represented material was used in the work.

When certified summary scale sheets are used, and weighmaster certificates are not used, verify that material shown on the summary sheets has been used in the work. Do this verification by using a tally sheet, a spread record, or a random check. In the daily report, record that the material has been used in the work and the type of verification method. Sign the summary scale sheets to certify that the represented material, less any material deducted from the total, was used in the work.

Return to the contractor a copy of any weighmaster certificates or scale sheets representing loads or partial loads that are not to be paid for. On the weighmaster certificate or scale sheet, indicate the quantity of material not included for payment. Retain a copy for the project records. When a determination is made to reduce the quantity, advise the contractor's foreperson or superintendent the amount and reason for the reduction. In the daily report, note the reduction and the name of the contractor's employee whom you advised of the reduction.

### 3-902E (2d) Contractors

The following describes some of the duties and responsibilities of contractors and their agents in using scales and measuring devices for measuring and proportioning materials:

- The contractor and materials suppliers must maintain scales and meters within the accuracy specified.
- The owner of the scale or meter must maintain it in good operating condition at all times. If breakdowns or suspected inaccuracies occur, the owner must make repairs. After repairing a commercial device, the owner must notify in writing the county sealer of weights and measures that a repair was made. The device must be resealed before it is used to weigh materials for payment. For noncommercial devices, the contractor must ensure the *MPQP* test is performed. The contractor must notify the resident engineer at least 24 hours before any scheduled testing so that the testing can be witnessed.

Do not directly contact the county sealer of weights and measures for the contractor. The owner of the measuring device must request the testing. The resident engineer may only inform the contractor that such testing is necessary.

The district weights and measures coordinator may contact the Division of Construction weights and measures coordinator on any question regarding the validity of a seal or the legal capacity of a scale.

### 3-902E (2e) Division of Construction Weights and Measures Coordinator

The Division of Construction weights and measures coordinator does the following:

- Oversees that the weights and measures program is operating satisfactorily throughout Caltrans.
- Serves as a contact between the district weights and measures coordinators and the California Department of Food and Agriculture, Division of Measurement Standards.
- Keeps the district weights and measures coordinators informed of the latest equipment and technology being developed throughout the industry.

### 3-902F Final Pay Items

Section 9-1.02C, "Final Pay Item Quantities," of the *Standard Specifications*, defines and specifies the procedure for calculating pay quantities for final pay items.

### **3-903 Force Account**

The force account method, used to determine payment for extra work, consists of adding specified markups to the actual cost of labor, equipment, and material used to perform the extra work.

Section 9-1.04, "Force Account," of the *Standard Specifications* specifies the force account method of payment. Section 5-3, "Change Orders," of this manual contains examples of change orders with payment for extra work at force account.

Normally, the contractor will use labor and equipment that is on the site and used for work in progress. The change order will usually specify materials to be used in the extra work. However, before the work begins, the resident engineer should discuss with the contractor the labor, equipment, and materials to be used. The resident engineer can avoid misunderstandings and inefficiencies by knowing the resources to be used ahead of time. After the work is performed, Caltrans must pay the contractor for material used and at the appropriate rates for the number of hours that labor and equipment was used.

### 3-903A Authorization for Force Account Payment

On the authorizing change order, always show the amount to be paid for extra work at force account as an estimated amount. For the format for change orders, refer to Section 5-3, "Change Orders," of this manual. You may make payment for extra work in excess of the estimated amount shown on the contract change order up to 100 percent of the estimated amount or \$15,000, whichever is smaller. To authorize any additional payment, use a supplemental change order.

### 3-903B Force Account Records

On daily reports, record observations and inspections of extra work in progress in sufficient detail to provide a reasonable basis for agreement on payment. Records must be original, not a copy from other documents.

Include the following information when appropriate to the method of payment for the work:

- Description of work performed. This description must be consistent with the description of extra work authorized by the change order.
- Time and date of inspection.
- The change order number.
- Location of work.
- Types of labor, equipment, and materials used.
- Estimated hours worked.
- General measurement or amount of work accomplished.

Make entries on the day of observation. If clarifying reports are necessary to cover work not previously reported, state the facts as known and date the clarifying report as of the day it is written.

The daily report must also contain a reference to any known off-site work.

When extra work is performed at force account, decide whether the magnitude of the work warrants the full-time presence of an assistant resident engineer. An assistant resident engineer assigned full time must include in the daily report the number of hours actually worked at the site. When an assistant resident engineer is assigned only part-time, daily reports must present only known facts. On the daily report, record that inspection was "intermittent." A typical entry might read as follows:

Hours reported on report dated 6/26/00 entry based on one inspection during the day. Later found out that crew and equipment worked whole shift instead of half shift (add the date of the supplemental entry and sign the entry).

Include notations concerning decisions to allow or deny payment for work that may be in dispute or not considered a legitimate part of extra work. Similarly, prepare a supplemental daily report if it is later found that the number of hours or labor and equipment was substantially different than recorded on the original daily report. Such a supplemental daily report might read as follows:

6/24/16 – 10:15 a.m. – Change Order No. 17 – Placing Riprap Lt. of Sta. 500.

Crew of two laborers and foreperson with a D-6 crawler tractor with side-boom and operator laid about 150 sq ft of salvaged rubble riprap. Estimate crew and tractor worked about 4 hours.

### 3-903C Tentative Agreements

Do not give copies of daily reports to the contractor's personnel. Do not permit the contractor's personnel to sign or initial daily reports. However, at the earliest possible time, reach tentative agreement on extra work details. With the contractor's foreman, discuss labor, equipment, and materials at the end of each shift or no later than the following shift that extra work was performed. Good communication at this time will help to prevent misunderstanding and arguments over details at a later date.

Use Form CEM-4907, "Tentative Daily Extra Work Agreement," for this purpose. On this form, tentatively agree to and list hours of labor and equipment used in extra work at force account for each change order each day.

### 3-903D Markup for Subcontracted Work

Section 9-1.04A, "General," of the *Standard Specifications* includes an administrative markup for the prime contractor when a subcontractor performs the work.

When an engineer's cost analysis is based on force account, using rates as specified in the contract, include a markup in the calculation of the work performed by a subcontractor in the following situations:

- Changes and extra work at the agreed prices in accordance with Section 4-1.05A, "General," of the *Standard Specifications*.
- Work performed before item elimination in accordance with Section 9-1.06D, "Eliminated Items," of the *Standard Specifications*.
- Bid item adjustment due to increased or decreased quantities in accordance with Section 9-1.06B, "Increases of More Than 25 Percent," and Section 9-1.06C, "Decreases of More Than 25 Percent," of the *Standard Specifications*.
- Payment adjustments for work-character changes are made in accordance with Sections 4-1.05B, "Work-Character Changes," and 9-1.15, "Work-Character Changes," of the *Standard Specifications*.

### 3-903E Owner-Operated Labor and Equipment

For owner-operated labor and equipment, refer to Section 9-1.04A, "General," of the *Standard Specifications*. The method for paying for owner-operated equipment on a force account basis is at market-price invoice. Because owner-operators include labor and equipment markups and the labor surcharge in their invoice price, only apply the applicable administrative markup for the owner-operated labor and equipment invoice. The administrative markup to be applied to the invoice for projects with the time-related overhead bid item is 10 percent. The administrative markup to be applied to the invoice for projects without the time-related overhead bid item is 15 percent.

### 3-903F Billing for Extra Work at Force Account

The following are the procedures for billing for extra work at force account:

- The contractor must submit change order bills covering extra work under each change order each day that extra work is performed. The contractor must use the Caltrans internet change order billing system to submit change order bills. Refer to Section 5-103E, "Change Order Billing," of this manual for additional information.
- Field construction personnel must do the following when reviewing change order bills:
  1. Compare change order bills against assistant resident engineer's daily reports and tentative agreements, if they are used. Make this comparison to verify the correctness of the contractor's billing, and to avoid the possibility of a duplicate payment for the same work. For a discussion of assistant resident engineer's daily reports and tentative agreements, refer to Sections 3-903B, "Force Account Records," and 3-903C, "Tentative Agreements," of this manual.
  2. The contractor must include everything to be paid for on the change order bill. Do not add any items even though you know them to be legitimate charges. Instead, call the omission to the contractor's attention. The contractor may submit a supplemental change order bill to include the omitted items.
  3. Delete items for which the contractor is not entitled to payment.
  4. You may correct hours for labor and equipment downward, but not upward.
  5. Do not correct wage rates that the contractor has submitted. Reject any change order bill with incorrect wage rates. Note that Caltrans must pay for extra work at the same wage rate paid by the contractor. Do not refuse to pay a particular wage rate because it is above the prevailing wage rate.
  6. Correct equipment rental codes that are obviously in error, or reject the reports. Verify that the rental codes shown are for the equipment that was actually used.
  7. The person, whether a contractor or Caltrans employee, who makes corrections to a change order bill must print out, sign (not initial) and date the corrected change order bill.
  8. Maintain a log of change order bills received and rejected.

The resident engineer must approve the change order bill to authorize payment for extra work. The resident engineer's approval of a change order bill for progress payment certifies that payment is in accordance with contract requirements and established administrative procedures.

### 3-903G Labor

The markups to be applied to the cost of labor performed on force account work are specified in Section 9-1.04B, "Labor," of the *Standard Specifications*, or as changed by the special provisions.

A “labor surcharge” is included in the cost of labor. The *Labor Surcharge and Equipment Rental Rates (Cost of Equipment Ownership)* book in effect at the time the work is performed contains the labor surcharge percentage. One general rate applies to most crafts, and the book contains several higher rates for certain crafts. The resident engineer must determine the correct surcharge percentage to be used and verify that the percentage has been entered on the change order bill.

At times, a superintendent or an owner acts as a working foreperson or an equipment operator works at some other craft. In such situations, make payment on a “value received” basis. Payment will be made for owners or supervisory personnel at the proper rate for the work performed. For example, pay for a superintendent acting as a foreperson on force account work at the normal hourly rate for a foreperson. Do not prorate the superintendent’s weekly or monthly salary to an hourly rate. In paying for a superintendent on force account work, make the payment on a functional basis and not on a position or classification basis.

On some projects, a superintendent or project manager directs the activities of several forepersons or one or more general forepersons who directly supervise the forepersons. The general forepersons are sometimes referred to as superintendents, such as grading superintendents or paving superintendents. This change in nomenclature does not change the functional nature of these positions. They are general forepersons or forepersons and are not considered to be supervisory or overhead personnel. Make payment at the actual hourly rate paid by the contractor when such personnel function as forepersons on force account work.

When paying for salaried personnel, do not authorize force account payment for overtime hours unless the contractor has an established practice of paying overtime to salaried personnel. The usual case is that the weekly or monthly salary covers the number of hours required by the work.

The *Standard Specifications* allow for payment of the actual subsistence and travel allowances paid by the contractor.

Pay per diem and travel allowances on force account only when the contractor is paying these allowances on bid item work.

When 7-day subsistence is included in labor contracts in lieu of per diem and travel time, subsistence will be paid for the entire period involved if the workers are employed full time on force account.

When workers are employed on both force account work and bid item work in the same day, prorate subsistence payments and travel allowances between the contractor and Caltrans. Base the prorated amount on the first 8 hours worked. Do not pay per diem for time worked after the first 8 hours in any one day.

### 3-903H Material

Payment for material purchased for force account work must be supported by a copy of the vendor’s invoice whenever possible. If no individual invoice is available, as in the case of materials taken from contractor’s stock, a copy of the mass purchase invoice may be used as support. If no invoice is available to support unit purchase

prices, submit a statement with the change order bill. In the statement, explain how the unit prices were verified. Any invoice the contractor submits must represent the material actually used.

### 3-903I Equipment Rental

For equipment used for extra work paid at force account, refer to Section 9-1.04D, "Equipment Rental," of the *Standard Specifications* or as modified by the special provisions. The following are guidelines for paying for equipment rental.

#### *3-903I (1) Equipment Selection*

In accordance with Section 5-1.03, "Engineer's Authority," of the *Standard Specifications*, approve equipment used on force account work. Before giving approval, determine whether available and suitable equipment is already on the job site or whether equipment not on the job site is required. For example, a piece of equipment on the job site that can perform a given operation satisfactorily may be larger than necessary. Determine if it will be economical to use oversized equipment at its rate or to obtain equipment of the proper size. Obtaining equipment not on the job site necessitates payment for move-in and move-out expenses and for minimum rental periods. The determination may also be based on other factors, such as public safety and the urgency of the work. Availability of equipment on the job site can be determined by using daily reports, progress schedule, and other contractor-provided information. When there is no contractor-owned equipment available for use and only rented equipment is available on the job site, the engineer may approve the use of the rented equipment at the rental invoice price in accordance with Section 9-1.04D, "Equipment Rental," of the *Standard Specifications*. If both contractor-owned and rented equipment on the job site are suitable and available for use, the contractor-owned equipment should be used.

Some equipment includes accessories as an integral part of the basic machine. When accessories are an integral part of the machine, the rates in the *Labor Surcharge and Equipment Rental Rates (Cost of Equipment Ownership)* book indicate that the accessory is included in the quoted rate. Do not make deductions for accessories on such integral equipment. For unusual situations, consult the Division of Construction. When the accessories are not integral and not necessary for the effort of the extra work, payment is only for the equipment required.

#### *3-903I (2) Equipment Rental Rates*

*Labor Surcharge and Equipment Rental Rates (Cost of Equipment Ownership)* contains the cost of ownership rates for most of the equipment used on Caltrans projects. However, the Division of Construction has also established cost of ownership rates for some equipment that is not in the book. These rates are available at:

<https://dot.ca.gov/programs/construction/equipment-rental-rates-and-labor-surcharge>

Establish rates that are not listed in the book or on the website, use the following procedure:

- Obtain a complete description of the equipment, including the manufacturer, model number, horsepower, size or capacity, and accessory equipment.
- If the equipment is nonstandard or unusual, request the following data from the contractor:
  1. Type of equipment (such as segmented, self-propelled, telescoping hydraulic crane, articulated, or rubber-tired roller)
  2. Trade name
  3. Model and serial numbers
  4. Year manufactured
  5. Size, capacity, or both
  6. Type and amount of power
  7. Whether crawler, rubber-tire, or other
  8. Manufacturer or distributor (if local, give address)
  9. Initial cost of the basic machine and attachments
  10. Operating requirements, costs, or both, if available or unusual
  11. Name of owner
- Transmit this information to the Division of Construction. The Division of Construction will establish a cost of ownership rate, codes, and effective time period and advise the district by mail, email, or fax. Use this document as the authority to pay the rate established.
- The contractor must be advised of the codes so that its billings can include them.
- For equipment not on the job site, and in special circumstances, the *Standard Specifications* permit a rate to be paid that is in excess of the rate listed in the *Labor Surcharge and Equipment Rental Rates (Cost of Equipment Ownership)* book. When the contractor proposes a rental rate in excess of the listed rate, verify that the equipment meets all the conditions listed in Section 9-1.04D(1), “General,” of the *Standard Specifications*. The higher rate will constitute a change to the contract and must be established by a change order. Use the following procedures to determine the rate:
  1. Obtain a written statement from the contractor. The statement must include the proposed rate and the justification that Section 9-1.04D(1), “General,” of the *Standard Specifications* requires.
  2. Decide whether the conditions of use and ownership of the equipment meet all the specified criteria for payment of the higher rate.
  3. Submit a change order that provides for the proposed rate. State in the change order whether the table titled “Equipment Rental Hours” is applicable. The table appears in Section 9-1.04D(3), “Equipment Not On the Job Site and Not Required for Original-Contract Work,” of the *Standard Specifications*. If the equipment is used for bid item work, use the normally established rental

rates for the entire time the equipment is used for extra work. Include in the change order a clause similar to the following: "In the event this equipment is subsequently used on bid item work, this rate is void."

4. Include justification for approval in the change order memorandum, and attach the contractor's letter.
- Equipment for which the rental rate is not shown in the *Labor Surcharge and Equipment Rental Rates (Cost of Equipment Ownership)* book, but for which the Division of Construction established a rental rate, is eligible for the higher rate if all necessary conditions are met.

### 3-903I (3) *Time in Operation*

The engineer in the field must determine the rental time to pay for equipment in accordance with Section 9-1.04D(2), "Equipment on the Job Site," of the *Standard Specifications*.

In general, consider equipment to be in operation when all of the following conditions exist:

- The equipment is at the site of the extra work or being used to perform the extra work.
- The equipment is not inoperative because of breakdown.
- The force account work being performed requires the equipment.

Use the following examples as guidelines for determining rental time to be paid for equipment.

- An air compressor is on the job site for 8 hours on a force account operation. It is actually used for only a few periods during the 8 hours, but it is impractical to use it on other work during the standby periods. Pay for the compressor and all accessories used intermittently for the entire period. The engine does not have to be running continuously during the period to qualify for payment. If the air compressor was also used on bid item work intermittently, prorate the 8 hours between the extra work and the bid item work.
- An air compressor is on the job site for 8 hours. It is used for the first 2 hours, but after those hours, it is no longer needed. Pay the rental for only 2 hours whether the contractor chooses to remove it or chooses to leave it at the site of the work. Apply the same reasoning if the time of operation occurred at any other time of the day. In this example, if a pavement breaker was needed intermittently for 2 hours and a tamper intermittently for 2 hours, pay 2 hours for each tool. If the pavement breaker is needed for the first hour and the tamper for a second hour, pay 1 hour for each. Advise the contractor when equipment is no longer needed at the site. In the daily report, record this notice and the time.
- A skip loader is used to load dump trucks; however, the skip loader is used only intermittently during the shift because one of the dump trucks broke down. The resident engineer allows the operation to continue because it is critical. Make payment for the loader for the entire shift. In such a situation, the resident

engineer must try to do whatever is necessary to balance the operation. When balancing cannot be achieved, decide whether suspending an operation is more economically feasible than allowing it to continue.

Sometimes two pieces of equipment perform extra work at force account, yet the work does not require full-time use of both. In such instances, it is appropriate to accept (but not order) the use of only one operator for both pieces of equipment. Determine the rental time in the same manner as if each piece of equipment had a full-time operator and was used intermittently.

On extra work at force account, pay the same time for a foreperson's pickup that you would pay for the foreperson.

### *3-903I (4) Equipment Not on the Job Site*

In general, the contractor schedules extra work paid for on a force account basis and uses equipment available on the project. However, circumstances may require use of equipment not on the job site that must be brought in especially for the extra work. The resident engineer should make decisions regarding the type of equipment and its scheduled use. Sections 9-1.04D(3), "Equipment Not On the Job Site and Not Required for Original-Contract Work," and 9-1.04D(4), "Equipment Not On the Job Site and Required for Original-Contract Work," of the *Standard Specifications* specify the requirements for paying for the use of such equipment. These specifications apply when the contractor does not use or uses the equipment for bid item work. Change any previous payment as "equipment not on the job site" to payment as "equipment on the job site" when such equipment is used for bid item work.

Order the equipment removed from the project, pay move-out and possible subsequent move-in costs, or continue paying for the equipment during a suspension in extra work. Perform a cost analysis to determine the most cost-effective alternative. Temporary removal of the equipment to the contractor's shop or a storage area off the project is not removal from the project. To end payment for the equipment, the resident engineer must order its removal.

### *3-903I (5) Non-Owner-Operated Dump Truck Rental*

Section 9-1.04D(5), "Non-Owner-Operated Dump Truck Rental," of the *Standard Specifications* specifies that the resident engineer must establish the hourly rate to be paid for dump truck rental. The actual hourly rate paid by the contractor or the truck broker may be the established rate if it is consistent with rates paid for the same trucks on other work. For help in establishing hourly rates, compare with rates paid for similar equipment on other Caltrans work.

### *3-903I (6) Standby Time*

Pay standby charges for commercial delivery at the invoice rate.

### 3-903J Extra Work Performed by Specialists

Section 9-1.05, "Extra Work Performed by Specialists," of the *Standard Specifications*, allows extra work to be performed by a specialist subcontractor that

neither the contractor nor its current subcontractors can perform. In general, specialists are to be used only for minor portions of the work. The specifications also allow for the specialist work to be paid for by invoice if itemized billing is not the established practice of the specialist's industry.

Do the following when considering the use of specialists:

- Before work begins, decide whether the work is normally done by any of the contractor's forces. The contractor's forces include any firms or organizations performing bid item work, including subsidiaries of such firms or organizations and subsidiaries of the contractor. Subsidiaries of a subcontractor are considered to be a part of the subcontractor's organization. If you decide that the contractor's forces can perform the work expediently, do not authorize the use of the specialist.
- Allow the contractor to hire a specialist only if an established firm with established rates would do the work.
- Districts must establish procedures to pre-approve invoiced billing. Invoiced billing must not be used to circumvent the force account method for determining payment.

### **3-904 Payment Adjustments**

A payment adjustment is a monetary increase or decrease applied to the unit price of a bid item. The adjustment is a change to the contract and must be made by change order. Payment adjustments are either unit adjustments to the unit price of a bid item or they may be a lump sum increase or decrease applied to a bid item.

Payment adjustments are provided for in Sections 9-1.06, "Changed Quantity Payment Adjustments"; 9-1.15, "Work-Character Changes"; 9-1.17C, "Proposed Final Estimate"; and 9-1.17D(2)(b), "Overhead Claims," of the *Standard Specifications*. Other payment adjustments may be required, depending on the bid items, such as hot mix asphalt and concrete pavement.

Do not pay for payment adjustments until change orders authorizing the adjustments have been approved.

If you anticipate that payment adjustments in accordance with Sections 9-1.06, "Changed Quantity Payment Adjustments," or 9-1.15, "Work-Character Changes," of the *Standard Specifications* will result in decreases in final payment, withhold an amount sufficient to cover the value of the decrease.

For more discussion about determining payment adjustments, refer to Section 5-3, "Change Orders," of this manual.

#### **3-904A Changed Quantity Payment Adjustments**

When the total pay quantity of a bid item varies from the Bid Item List by more than 25 percent, the variation may be the result of more or fewer units than shown in the Bid Item List required to complete the planned work. The variance may also result from ordered changes or a combination of both of these factors. When the variation

exceeds 25 percent, adjust the compensation in accordance with Section 9-1.06, “Changed Quantity Payment Adjustments,” of the *Standard Specifications*, or document in the contract records the reason for not making a payment adjustment. When the accumulated increase or decrease in bid item units shown on a change order exceeds 25 percent of the Bid Item List, the overrun or underrun must be acknowledged and provided for in the current change order. Refer to Section 5-306C, “Methods of Payment,” of this manual for more information on change orders. Provide for this overrun or underrun through one of the following options, whichever is applicable:

- Adjust the contract price in accordance with Section 9-1.06, “Changed Quantity Payment Adjustments,” of the *Standard Specifications*.
- Defer any payment adjustment due to the overrun or underrun.
- State in writing that the bid item is not subject to adjustment. Refer to Section 5-3, “Change Orders,” of this manual for a discussion and examples of change orders providing for payment adjustments resulting from increased or decreased quantities.

#### *3-904A (1) Increases of More Than 25 Percent*

It is usually appropriate to defer adjustment if work on the bid item has not been completed. Additional change orders may affect the quantity, or the number of units required to complete planned work may not be known. However, as soon as unit costs and final quantities can be reasonably determined, calculate any required unit adjustment and provide for it through a change order. When work on the bid item is completed, apply the unit adjustment to the total number of units in excess of 125 percent of the quantity shown on the Bid Item List.

Unless requested by the contractor in writing, the engineer does not have to adjust the contract price of an item if the bid item cost of the work in excess of 125 percent of the quantity shown on the Bid Item List is less than \$5,000. However, before exercising this right, verify that Caltrans will not gain any economic benefit from an adjustment. On the other hand, make an adjustment if it would decrease cost and the amount of the decrease would exceed the cost of making the adjustment.

#### *3-904A (2) Decreases of More Than 25 Percent*

If a bid item underruns the quantity shown on the Bid Item List by more than 25 percent, inform the contractor in writing as soon as work on the item has been completed. Unless the contractor requests an underrun adjustment in writing, no adjustment will be made.

#### *3-904A (3) Eliminated Items*

Section 9-1.06D, “Eliminated Items,” of the *Standard Specifications* applies only to bid items eliminated in their entirety. Advise the contractor as soon as it is known that an item will be eliminated. Caltrans will not be responsible for costs incurred for material ordered after notification.

Write the change order providing for the elimination of a bid item to include the disposition of any surplus material. Refer to Section 3-904A (4), "Surplus and Salvaged Material" of this manual for how to handle surplus material resulting from an eliminated item that cannot be returned to the vendor.

### *3-904A (4) Surplus and Salvaged Material*

Minor differences between quantities of material required to complete the planned work and quantities shown in the Bid Item List or shown in quantity summaries on the contract plans are normal operating differences. Caltrans is not liable for a surplus of material resulting from these operating differences.

If the final quantity of an item is less than 75 percent of the quantity shown on the Bid Item List, include any actual loss due to excess material in the costs as computed in accordance with Section 9-1.06C, "Decreases of More Than 25 Percent," of the *Standard Specifications*.

Do not make any allowance for material the contractor keeps.

Caltrans recognizes that certain materials or manufactured items required for the planned construction may be unique and not usable by the contractor, the supplier, or for other projects or customers. If such materials or items become surplus by reason of an ordered change, resulting in a direct and unavoidable loss to the contractor, such loss must be compensated. Determine compensation on the basis of actual cost as provided in Section 9-1.06D "Eliminated Items," of the *Standard Specifications*. The guidelines below describe how to dispose of material that the contractor cannot economically dispose of.

A determination to salvage items made surplus by ordered changes should be based on economic benefit to Caltrans, conservation of the energy and materials required to fabricate the items, or both. Base economic benefit on the following:

- The item's condition is adequate to perform its function satisfactorily. Damage does not necessarily make an item unsuitable for salvage. Caltrans has the capability to repair some items, so investigate this approach before deciding to dispose of a damaged item. Also consider repair costs when determining the cost-effectiveness of salvaging.
- The value equals or exceeds the difference in the cost of salvaging (including hauling) and the cost of removal and disposal.

Also, an item should be salvaged if it meets one or more of the following conditions:

- It is a stock item with a definite, foreseeable use. Stock items include all items that Caltrans normally uses.
- It is not a stock item but can be put to immediate use or has a definite, foreseeable use. This classification would include items that can be reinstalled in the immediate project or could be installed on future projects.
- It is part of an electrical installation owned jointly with another agency, and the other agency requests its salvage.

- It can be used immediately for some other beneficial purpose.

Most districts maintain a district salvage yard or other designated areas for receiving salvaged material. Each district also has a district recycle coordinator. Before the delivery of potentially salvageable items, make arrangements with the appropriate person. Materials should not be salvaged until such arrangements are made.

### 3-904B Payment Adjustments for Price Index Fluctuations

Section 9-1.07, "Payment Adjustments for Price Index Fluctuations," of the *Standard Specifications* specifies payment adjustments for various bid items that contain paving asphalt. The payment adjustment occurs when the California statewide crude oil price index fluctuation exceeds the threshold as described in the contract specifications. Compensation is adjusted when the paving asphalt price fluctuates from the month of the bid date to the month in which the contract item containing paving asphalt was placed. Refer to the example in Section 5-3, "Change Orders," of this manual.

It is important to make timely payments for price index fluctuations. Increases in the cost of paving asphalt may place financial burdens on contractors and can cause projects to exceed allocated supplemental and contingency funds. The resident engineer is responsible for the following:

- Initiating a change order within 30 days of contract approval.
- Verifying that monthly payment adjustments for paving asphalt are included in monthly estimates when items that contain paving asphalt are used.
- Monitoring monthly expenditures and estimating future months of expenditures of payment adjustments for paving asphalt to avoid exhausting the project supplemental funds and contingency balance.
- Notifying the construction engineer and project manager if you anticipate the project contingency balance will be depleted so that appropriate action can be taken.
- At the time of bid, the contractor has the option to opt out of payment adjustments for price index fluctuations. Form DES-OE-0102.12A, "Opt Out of Payment Adjustments for Price Index Fluctuations," is included in the bid book. To determine if the contractor has opted out, review the bid book for the project. If the opt out form in the bid book is not completed, then all of the requirements apply to the project.

### 3-904C Work-Character Changes

Before work can be considered a "work-character change," there must have been an ordered change to the plans or specifications. If such an ordered change materially increases or decreases the unit cost of a bid item, then a work-character change has occurred. Work-character changes are not to be confused with "differing site conditions." For a discussion of differing site conditions, refer to Section 3-5, "Control of Work," of this manual.

When calculating the adjustment for a change in work-character, the original bid price bears no relation to the adjustment unless it can be demonstrated that the bid price actually represents the cost of the work.

### **3-905 Time-Related Overhead**

Section 9-1.11, "Time Related Overhead," of the *Standard Specifications* applies to projects that have a time-related overhead bid item. This section includes a description of time-related overhead and a description of time-related field- and home-office overhead included in the time-related overhead bid item. The contractor includes time-related overhead costs in the time-related overhead bid item. Overhead that is not related to time is included in other bid items. Any contract time adjustments made by change order will result in an equivalent adjustment to the time-related overhead bid item quantity.

The markups for force account work performed by the prime contractor on time-related overhead projects are modified in Section 9-1.04A, "General," of the *Standard Specifications*.

Refer to Section 5-409, "Overhead Claims," of this manual for information regarding claims for overhead for projects without a time-related overhead bid item.

#### **3-905A Audit Examination and Reports**

When the time-related overhead bid item quantity exceeds 149 percent of the quantity at time of bid, consult with your district management before requesting that the contractor provide an audit of its overhead costs. Refer to Section 5-410, "Audits," of this manual for more information.

#### **3-905B Payment**

Time-related overhead is paid on the monthly progress payment for each working day charged during the pay period. The quantity of time-related overhead is not adjusted for concurrent delays. The quantity of time-related overhead will be adjusted only as a result of critical delays that revise the current contract completion date. Adjustments to contract time are handled as follows:

- If contract time is adjusted by change order, and there are no revisions to working days charged to date, payments for the adjusted time occurs when the original bid item quantity is exceeded.
- If you have charged nonworking days that you later determine to be a critical delay, write a change order to make a time adjustment and promptly pay for the revised working days charged to date.

### **3-906 Progress Payments**

Section 9-1.16, "Progress Payments," of the *Standard Specifications* requires Caltrans to make an estimate of work completed each month. Such estimates are designated as progress pay estimates. Each progress pay estimate must include payment for work completed up to and including the 20th day of the month. Include

payment for change order bills that are submitted on time. Also include payment for extra work performed at agreed price and payment adjustments. Billing for this work must be submitted by the resident engineer during the pay period in which the work was performed.

Caltrans supports a collaborative progress payment process allowing contractor participation in estimating bid item quantities completed for progress payments. Contractor participation in this process is optional but should be determined at the preconstruction conference. When a contractor provides a submittal of estimated item quantities and supporting calculations for work completed up to and including the 20th day of the month, two working days before the progress payment cut-off date, the resident engineer will provide Caltrans' estimate of item quantities and supporting calculations to the contractor. One working day before the progress payment schedule cut-off date, the contractor and resident engineer will attempt to resolve differences in the estimated quantities. If an agreement cannot be reached for a particular item quantity, the progress payment will be based on Caltrans' estimated quantity for the item. If modifications in estimated quantities are supported, revise the Caltrans estimated quantity and supporting calculations before processing the progress payment. Where the contractor does not submit a timely monthly estimate of item quantities, omits certain item quantities, or does not provide supporting calculations, the collaborative process cannot be used. Other collaborative process arrangements that are mutually agreeable to the contractor and Caltrans may be established.

Resident engineers must transmit to the district construction office the documents and information required to prepare progress payment vouchers. All documents must be in the district office no later than the date established by the district (usually no later than the end of the first working day after the 20th of each month).

District construction must arrange a schedule with the Division of Construction that will accommodate the Division of Accounting.

A monthly estimate and payment must be made if any amount of money is due the contractor.

Show all quantities submitted for payment on source documents. Typically, Form CEM-4801, "Quantity Calculations," is used for this purpose. Form CEM-4801 is shown in Example 3-9.1 at the end of this section. The estimate must reflect the totals on the source documents. A source document is defined as the basic document executed to record or calculate quantities, percentages of lump sums, or extra work for payment. Refer to Section 3-902C, "Source Documents," in this manual for a discussion of source documents. Example 3-9.1, "Quantity Calculations," is a sample of a source document.

The quantity shown on the estimate for a bid item must agree with the sum of the quantities to date on all of the source documents for that item.

The resident engineer is responsible for the accuracy of a progress pay estimate. By approval, the resident engineer verifies that the quantities are correct, and that data submitted conforms to the policies of Caltrans. All entries on Form CEM-6004,

“Contract Transactions Input,” must be checked by other construction personnel for errors such as transposition and wrong numbers.

The resident engineer must review and approve each monthly estimate before district construction office staff can process it for payment. To expedite handling, the resident engineer need not sign the estimate itself to indicate approval. Approval may be by telephone. Confirm telephone approval by sending a memo or a “pre-verification of pay estimate” form letter to the district construction office.

Refer to Section 5-103, “The Contract Administration System,” of this manual for technical details on the production of estimates.

### 3-906A Bid Items

Include all bid item work completed satisfactorily in accordance with the contract in progress payments. Do not include in progress payments preparatory or organizational work such as assembling equipment, shop work, forming, or crushing or stockpiling of aggregate (unless provided for in the special provisions). Do not pay for material placed or installed for which you have not obtained the required evidence of acceptability (Form TL-0029, “Report of Inspection of Material”; Form TL-0624, “Inspection Release Tag”; certificate of compliance; or acceptance tests).

For items bid on a unit basis, include in progress payments work that is substantially complete. Withhold a sufficient number of units to cover the value of the incomplete incidental work. In each case, a source document must be on file showing the details of the quantity’s determination.

Refer to intermediate source documents for items that are bid on a unit basis with a fixed final pay quantity, such as structural concrete and bar reinforcing steel (bridge), to show how partial payment was estimated. Withhold units of work to cover the value of incomplete incidental work. Base the withheld amount on a force account analysis of the remaining incidental work.

The following examples are listed to illustrate the procedure for partial payments:

1. Mobilization Item

The Contract Administrative System (CAS) will automatically calculate and enter partial payments for the item, “Mobilization.”

2. Maximum Value Items

Handle items for which maximum payment is limited until after a time fixed in the contract as follows:

- a. Include on the estimate the quantities completed in the same manner as for any other bid item. The quantity will be extended at the bid price and added to the total of work done.
- b. The system will make a deduction for any overbid.
- c. The system will return the deduction at the time set forth in the contract.

3. Roadway Excavation

In normal situations, material is excavated, hauled, placed in final position in embankment, and compacted, but slope finishing is not done. This is considered incidental work, and a quantity may be withheld to cover the value of the work remaining.

4. Aggregate for Subbase and Base

Material may be produced, hauled, placed, and compacted, but final trimming to tolerance has not been performed. This is incidental work, and a quantity may be withheld to cover the value.

5. Portland Cement Concrete Pavement

Concrete may be in place and cured but not ground to meet surface tolerance. Grinding is incidental work, and units may be withheld to cover the estimated cost.

6. Sewers and Irrigation Systems

Pipe may be placed and backfilled but not tested. Withhold units to cover this work.

7. Fence

Posts and wire or mesh may be in place and securely fastened but bracing wires not completed. Withhold units to cover this incidental work.

8. Structural Concrete, Bridge (Final Pay Quantity)

Bridge construction generally requires erecting falsework to carry dead loads of concrete (or steel) members until they become self-supporting. When falsework supports the superstructure concrete of box girder or slab bridges, make partial payments for the bid item.

When the soffit plywood is complete in place, make a partial payment equivalent to 35 percent of the projected superstructure concrete volume.

Withhold 5 percent for removal of the falsework materials and the final surface finishing of concrete.

9. Bar Reinforcing Steel

Pay for bar reinforcing steel that is complete and in place in the forms. It does not have to be encased in concrete before payment is made.

10. Structural Steel (Final Pay Quantity)

Steel placed is paid by units erected and in place. Withhold units to cover incidental work such as additional bolting and welding.

For work that includes an item for “furnishing,” make no payment for furnishing until all contract requirements have been met, including acceptability of the material and delivery to the project. However, payment may be made for materials on hand, as covered in Section 3-906E, “Materials on Hand,” of this manual, for items that qualify and meet specified eligibility requirements. Refer to the *Bridge Construction Records and Procedures* manual for additional instructions.

For lump sum bid items, if a schedule of values is required, refer to Section 3-906B, “Schedule of Values,” of this manual. Otherwise, pay a percentage of the lump sum

bid price as work progresses. Use for this calculation the ratio of the number of working days an item of work has been in progress divided by the estimated total number of working days required to complete the item work. Be aware that such a simplified method might not reflect the value of the work actually completed. Reach an equitable agreement with the contractor for the basis of determining progress payments on lump sum items.

If any work or material on hand paid for on a previous monthly estimate loses value through loss, damage, or failure to function, deduct units representing the lost value from the following monthly estimate. Another example is storm damage requiring repair or replacement in accordance with Section 5-1.39B, "Damage Caused by an Act of God," of the *Standard Specifications*.

Do not pay for item work added by change order until the change order is approved. However, payment for bid item overruns that are not the result of a change in the contract may be included in the monthly estimate.

### 3-906B Schedule of Values

A schedule of values is required for specific lump sum bid items such as electrical systems. Building construction will also be a lump sum bid item and will require a schedule of values as specified in the special provisions. Structure Construction will provide a technical review to verify that progress payments can be based on the value of the work in place.

### 3-906C Extra Work

Do not pay for change order work until the change order is approved. Refer to Section 3-403, "Changes and Extra Work," Section 3-906D, "Interest," and Section 5-3, "Change Orders" of this manual, for further information on change orders providing for extra work.

### 3-906D Interest

Section 9-1.03, "Payment Scope," of the *Standard Specifications* provides for interest to be paid on unpaid and undisputed progress payments, payments after acceptance, change order bills, claim payments, and awards in arbitration.

Keep a log of the dates when change order bills are received, rejected, and resubmitted. In a timely manner, process all change order bills, and fully document reasons for rejecting change order bills.

Make interest payments for late payments by change order as a payment adjustment at lump sum. Refer to Section 5-3, "Change Orders," of this manual for more information.

### 3-906E Materials on Hand

Pay for acceptable materials on hand with individual material costs of at least \$50,000 or at least \$25,000 for requestors certified as a disabled veteran business

enterprise, disadvantaged business enterprise or small business, provided that all specified conditions have been met. Follow the procedures described below:

- Give the contractor Form CEM-5101, “Request for Payment for Materials on Hand.”
- The contractor must initiate payment by submitting in duplicate a properly completed Form CEM-5101. Make no payment for any material if the contractor has not requested payment on the state-furnished form. The contractor must submit a request one week before the end of the estimate period for each estimate. Each request must represent the current status of materials on hand at the time the request is made. Do not honor a request if it does not represent the actual amount on hand.
- Upon receipt of a request for payment for materials on hand, the resident engineer must check that it is filled out properly, meets specified eligibility requirements, and that the contractor attached evidence of purchase. Check on requestor’s certification for a disabled veteran business enterprise, disadvantaged business enterprise, or small business when the material cost is \$25,000 to \$50,000. When the contractor’s supporting evidence of purchase shows that a discount has been allowed, reduce the payment for materials on hand by the amount of the discount.
- Before processing a materials-on-hand request, inspect all materials for acceptability. Materials must have a certificate of compliance or Form TL-0029, “Report of Inspection of Material.” Form TL-0029 is evidence that the material was inspected at the source. In general, accept only completely fabricated units, ready for installation on the project with the following exceptions:
  1. Piling—Steel plate used for steel pipe piling and driven steel shells filled with concrete and reinforcement as described in Section 49, “Piling,” of the *Standard Specifications* may be considered acceptable as raw material. However, pay for such material as raw material only until shop fabrication of the pile is 100 percent complete. After shop fabrication is complete, the estimated fabricated value may be paid, subject to other specified restrictions and administrative guidelines.
  2. Structural Steel—Structural steel used in steel structures as described in Section 55, “Steel Structures,” of the *Standard Specifications* may be considered acceptable as raw material. However, pay for such material as raw material only until shop fabrication of a usable member, such as a girder or other shape ready for shipment to the job site, is 100 percent complete. After shop fabrication is complete, the estimated fabricated value may be paid, subject to other specified restrictions and administrative guidelines.
  3. Sign Structures—Structural steel used in overhead sign structures as described in Section 56, “Overhead Sign Structures, Standards, and Poles,” of the *Standard Specifications* may be considered acceptable as raw material. However, pay for such material as raw material only until shop fabrication of a usable member, such as a sign frame or other member, is 100 percent

complete. After shop fabrication is complete, pay for the estimated fabricated value, subject to other specified restrictions and administrative guidelines.

- Verify proper storage of materials listed on Form CEM-5101 in accordance with the following procedures:

#### *3-906E (1) Materials at the Project*

For all valid requests for material located at or near the project, determine whether the materials are stored in conformance with the contract. To conform to this requirement, the contractor may have to store materials in fenced areas with locked gates, in locked warehouses, or in areas where it is improbable that materials would be lost from any cause. In addition to having controlled storage, the contractor is required by the *Standard Specifications* to provide proper storage and handling so that the materials do not become damaged or contaminated. For stored materials with water pollution potential, the contractor must establish and maintain water pollution control measures. Call any indication of improper storage to the contractor's attention. Withhold payment for materials on hand until the materials are properly stored.

Do not pay for material accepted on the basis of certificates of compliance until such certificates have been received.

The resident engineer or an assistant resident engineer must review Form CEM-5101 to verify that the request is acceptable.

#### *3-906E (2) Materials Not at the Project*

For materials not delivered to the job site, obtain evidence, and establish the fact of purchase, proper storage, acceptability, accessibility, and other factors. Materials Engineering and Testing Services (METS) maintains representatives in major industrial areas and provides inspection in all other areas for this purpose. The following is the procedure for requesting METS assistance:

- If it is not practical for the resident engineer or assistant resident engineers to verify quantity, quality, location and proper storage, send the duplicate copy of the Form CEM-5101 to METS.
- Upon receipt of Form CEM-5101, METS will immediately notify the appropriate inspection office or offices. The METS representative will notify the resident engineer directly using Form TL-0649, "Report of Material on Hand," or TL-6037, "Fabrication Progress Report," that the material has been inspected and that it is in acceptable condition and properly stored. METS will use Form TL-6037 for structural steel, precast prestressed concrete members, or sign structures. For other products, METS will use Form TL-0649.

METS may also indicate on its correspondence, the percent complete of shop fabrication on various structural components. This figure is given for the purpose of reporting progress on the affected items. Do not use it to increase payment for materials on hand during fabrication.

- Upon receipt of the Form CEM-5101 and the above verification, the resident engineer can approve the partial payment. The contractor must submit a new Form CEM-5101 for each estimate, and the above procedure must be followed. However, it is possible METS may not be able to respond in time for payment on the estimate. METS gives priority to new or changed requests. Therefore, for requests that have not changed since a previous submittal, resident engineers may approve subsequent payments in the absence of any METS reports to the contrary.

On the monthly progress pay estimate, enter the total value of acceptable material as material on site regardless of storage location. Use Form CEM-5105 to summarize, authorize and document material on hand payments.

The maximum payment for materials on hand should be such that, when the estimated placing and other remaining costs of the work are added, the contract price is not exceeded. The purpose of this is to prevent payment of more than the contract price for the materials and to leave sufficient funds in the item to complete the work.

### 3-906F Withholds

#### *3-906F (1) Progress Withholds*

Progress withholds are usually determined by noncompliant (unsatisfactory) progress. Whenever a contractor's performance is unsatisfactory, the resident engineer notifies the contractor of the apparent failure.

#### 3-906F (1a) Noncompliant Progress

Progress is determined by comparing the contractor's actual progress with the curve on Form CEM-2601, "Construction Progress Chart." This requires calculation of the percent of work completed and the percent of time elapsed. If the plot of these percentages falls on or above the curve on Form CEM-2601, progress is considered satisfactory. Otherwise, it is considered unsatisfactory except under extenuating circumstances. Refer to Section 9-1.16E(2), "Progress Withholds," of the *Standard Specifications* for noncompliant progress conditions.

After each progress estimate, update Form CEM-2601. The Contract Administration System (CAS) uses the formula contained on this form to determine progress. For a description of this process, refer to Section 5-1, "Project Records and Reports," of this manual.

The contractor's progress is usually considered unsatisfactory when the contractor's progress curve falls below the curve of the contract progress chart or when successive points on the contractor's progress curve indicate the contractor's progress rate will soon fall below the curve.

The percentage of work completed (except on landscape projects with Type 1 plant establishment) is determined by dividing the amount on the line titled "Total Work Completed" on the "Project Record Estimate" by the "Authorized Final Cost" on the "Project Status." CAS calculates this percentage. Calculations for percentage of

work completed for Type 1 plant establishment are shown in Section 3-906F (1b), “Plant Establishment work,” of this manual.

CAS computes the percent of contract time elapsed by dividing the number of working days elapsed to the date of the progress estimate, by the original working days specified in the contract plus “Total time extension days approved to date,” on Form CEM-2701, “Weekly Statement of Working Days.”

Whenever the contractor fails to prosecute the work adequately, evidenced by the plot of actual progress and your concurrence, you must notify the contractor of the apparent lack of progress. If you judge that the work on the remaining work activities will not be completed by the “computed date for completion” as defined in Section 3-804, “Time,” of this manual, you must request that the contractor submit a revised schedule showing how the balance of the work will be carried out.

Occasionally, the resident engineer has information indicating that the percent of time elapsed is different from that which CAS will calculate. The usual reason for this is that pending time extensions have not yet been approved and entered into the system. The percent of time elapsed can be calculated using the anticipated time extension in the formula described above. The resident engineer must document the calculated percent of time elapsed as well as the reasons therefore. Enter the calculated percent of time elapsed in the appropriate place on Form CEM-6101, “Project Record—Estimate Request.” CAS will calculate satisfactory or unsatisfactory progress based on this figure.

Whenever the district believes the contractor’s bonding company should be notified of unsatisfactory progress, advise the Division of Construction of the reasons supporting such an action. If appropriate, the district will initiate the notification.

If the district believes the lack of progress on a contract justifies a meeting, the district arranges a conference to be attended by the contractor’s representatives, the bonding company, and Caltrans. If appropriate, the Division of Construction will arrange the conference. For more information, refer to Section 3-808, “Contractor’s Control Termination,” of this manual.

### 3-906F (1b) Plant Establishment Work

For specifications and administrative guidelines for plant establishment time requirements refer to Section 20-4, “Plant Establishment Work,” of the *Standard Specifications*, and Section 4-2002C (8), “Plant Establishment Work,” of this manual. In general, a withhold for unsatisfactory progress should be waived only for landscape projects or on other projects only after a corrected entry has been made for “percent time elapsed” as covered for Type 1 and Type 2 plant establishment.

For projects with Type 2 plant establishment, the percent of time elapsed and percent of work completed is determined in the normal manner as described in Section 3-906F(1a), “Noncompliant Progress,” of this manual.

For projects with Type 1 plant establishment, compute the percent of time elapsed and the percent of work completed as follows for the periods before the start of plant establishment. After the start of Type 1 plant establishment, the resident engineer

will decide if the progress is satisfactory. In general, consider progress satisfactory if the contractor entered the plant establishment period on time and carries out plant-establishment work on time. Progress will be considered unsatisfactory if there will be an overrun in contract time because of a delayed start of Type 1 plant establishment.

Determine the percentage of work completed by dividing the value of work accomplished by the authorized contract amount minus the authorized plant establishment work.

$$\% \text{ Complete} = \frac{\$ \text{ Value Completed Work}}{(\$ \text{ Total Auth. Contract Amt.} - \$ \text{ Plant Estab. Work})}$$

Determine the percentage of time elapsed by dividing the number of working days elapsed to the time of the estimate on Form CEM-2701 by the total contract time limit plus "Total change order days approved to date" on Form CEM-2701 and minus the length of the plant establishment period.

$$\% \text{ Time} = \frac{\text{Working Days Elapsed}}{(\text{Orig. Cont. Time} + \text{Time Ext. to date} - \text{Plant Estab. Period})}$$

Compare these two percentages to the curve on Form CEM-2601, "Construction Progress Chart." If progress is satisfactory, check the "Override Unsatisfactory Progress" on Form CEM-6101, "Project Record—Estimate Request."

### *3-906F (2) Performance Failure Withholds*

Whenever the contractor fails to comply with a contract part, including timely submittal of a required document, the resident engineer notifies the contractor of the apparent performance failure. For example, performance failure withholds may be taken for the following required documents:

- Quality control plan
- Baseline schedule
- Updated schedules
- Revised schedules
- Time impact analyses
- Final schedule
- Traffic control plans
- Traffic contingency plan
- Water pollution control plan
- Storm water pollution prevention plan

The resident engineer gives the contractor 7 days from this notification to either provide the submittal or a request for information. If neither is provided on time, the resident engineer should take the performance failure withhold in the next progress pay estimate. If the contractor submits a request for information, the resident engineer should allow another 7 days from the time the request for information is answered in full before taking the performance failure withhold. Refer to Section 9-1.16E(3), "Performance Failure Withholds," of the *Standard Specifications*. Other withholds such as progress withholds, stop notice withholds, and penalty withholds are separate and may be taken simultaneously if justified.

### *3-906F (3) Stop Notice Withholds*

Refer to the Division of Accounting all inquiries regarding bills for labor, material, or equipment rental not paid by Caltrans' contractor. Detailed information for construction payments, legal withholds, labor compliance withholds, levies and liens, including stop notice contacts can be found on the Division of Accounting "Major Construction Payment & Information" website:

<https://misc-external.dot.ca.gov/pets/>

### *3-906F (4) Penalty Withhold*

For penalty withholds, refer to Sections 7-1.02, "Laws," and 9-1.16E(5), "Penalty Withholds," of the *Standard Specifications*. Penalty withholds may become a deduction if appropriate. Withholds may be required in accordance with Sections 7-104, "Air, Water, and Noise Pollution Control"; 7-105, "Permits, Licenses, Agreements, and Certifications"; and 8-102, "Labor Compliance Responsibilities," of this manual.

### 3-906G Deductions

Deductions (as opposed to withholds) are those amounts held back for specific purposes. The resident engineer must identify, initiate, and control all deductions. Refer to Section 5-103F (1c), "Deductions," of this manual for information on administering deductions.

Make a deduction from payment to the contractor as soon as the liability for the event requiring a deduction has been determined. It is preferable to base deductions on known amounts resulting from agreements or actual billings, but, if necessary, they can be estimated.

Resident engineers must keep source documents and summary sheets in the appropriate contract records to cover all deductions. In the absence of any information to the contrary, CAS will carry deductions forward from the previous month.

Whenever the contractor's progress is unsatisfactory and the project has progressed to a point where a reasonably accurate estimate of probable liquidated damages can be made, the resident engineer must deduct an amount sufficient to cover probable liquidated damages. Make the deduction in lieu of any withhold for unsatisfactory progress. Enter the amount and description of deductions on Form CEM-6101,

“Project Record–Estimate Request,” and check “Override Unsatisfactory Progress,” to prevent the withhold.

### 3-906H Supplemental Progress Payments

Resident engineers are responsible for the completeness and accuracy of each progress payment. Supplemental progress payments are used to correct omissions or make adjustments to a previously processed progress payment estimate for work performed within that pay estimate period. Supplemental progress payments may be run only between the completion of the original monthly progress payment and the 15th of the following month.

Refer to Section 5-103F, “Generating Estimates,” of this manual for the process of generating a supplemental progress payment.

### 3-906I Negative Estimates

The resident engineer is responsible for the accuracy of all payment estimates, including progress payment, after acceptance, semifinal, and final estimates. Negative estimates reflect an overpayment made to the contractor. When a negative estimate is necessary, you must prepare a brief justification and submit it with the estimate request to the district construction office. The district construction office must obtain concurrence from the deputy district director of construction or delegate, and the Division of Construction’s field coordinator before running the negative estimate.

When a negative estimate is approved for processing, the Division of Accounting bills the contractor for the amount due. If, for any reason, you believe that the contractor should not be billed, notify the district construction office and the Division of Construction progress pay coordinator. Once notified, the Division of Construction progress pay coordinator, with the Division of Construction field coordinator’s concurrence, will notify the Division of Accounting not to bill the contractor.

Section 3-907E, “Payment Offset,” of this manual describes another method available to the resident engineer and the Division of Accounting to resolve overpayment to the contractor.

### **3-907 Payment After Contract Acceptance**

Caltrans makes final payment as soon as possible after the contract is accepted and the contractor submits the required documents requested by the resident engineer. Any estimate covering a payment after contract acceptance is identified either as “after acceptance,” “semifinal,” or “final.”

Soon after the contract is accepted, meet with the contractor to discuss submitting required information to complete the contract. If the contractor does not submit required data within 4 weeks after acceptance, you must notify the contractor in writing that Caltrans will issue the proposed final estimate and deduct the appropriate amount. Section 5-406, “Claims Resolution Process,” of this manual lists the timeline for completing payment steps after the acceptance process.

### 3-907A Payment Before Final Estimate

A payment after acceptance but before the proposed final estimate must adhere to Section 9-1.17B, "Payment Before Final Estimate," of the *Standard Specifications*. The purpose of this type of progress payment is to release all money due the contractor that exceeds any amounts withheld under the contract. When determining amounts to be paid or deducted for this type of estimate, the following applies:

1. Include payment for the following:
  - a. Any work completed since the previous estimate
  - b. Any errors that may have been discovered and corrected
  - c. Any labor compliance deficiencies that have been cleared
2. Include payment for any overbids on maximum value items, including the mobilization item. You do not need to take any additional action for this step.
3. When delinquent or inadequate payrolls exist, make a deduction from the payment.
4. When the contractor has failed to correct deficiencies in its equal employment opportunity program, make a deduction from the payment. These deficiencies include failure to submit Form CEM-2402F, "Final Report—Utilization of Disadvantaged Business Enterprises First-Tier Subcontractors."

The deductions will be in the same amount as for any progress estimate. Refer to Section 8-1, "Labor Compliance," Section 8-2, "Equal Employment Opportunity," and Section 8-3, "Disadvantaged Business Enterprises and Disabled Veteran Business Enterprises," of this manual.

5. To cover any outstanding documents required under this contract, make a deduction from the payment. These outstanding documents include the following:
  - a. Reduced prints of working drawings
  - b. Outstanding payrolls that are not yet delinquent
  - c. Or any information upon which to base the proposed final estimate, such as payment adjustments of contract unit prices

The deduction, regardless of the number of outstanding items, will be the lesser of 10 percent of the "Subtotal Amount Earned Without Mobilization," or \$10,000, and at least \$1,000.

In addition to the steps listed for determining amounts to be paid or deducted for an estimate after contract acceptance, the resident engineer must also do the following:

1. Notify the district of what deductions are applicable.
2. Compound the deductions when a combination of the situations outlined previously occur:
  - a. The contractor has delinquent or inadequate payrolls.

- b. The contractor failed to correct deficiencies in its equal employment opportunity program.
  - c. The contractor failed to honor requirements related to disadvantaged business enterprises.
3. Also compound permanent deductions. Permanent deductions include items such as material royalties, railroad flagging charges, material testing, out-of-specification material, or restaking charges. Also considered permanent are deductions for anticipated liquidated damages. (When warranted, anticipated liquidated damages can be made on progress estimates. However, anticipated liquidated deductions will need to be made permanent on the after-acceptance estimate. To do so, release anticipated liquidated damages; then take actual liquidated damages under liquidated damages on the after-acceptance estimate.)
  4. When you make deductions for outstanding items, advise the contractor in writing of the specific missing items.
  5. Before processing an after-acceptance estimate, run the following two reports, "Status of CCO," and "CCO master listing." These reports will show any adjustment of compensation credit or deferred time not yet taken.

### 3-907B Proposed Final Estimate

The purpose of the proposed final estimate is to obtain formal agreement regarding final payment. For this type of estimate, follow these guidelines:

- Submit the proposed final estimate to the contractor within the time frame outlined in Section 5-406, "Claims Resolution Process," of this manual.
- Before processing the proposed final estimate, ensure all change order bills submitted by the contractor are processed and ready for payment. Ensure the estimate's issuance is not delayed for change order bills that remain outstanding.
- If the contractor has not submitted required information, proposed final estimate must still be issued on time. In this situation, the following guidelines apply:
  1. Any time before a proposed final estimate is issued, the district may exercise an option described in Section 9-1.04C, "Materials," of the *Standard Specifications*. This section identifies the conditions under which Caltrans may establish the cost of materials when valid copies of vendors' invoices are not forthcoming. When the district decides to establish such costs, use the following procedure:
    - a. If the established cost is necessary to determine compensation, complete the pending change order, and have it unilaterally approved. To determine compensation, refer to Sections 9-1.06, "Changed Quantity Payment Adjustments," or 9-1.15, "Work-Character Changes," of the *Standard Specifications*.
    - b. If the established cost is necessary to make force account payment on an existing change order, include this established cost as a lump sum payment on

a supplemental change order. Also, unilaterally approve this supplemental change order.

2. On the proposed final estimate, you may list (in the amount the district determines to be payable) any force account billings that have not been paid because of a dispute. Upon return of the proposed final estimate, the contractor must reiterate the disputed extra work, which must be handled like any other claim. Do not list in the proposed final estimate any force account billings the contractor has not yet submitted. It is the contractor's responsibility to either submit these bills before the proposed final estimate or list them as exceptions to the proposed final estimate.
3. The district will show the required deduction on the proposed final estimate in the same manner as for any other deduction when the contractor has the following outstanding items:
  - a. Delinquent or inadequate payrolls
  - b. Deficiencies in its equal employment opportunity program
  - c. Violations of requirements related to disadvantaged business enterprises

(These items are also described in Section 3-907A, "Payment Before Final Estimate," of this manual.) When such deductions are shown, include a statement similar to the following on the letter that accompanies the proposed final estimate: "The amount of \$\_\_\_\_\_, which has been deducted for nonsubmittal of documents required by the contract, will be paid when all such documents have been received."

- Submit Form CEM-6101, "Project Record—Estimate Request," to the district office with the proposed final estimate box checked to initiate the proposed final estimate.
- The proposed final estimate is to be prepared and sent to the contractor by the district construction office. It should include the following:
  1. A letter transmitting the proposed final estimate to the contractor. This letter should include the statements shown in Example 3-9.2, "Form Letter for Submitting Proposed Final Estimate to the Contractor."
  2. A form for the contractor's acceptance of the amounts listed in this estimate. Ensure the form contains wording similar to the wording in Example 3-9.3, "Acceptance Statement Form."
  3. The proposed final estimate report showing the status of item payments generated by CAS along with the "schedule of extra work" and "schedule of deductions" reports. Samples of these reports are shown in Examples 3-9.4 through 3-9.8.
  4. If deductions for items such as staking charges, laboratory charges, railroad flagging charges, and overruns of contract time are not finalized and shown on the reports, a list of their estimated maximum amounts must be attached.

- Use separate correspondence, not the proposed final estimate, for funds deducted for labor violations and wage restitution (as opposed to outstanding or inadequate payrolls).
- When money is due on the proposed final estimate, ensure the semifinal estimate processed immediately after reflects the same “totals” as the proposed final estimate. If you follow this approach, the contractor will submit claims based on the “statement of total amount earned,” rather than a “revised” number.
- To establish the beginning of the 30 days during which the contractor may submit written claims, send the proposed final estimate by certified mail, “return receipt requested,” or overnight delivery.
- From the issuance of the proposed final estimate to the receipt of the contractor’s response, do not enter into any negotiations, written or verbal, concerning the proposed final estimate or potential claims, except as described in the following paragraph. During this time, negotiating or communicating with the contractor (or issuing change orders) may negate the finality of the proposed final estimate. If the finality is negated, the contractor may have 30 days from the most recent communication to respond.
- If you discover an error that requires a decrease in a quantity, send a letter to the contractor stating the discovery of an error, and specify the item and amount of the change. Also, state that the error will be addressed after the contractor returns the proposed final estimate. If the contractor discovers and brings to your attention any errors or discrepancies, handle this situation through separate correspondence covering only the affected items. For example, if the contractor disputes the quantity of an item, send a letter to the contractor stating that the item must be listed as an exception to the proposed final estimate. In the letter, also state that the item will be analyzed after the return of the proposed final estimate and exceptions, also known as the “Acceptance Statement.”
- When the contractor returns the “Acceptance Statement,” proceed in accordance with the appropriate option below:
  1. If the returned Acceptance Statement has no exceptions (administrative claims or contract claims) and all documents required under the contract have been received, prepare the final estimate. Refer to Section 3-907D, “Final Payment and Claims,” of this manual for more information.
  2. If the returned Acceptance Statement has no exceptions, but some documents are still outstanding, continue pressing the contractor, in writing, for the missing documents. If amounts due the contractor exceed the deductions by more than \$300, prepare and process a semifinal estimate.
  3. If the documents have not been received in approximately 60 days, request advice from the Division of Construction field coordinator about further action.
  4. If the Acceptance Statement is returned with exceptions, initiate the claims procedure as outlined in Section 5-4, “Disputes,” of this manual.

5. If the Acceptance Statement is returned requesting a payment adjustment in accordance with Section 9-1.17C, "Proposed Final Estimate," of the *Standard Specifications*, determine if the payment adjustment is warranted. If the payment adjustment is warranted, make the payment in the same manner as for any other adjustment and unilaterally approve in the district. The following is an example of a calculation to determine this payment adjustment:

Example:

Contractor's original bid (including mobilization)	\$100,000
90 percent of Contractor's bid	\$ 90,000
Final estimate of total work (including mobilization, extra work, and less permanent deductions)	\$ 85,000
Difference	\$ 5,000
Adjustment of Overhead Costs (10 percent of difference)	\$ 500

6. When the Acceptance Statement is not returned within the specified 30 days, verify it has not been lost in transit and then proceed in accordance with the appropriate option below:
  - a. If all documents have been received, prepare and process the final estimate.
  - b. If some documents are still outstanding, request advice from the Division of Construction's field coordinator about further action.
  - c. If the contractor includes in the Acceptance Statement any claim that is postmarked or hand-delivered more than 30 days after the date the contractor received the proposed final estimate, the claim is considered late and will not be processed. On a hand-delivered claim, record the date the claim arrived, who delivered it, and who received it. Retain the envelope for a claim that arrived through the mail to establish the date the claim was sent. Inform the contractor of the late filing by using a letter worded in a similar way to the letter below. This notification will constitute the final administrative action on a late claim.

**Notification to Inform the Contractor of a Late Filing:**

Contractor \_\_\_\_\_,

The statement of claim included in your letter dated \_\_\_\_\_, was submitted to us more than 30 days after you received copies of the proposed final estimate for Contract No. \_\_\_\_\_, (County Route and Mile-Post).

A final estimate is, therefore, being processed for issuance to you as provided in Section 9-1.17C, "Proposed Final Estimate," of the *Standard Specifications*.

Sincerely,  
District Construction Office

- d. If the contractor includes claims with the return of the proposed final estimate, the district should immediately acknowledge the receipt of the claims by sending a written statement similar to the following:

**Acknowledgment of the Receipt of Claims:**

Your written statement of claims has been received. The engineer will base the determination of your claims upon the investigation of your statement.

The investigation of your claim statement will begin immediately. If it is determined that additional information is required, you must furnish it within 15 days of the request in accordance with Section 9-1.17D(2), "Claim Statement," of the *Standard Specifications*. You may request in writing an extension of time to a specific date. Our purpose is to provide you with the engineer's final determination on claims in the minimum possible time, consistent with the assurance that all the facts are available for consideration.

- e. If the initially submitted claim statement is obviously deficient in information, use a paragraph similar to the following example instead of the second paragraph above:

**Notification of Deficiency of Information:**

Your initial submission appears to be deficient as to the following:

[Select appropriate item or items.]

1. Statement of contractual basis for claim
2. Information as to compliance with Section 4-1.05A, "General"; or Section 5-1.43, "Potential Claims and Dispute Resolution," or both of the *Standard Specifications*
3. Breakdown of amount claimed due
4. Other, as applicable

Please submit any further information you wish to have considered by [date, approximately 15 days after the contractor will receive the letter]. If you will require additional time to prepare your supplementary statement, please

request an extension in writing specifying the date to which the extension is requested. The engineer intends to make the final determination on claim matters in the minimum possible time, consistent with the assurance that all the facts are available for consideration.

- f. Examine claims expeditiously. For detailed instructions, refer to Section 5-4, "Disputes," of this manual.

### 3-907C Semifinal Estimate

A semifinal estimate is any estimate prepared after issuing the proposed final estimate and before preparing the final estimate. The primary purpose of a semifinal estimate is to make timely payment for all nondisputed items that have not been paid on a previous estimate. However, semifinal estimates can also be issued to make payment if some, but not all claims, have been resolved.

The proposed final estimate need not show a zero balance for money owed to the contractor. If the proposed final estimate does identify money owed to the contractor, immediately run a semifinal estimate after the proposed final estimate. Do not wait for any response from the contractor to the proposed final estimate. Do not issue any other estimates until 30 days after issuing the proposed final estimate.

Normally, use the same procedures to issue a semifinal estimate as those to issue a progress estimate.

### 3-907D Final Payment and Claims

Submit a final estimate only after one of the following conditions has been met:

- The contractor has submitted all required documents, and complete agreement on payment has been reached.
- The district director's determination of claim has been issued.
- The contractor does not respond to the proposed final estimate in the specified time but has submitted all required documents.
- The district has been advised by the Division of Construction field coordinator to proceed.

Refer to Section 5-406, "Claims Resolution Process," of this manual for more information. As soon as the district approves the final estimate, it must use a transmittal letter. The letter must state the following: "Submitted herewith in accordance with Section 9-1.17D(3), 'Final Determination of Claims,' of the *Standard Specifications* is a copy of the final estimate for your Contract No. X."

A copy of the transmittal letter is to be sent to the resident engineer to be retained in the project files.

The district transmits only the final estimate because the disbursing office of the Division of Accounting will mail to the contractor the corresponding copy of the progress payment voucher.

### *3-907D (1) Material to Submit with the Final Estimate*

Before payment of a final estimate, the Division of Construction progress pay staff must ensure that administrative details have been completed. For this purpose, the district must forward the following data before or with all final estimates:

- Submit the proposed final estimate as originally submitted to the contractor, including transmittal letters.
- Submit the Acceptance Statement returned by the contractor. If the contractor has refused to sign the statement, submit it with an explanation of the contractor's refusal.
- Submit a transmittal letter containing, but not limited to, the following:
  1. A list of the forms and attachments being transmitted or an explanation as to why a form or attachment is missing. Include letters from the Division of Construction authorizing the submittal of the final estimate without certain documents and stating the action taken or to be taken as a result of the missing documents.
  2. A statement about the use of materials agreements. If there are no materials agreements, state this.
  3. A statement that reduced prints of all shop drawings for highway bridges and railroad bridges have been received from the contractor. If such drawings are not required, please state so.
  4. Correspondence or documents explaining or authorizing the differences between the proposed final estimate and the final estimate.
  5. Form CEM-2402F, "Final Report—Utilization of Disadvantaged Business Enterprises, First-Tier Subcontractors."

### 3-907E Payment Offset

A payment offset is a method of obtaining monies due to Caltrans on one contract by levying against future payments being made to a contractor on another Caltrans contract. Offsets may be taken to obtain adequate funds for any amount due and for determinations made by an arbitrator. The offset process should be completed within 90 calendar days of contract acceptance except when an offset for a determination by an arbitrator is required.

Many stakeholders are involved in the payment offset process. The following should be considered when choosing an active contract to apply an offset against:

1. There should be sufficient payments pending.
2. It should be bonded by the same bonding company if possible.
3. It should be administrated within the same district.

To begin the payment offset process, send a letter to the contractor, bonding company, and offset bonding company. The contractor and the bonding companies

have 20 calendar days from receipt of the letter to request a meeting to discuss the offset.

If the contract or bonding companies do not request a meeting, execute the offset. If a meeting is requested, a meeting will be held within 10 calendar days of receipt of the request. The meeting is conducted by the district director or as delegated to at least a supervising transportation engineer.

The resident engineer prepares a summary of the facts, minutes of the meeting, and a final determination report. If the offset is warranted, notify the district administering the contract being offset, the contractor, and bonding companies of the final determination, and the amount of the offset. If the contractor or the bonding companies do not request a hearing, execute the offset. If the hearing officer determines that an offset is not warranted, continue through the collections process administered by the Division of Accounting. The Division of Accounting executes only those offsets authorized by the Division of Construction.

### **3-908 Arbitration**

If the contractor has diligently pursued and exhausted the administrative procedures specified in the contract for Minor A projects and major projects, the contractor is entitled to file for arbitration of its claims 240 days after contract acceptance even if the district director determination of claims has not been issued.

The Caltrans Legal Division handles all construction contract arbitrations. Refer to Section 5-411, "Arbitration," of this manual for more information.

### Example 3-9.1. Quantity Calculations

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION  
**QUANTITY CALCULATIONS**  
 CEM-4801 (REV 11/1992) CT# 7541-3520-0

<p style="text-align: center;"><b>JOB STAMP</b></p> 07-1381U4 07-LA-210-47.5/57.3 Fed. No. (NONE)	<p>ITEM 8 - Temp Railing (Type K)</p> <p>LOCATION Ramp 3</p> <p>CALC. BY A. Sistantre</p> <p>CHK. BY R. Engineer</p>	<p>FILE NO. 48-8-2</p> <p>SEGREGATION YES <input type="checkbox"/> NO <input checked="" type="checkbox"/></p> <p>DATE 09/17/2012</p> <p>DATE 09/18/2012</p>
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Field Measurement:	X	Estimated Quantity:	1,500
Field Counted:	NO	Unit of Measure:	feet
Final Pay Item	NO	Unit Price:	\$8.00/foot
		75% of item:	1,125 feet
		125% of item:	1,875 feet
Remarks or other calculations:			
500 feet placed on September 10, 2012 at Maple Street offramp, Station 3+00 RT			
Material Inspection/Release: Certificate of compliance obtained on September 5, 2012.			
		Pay this estimate:	500 feet
		Previously paid:	250 feet
		Total to date:	750 feet

POSTED BY O.E. Ngindeer	DATE 09/20/2012	POSTED TO CEM 6004, page 4 line 5
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**ADA Notice** For individuals with sensory disabilities, this document is available in alternate formats. For information call (916) 654-6410 or TDD (916) 654-3880 or write Records and Forms Management, 1120 N Street, MS-89, Sacramento, CA 95814. CEM4801

### Example 3-9.2. Form Letter for Submitting Proposed Final Estimate to the Contractor

Subject: Proposed Final Estimate

In accordance with the provisions of Section 9-1.17D(1), "General" of the *Standard Specifications*, attached (in triplicate) is a proposed final estimate for

\_\_\_\_\_  
(Contract)                      (Dist. Co. Rte. M.P)

Please review the proposed final estimate and, if satisfactory, indicate your approval in the space provided on the attached Acceptance Statement. Return three copies of the Acceptance Statement to this office. One copy is for your files.

Please note the following portion of Section 9-1.17D(1), "General" of the *Standard Specifications*, which states:

"If you accept the proposed final estimate or do not submit a claim statement within 30 days of receiving the estimate, the Engineer provides you the final estimate and the Department pays the amount due within 30 days. This final estimate and payment is conclusive except as specified in sections 5-1.27, ("Records"), 5-1.47, ("Guarantee"), and 9-1.21, ("Clerical Errors"). If you submit a claim statement within 30 days of receiving the Engineer's proposed final estimate, the Engineer provides you a semifinal estimate and the Department pays the amount due within 30 days. The semifinal estimate is conclusive as to the amount of work completed and the amount payable except as affected by any claims or as specified in sections 5-1.27, 5-1.47, and 9-1.21."

Your promptness in returning the signed copies, indicating your approval, will expedite payment of the final estimate. Alternatively, a signed qualified approval by reason of a written statement of claims will expedite payment of a semifinal estimate. A statement of claims must include a notarized certificate containing the language required in Section 9-1.17D(2)(c), "Declaration," of the *Standard Specifications*.

If claims are submitted in connection with this contract, you will be expected to comply fully with Section 9-1.17D(2), "Claim Statement," of the *Standard Specifications*. The engineer will base the determination of claims upon the investigation of your statement, in which you are expected to present your position fully as to the contractual basis of the claim; compliance with contract requirements such as Sections 5-1.43, "Potential Claims and Dispute Resolution," subsections A through D; or 9-1.17D, "Final Payment and Claims," of the *Standard Specifications*, if applicable; a breakdown of the total amount claimed; and all other information you consider to be in support of your claim.

As further provided in Section 9-1.17D(1), "General," of the *Standard Specifications*, in case neither approval nor a statement of claims is received, postmarked or hand delivered, before the 31st day, a final estimate in the amount of this proposed final estimate will be issued. Your date of receipt of this proposed final estimate establishes the beginning of the specified 30 days.

Sincerely,

District Construction Office

### Example 3-9.3. Acceptance Statement Form

Subject: Acceptance Statement	
Attachment to transmittal letter	
Dated _____	Contract Identification _____
I have examined the quantities of bid items and amounts indicated as payment for extra work and the deductions on the proposed final estimate dated _____. I agree to accept the total of \$_____ as indicated, as the total amount earned for all work performed on the above contract, except as may be indicated below	
Exceptions (check one)	_____ Contractor
	_____ By
<input type="checkbox"/> None	
<input type="checkbox"/> As indicated per attached letter dated _____	_____ Title
	_____ Date

# Example 3-9.4. Sample of the Proposed Final Estimate

PROGRAM CAS145 PAGE 1  
 DATE 06/13/12 04-888884  
 TIME 10:46 AM ESTIMATE NO. 29  
 BID OPENING 11/10/09 WORK PERFORMED THROUGH 05/21/12  
 R.E. NAME: MAYA, TYKE DATE OF THIS ESTIMATE 06/13/12  
 LOCATION  
 04-SON-128-41.8/44.7

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION  
 PROJECT RECORD - ESTIMATE  
 PROPOSED FINAL ESTIMATE

COASTAL MOUNTAIN CONSTRUCTORS, INC.  
 8884 GOLDENEYE COURT  
 SANTA ROSA, CA 95402  
 IN SONOMA COUNTY ABOUT 9 KM EAST OF  
 PETALUMA FROM ADOBE ROAD TO 0.2 KM  
 WEST OF ARNOLD DRIVE

FED. AID NO. ACHS-P128(42)E ,STP-P128(42)E

ITEM NO.	ITEM DESCRIPTION	UNIT	CONTRACT PRICES	ORIGINAL AUTH. AMT	THIS ESTIMATE		TOTAL ESTIMATE	
					QUANTITY	\$ AMOUNT	QUANTITY	\$ AMOUNT
001	PROGRESS SCHEDULE (CRITICAL PATH METHOD)	LS	2,500.0000	2,500.00		0.900	2,250.00	
002	SMALL BUSINESS UTILIZATION REPORT	EA	250.0000	2,250.00		6.000	1,500.00	
003	TIME-RELATED OVERHEAD	WDAY	410.0000	180,400.00		440.000	180,400.00	
004	TEMPORARY FENCE (TYPE BW)	M	8.2000	30,094.00		3,844.860	31,527.85	
005	TEMPORARY FENCE (TYPE ESA)	M	6.2000	11,718.00		1,986.150	12,314.13	
006	TEMPORARY SHORING	M2	137.0000	104,120.00		44.400	6,082.80	
007	TEMPORARY CREEK DIVERSION SYSTEM (LOCATION 1)	LS	16,000.0000	16,000.00		1.000	16,000.00	
008	TEMPORARY CREEK DIVERSION SYSTEM (LOCATION 2)	LS	18,500.0000	18,500.00		1.000	18,500.00	
009	TEMPORARY CREEK DIVERSION SYSTEM (LOCATION 3)	LS	16,000.0000	16,000.00		1.000	16,000.00	
010	TEMPORARY CREEK DIVERSION SYSTEM (LOCATION 4)	LS	23,000.0000	23,000.00		1.000	23,000.00	
011	TEMPORARY CREEK DIVERSION SYSTEM (LOCATION 5)	LS	16,000.0000	16,000.00		1.000	16,000.00	
012	TEMPORARY CREEK DIVERSION SYSTEM (LOCATION 6)	LS	23,000.0000	23,000.00		1.000	23,000.00	
013	CONSTRUCTION SITE MANAGEMENT	LS	2,500.0000	2,500.00		1.000	2,500.00	
014	PREPARE STORM WATER POLLUTION PREVENTION PLAN	LS	2,500.0000	2,500.00		0.905	2,262.50	
015	TEMPORARY SILT FENCE	M	8.0000	35,040.00		4,507.200	36,057.60	
016	TEMPORARY GRAVEL BAG BERM	M	5.5000	14,080.00		295.000	1,622.50	
017	TEMPORARY CONSTRUCTION ENTRANCE	EA	1,700.0000	10,200.00		15.000	25,500.00	
018	TEMPORARY COVER	M2	3.1000	7,967.00		988.000	3,062.80	
019	TEMPORARY CHECK DAM	M	6.4000	832.00		1,457.000	9,324.80	
020	MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL)	EA	825.0000	4,950.00		9.000	7,425.00	
021	TEMPORARY DRAINAGE INLET PROTECTION	EA	118.0000	7,080.00		70.000	8,260.00	
022	TEMPORARY HYDRAULIC MULCH (BONDED FIBER MATRIX)	M2	0.7500	12,900.00		48,149.850	36,112.39	

### Example 3-9.6. Schedule B – Extra Work and Adjustment of Compensation

PROGRAM CAS145 SCHEDULE OF EXTRA WORK PAGE NO. 1  
 DATE 06/13/12 EST. NO.29  
 TIME 10:46 AM  
 R.E. NAME: MAYA, TYKE 04-888884

CCO REPORT NO. NUMBER	REPORT AMOUNT	TYPE OF WORK PERFORMED	WORK (+) (-)	WORK DATE	BR CONTR WK RPT.NO	COMMENTS	
001 0583	299.24	E.W. @ F.A.	(+)	050312	N 1039.0		
0584	1,040.25			050312	N 1040.0		
0585	2,005.32			051512	N 1045.0		
010 0103	16,640.84	A.C. @ U.P.	(+)	123111	N 100RS0		
035 0003	5,742.24	E.W. @ F.A.	(+)	061411	N 0662.0		
054 0005	21,651.92	E.W. @ F.A.	(+)	121911	N ABL2 0		
058 0003	629.20	E.W. @ F.A.	(+)	050112	N 1041.0		
	48,009.01	TOTAL THIS ESTIMATE					
	2,518,826.34	TOTAL PREVIOUS ESTIMATE					
	2,566,835.35	TOTAL TO DATE					

### Example 3-9.7. Schedule of Extra Work

PROGRAM CAS145 SCHEDULE OF EXTRA WORK PAGE NO. 1  
 DATE 06/13/12 EST. NO.29  
 TIME 10:46 AM  
 R.E. NAME: MAYA, TYKE 04-888884

CCO REPORT NO. NUMBER	REPORT AMOUNT	TYPE OF WORK PERFORMED	WORK (+) (-)	WORK DATE	BR CONTR WK RPT.NO	COMMENTS	
001 0583	299.24	E.W. @ F.A.	(+)	050312	N 1039.0		
0584	1,040.25			050312	N 1040.0		
0585	2,005.32			051512	N 1045.0		
010 0103	16,640.84	A.C. @ U.P.	(+)	123111	N 100RS0		
035 0003	5,742.24	E.W. @ F.A.	(+)	061411	N 0662.0		
054 0005	21,651.92	E.W. @ F.A.	(+)	121911	N ABL2 0		
058 0003	629.20	E.W. @ F.A.	(+)	050112	N 1041.0		
	48,009.01	TOTAL THIS ESTIMATE					
	2,518,826.34	TOTAL PREVIOUS ESTIMATE					
	2,566,835.35	TOTAL TO DATE					

### Example 3-9.8. Schedule of Deductions

PROGRAM CAS145 SCHEDULE OF DEDUCTIONS PAGE NO. 1  
 DATE 06/13/12 EST. NO.29  
 TIME 10:46 AM  
 R.E. NAME: MAYA, TYKE 04-888884

DEDUCTION DESCRIPTION	AMOUNT	EST NO.	THIS ESTIMATE	TOTAL ESTIMATE
ADMINISTRATIVE				
RESTAKING CHARGE REQ 62	-1,065.00	18		
RESTAKING CHARGE REQ 65	-1,065.00	22		
			0.00	-2,130.00
LABOR COMPLIANCE VIOLATION				
MISSING PAYROLLS	-10,000.00	20		
RETURN PAYROLL DEDUCTION	10,000.00	21		
MISSING PAYROLLS	-10,000.00	29		
			-10,000.00	-10,000.00
			-10,000.00	-12,130.00
TOTAL DEDUCTIONS				

## Section 12 Temporary Traffic Control

### 4-1201 General

### 4-1202 Before Work Begins

#### 4-1202A Flagging

#### 4-1202B Temporary Traffic Control Devices

4-1202B (1) Traffic Cones

4-1202B (2) Plastic Traffic Drums

4-1202B (3) Portable Delineators

4-1202B (4) Channelizers

4-1202B (5) Barricades

4-1202B (6) Construction Area Signs

4-1202B (7) Telescoping Flag Trees

4-1202B (8) Type K Temporary Railing

4-1202B (9) Temporary Traffic Screens

4-1202B (10) Temporary Crash Cushion Module

4-1202B (11) Impact Attenuator Vehicles

4-1202B (12) Flashing Arrow Signs

4-1202B (13) Portable Flashing Beacons

4-1202B (14) Portable Changeable Message Signs

4-1202B (15) Portable Signal Systems

4-1202B (16) Temporary Flashing Beacon Systems

4-1202B (17) Automated Work Zone Information Systems

4-1202B (18) Portable Transverse Rumble Strips

4-1202B (19) Portable Radar Speed Feedback Sign Systems

4-1202B (20) Automated Flagger Assistance Devices

4-1202B (21) Temporary Automated End of Queue Warning System

#### 4-1202C Maintaining Traffic

4-1202C (1) Traffic Control Systems

4-1202C (1a) Lane Closure System

4-1202C (2) Temporary Pedestrian Access Routes

4-1202C (3) Bridge Cleaning and Painting Activities

#### 4-1202D Temporary Pavement Delineation

4-1202D (1) Temporary Pavement Markers

### 4-1203 During the Course of Work

#### 4-1203A Flagging

#### 4-1203B Temporary Traffic Control Devices

4-1203B (1) Traffic Cones

4-1203B (2) Plastic Traffic Drums

4-1203B (3) Portable Delineators

4-1203B (4) Channelizers

- 4-1203B (5) Barricades
- 4-1203B (6) Construction Area Signs
- 4-1203B (7) Telescoping Flag Trees
- 4-1203B (8) Type K Temporary Railing
- 4-1203B (9) Temporary Traffic Screens
- 4-1203B (10) Temporary Crash Cushion Module
- 4-1203B (11) Impact Attenuator Vehicles
- 4-1203B (12) Flashing Arrow Signs
- 4-1203B (13) Portable Flashing Beacons
- 4-1203B (14) Portable Changeable Message Signs
- 4-1203B (15) Portable Signal Systems
- 4-1203B (16) Temporary Flashing Beacon Systems
- 4-1203B (17) Automated Work Zone Information Systems
- 4-1203B (18) Portable Transverse Rumble Strips
- 4-1203B (19) Portable Radar Speed Feedback Sign Systems
- 4-1203B (20) Automated Flagger Assistance Devices
- 4-1203B (21) Temporary Automated End of Queue Warning System
- 4-1203C Maintaining Traffic
  - 4-1203C (1) Traffic Control Systems
    - 4-1203C (1a) Closure Schedules
    - 4-1203C (1b) Contingency Plans for Closures
    - 4-1203C (1c) Lane Closure System
    - 4-1203C (1d) Status Updates for Authorized Closures
    - 4-1203C (1e) Field Adjustments
    - 4-1203C (1f) Placement Sequence and the Start of Work
    - 4-1203C (1g) Drive-Through Inspection
    - 4-1203C (1h) Maintenance
    - 4-1203C (1i) Reverse Operations Inside Closures
  - 4-1203C (2) Temporary Pedestrian Access Routes
  - 4-1203C (3) Bridge Cleaning and Painting Activities
- 4-1203D Temporary Pavement Delineation
  - 4-1203D (1) Temporary Pavement Markers
  - 4-1203D (2) Channelizers
  - 4-1203D (3) Temporary Lane Line and Center Delineation
  - 4-1203D (4) Temporary Edge Line Delineation
  - 4-1203D (5) Temporary Traffic Stripe Tape
  - 4-1203D (6) Temporary Traffic Stripe Paint
  - 4-1203D (7) Temporary Pavement Marking Tape
  - 4-1203D (8) Temporary Pavement Marking Paint
- 4-1203E Temporary Pavement Delineation for Seal Coats
- 4-1204 Level of Inspection**
- 4-1205 Quality Control**

## **4-1206 Payment**

4-1206A Flagging

4-1206B Temporary Traffic Control Devices

4-1206B (1) Traffic Cones

4-1206B (2) Plastic Traffic Drums

4-1206B (3) Portable Delineators

4-1206B (4) Channelizers

4-1206B (5) Barricades

4-1206B (6) Construction Area Signs

4-1206B (7) Type K Temporary Railing

4-1206B (8) Temporary Traffic Screens

4-1206B (9) Temporary Crash Cushion Modules

4-1206B (10) Impact Attenuator Vehicles

4-1206B (11) Flashing Arrow Signs

4-1206B (12) Portable Flashing Beacons

4-1206B (13) Portable Changeable Message Signs

4-1206B (14) Portable Signal Systems

4-1206B (15) Temporary Flashing Beacon Systems

4-1206B (16) Automated Work Zone Information Systems

4-1206B (17) Portable Transverse Rumble Strips

4-1206B (18) Portable Radar Speed Feedback Sign Systems

4-1206B (19) Automated Flagger Assistance Devices

4-1206B (20) Temporary Automated End of Queue Warning System

4-1206C Traffic Control Systems



### Section 12 Temporary Traffic Control

#### 4-1201 General

This section provides guidelines for inspecting temporary traffic control devices in construction areas. For traffic control requirements, refer to Section 12, “Temporary Traffic Control,” of the *Standard Specifications* and to the *California Manual on Uniform Traffic Control Devices (California MUTCD)*. If a discrepancy occurs between the contract plans and specifications and the *California MUTCD*, the plans and specifications govern. Also refer to Section 2-2, “Traffic,” of this manual, which provides guidance and a general overview of providing a safe and convenient passage of public traffic through the construction area and is complementary to this section.

Temporary traffic control devices are divided into categories:

- Category 1 devices include traffic cones, plastic traffic drums, portable delineators, and channelizers.
- Category 2 devices include barricades and portable sign supports.
- Category 3 devices include crash cushions, impact attenuator vehicles, temporary railing, temporary barrier, and end treatments for temporary railings and barriers.

The condition of temporary traffic control devices should comply with the most current edition of the American Traffic Safety Services Association (ATSSA) publication *Quality Guidelines for Temporary Traffic Control Devices and Features*. Contact Construction at headquarters for a current hard copy.

#### 4-1202 Before Work Begins

Take the following steps before work begins:

- Determine what construction area signs should be placed before work begins for the entire project and before each stage of the project.
- Determine the methods and equipment the contractor will use for closing lanes, ramps, and roadways, and for flagging and controlling one-way traffic.

#### 4-1202A Flagging

Discuss any flagging operation with the contractor before the operation begins. Confirm flaggers are wearing American National Standards Institute (ANSI)-compliant garments in accordance with the Construction Safety Orders of the California Department of Industrial Relations, or the prime contractor’s or subcontractor’s Injury and Illness Prevention Program or *Code of Safe Practices*, whichever is more stringent. Review with the contractor how flaggers will communicate with each other, with pilot cars, and with workers inside the controlled

area. The contractor should develop a plan for handling emergencies and emergency vehicles in the control zone.

#### 4-1202B Temporary Traffic Control Devices

Verify that temporary traffic control devices comply with the contract requirements.

The resident engineer may accept use of contractor-proposed devices on the Authorized Material List for Highway Safety Features.

Determine if the temporary traffic control devices to be used are on the Authorized Material List for Signing and Delineation Materials and if they require a certificate of compliance.

Obtain self-certification for crashworthiness of Category 1 temporary traffic control devices.

Request a list of Category 2 temporary traffic control devices to be used on the project and copies of their Federal Highway Administration (FHWA) acceptance letters.

Verify that Category 3 temporary traffic control devices are on the Authorized Material List for Highway Safety Features.

#### *4-1202B (1) Traffic Cones*

If the contractor plans to use cones for night work, determine the type of cone proposed. All cones should use the same type and brand of retroreflective sheeting.

#### *4-1202B (2) Plastic Traffic Drums*

All drums should use the same type and brand of retroreflective sheeting. Verify the base is shaped to prevent rolling if struck by vehicles.

#### *4-1202B (3) Portable Delineators*

Obtain a sample of the type of portable delineator to be used on the project. Verify the base is shaped to prevent delineators from rolling if struck by vehicles.

#### *4-1202B (4) Channelizers*

Verify the channelizer's post is predominantly orange.

#### *4-1202B (5) Barricades*

Verify barricade construction complies with Section 12-3.10, "Barricades," of the *Standard Specifications* and sheet A73C of the *Standard Plans*.

Review the submittal for any Type 3 barricade to be used as a sign support for crashworthiness to the Transportation Research Board's *NCHRP Report 350* criteria or the American Association of State Highway and Transportation Officials (AASHTO's) *Manual for Assessing Safety Hardware (MASH)* as a single unit with a sign panel of the size and type used.

#### *4-1202B (6) Construction Area Signs*

At the preconstruction conference, remind the contractor to maintain an inventory of commonly required items at the job site and arrange for sign panels, posts, and mounting hardware or portable sign mounts to be furnished on short notice.

Verify construction area signs are from a commercial sign manufacturer and have a Type 3 or higher grade retroreflective sheeting.

Review Section 12-3.11, "Construction Area Signs," of the *Standard Specifications* for additional requirements.

#### *4-1202B (7) Telescoping Flag Trees*

Verify telescoping flag trees are from a commercial-quality material manufacturer.

#### *4-1202B (8) Type K Temporary Railing*

Request a certificate of compliance for Type K Temporary Railing.

Type K temporary railing placed within 10 feet of a traffic lane requires a reflector on each rail unit.

Review sheet T3B of the *Standard Plans* for staking requirements.

#### *4-1202B (9) Temporary Traffic Screens*

Review the specification requirements and sheet T4 of the *Standard Plans*.

#### *4-1202B (10) Temporary Crash Cushion Module*

Review the project plans and sheets T1A, T1B, and T2 of the *Standard Plans*. Frequently, the plans for stage construction, detour, or traffic handling will require arrays of temporary crash cushion modules. Changes to any of these plans may alter the need for temporary crash cushion modules.

If the contractor requests usage of alternative temporary crash cushion modules, verify that their proposed modules are on the Authorized Material List for Highway Safety Features.

Verify that temporary crash cushion modules used were manufactured after March 31, 1997.

Inspect crash cushion modules to confirm they comply with the specification and manufacturer requirements.

Temporary crash cushions may be installed on wooden pallets as an option. Verify that pallet height is 4½ inches or less. Pallets that exceed this height raise the sand in the crash cushions above an acceptable level. Do not allow the use of commercial pallets that exceed the maximum height.

#### *4-1202B (11) Impact Attenuator Vehicles*

Verify that the impact attenuator vehicle complies with all specification requirements.

Check that the attenuator meets the test level requirement for the posted speed limit.

Verify that the weight of the attenuator and the weight of the support truck are within the specified limits as shown on the Authorized Material List for Highway Safety Features.

Verify the contractor conducts a meeting with all involved parties to discuss the operation of the impact attenuator vehicle.

#### *4-1202B (12) Flashing Arrow Signs*

Verify that Type 1 and Type 2 flashing arrow signs comply with the specification requirements, including number of panel lights, display modes, power source, and devices to plumb and level the trailer.

#### *4-1202B (13) Portable Flashing Beacons*

Verify that portable flashing beacons comply with the requirements in Section 12-3.31, "Portable Flashing Beacons," of the *Standard Specifications*.

#### *4-1202B (14) Portable Changeable Message Signs*

Request a certificate of compliance for each portable changeable message sign.

Obtain a contact cell phone number for the contractor before starting activities that require a portable changeable message sign and arrange for an inspection with the contractor before the first deployment.

Verify that the sign complies with the requirements of Section 12-3.32, "Portable Changeable Message Signs," of the *Standard Specifications*, including number of lines and characters in a line, display modes, power source, and devices to plumb and level the trailer.

#### *4-1202B (15) Portable Signal Systems*

Confirm portable signal systems comply with the requirements in Section 12-3.33, "Portable Signal Systems," of the *Standard Specifications*.

Verify that the line of sight visibility in the field meets sight distance standards. If sight distance is not adequate, contact the district traffic engineer for suggestions or recommendations.

When portable signal systems are used in forests or grasslands, confirm adherence to all fire safety requirements. Checking fire safety requirements may require coordination with personnel from the U.S. Forest Service, Bureau of Land Management, or California Department of Forestry and Fire Protection.

#### *4-1202B (16) Temporary Flashing Beacon Systems*

Confirm temporary flashing beacon systems comply with the requirements in Section 12-3.34, "Temporary Flashing Beacon Systems," of the *Standard Specifications*.

#### *4-1202B (17) Automated Work Zone Information Systems*

Verify that automated work zone information systems comply with the general system functionality, motorist information messages, system communications, traffic data acquisition, and user interface specification requirements.

Obtain the name and contact information for the assigned onsite system coordinator.

Request the user interface software and provide it to the transportation management center for installation.

#### *4-1202B (18) Portable Transverse Rumble Strips*

Obtain a copy of the manufacturer's instructions for the portable transverse rumble strips.

Verify portable transverse rumble strips comply with the requirements in Section 12-3.36 "Portable Transverse Rumble Strips" of the project special provisions, if applicable.

#### *4-1202B (19) Portable Radar Speed Feedback Sign Systems*

Verify portable radar speed feedback sign systems comply with the requirements in Section 12-3.37 "Portable Radar Speed Feedback Sign Systems" of the *Standard Specifications*.

Obtain required submittals for the systems in accordance with Section 87-14 "Radar Speed Feedback Sign Systems," of the *Standard Specifications*.

#### *4-1202B (20) Automated Flagger Assistance Devices*

Verify that automated flagger assistance devices (AFAD) comply with the requirements in Section 12-3.38 "Automated Flagger Assistance Devices" of the *Standard Specifications*.

Obtain a copy of the manufacturer's operating instructions.

#### *4-1202B (201) Temporary Automated End of Queue Warning System*

Verify that temporary automated end of queue warning systems comply with the requirements in Section 12-3.39 "Temporary Automated End of Queue Warning System," of the *Standard Special Provisions*.

#### 4-1202C Maintaining Traffic

Before work begins, carefully review the plans, specifications, closure charts, and sheets T9 through T17 of the *Standard Plans*. It is important to plan which personnel, signage, and equipment will be required to implement the traffic control system.

Verify that the contractor has all components on hand before setting up any traffic control system and that all components meet the specifications requirements.

Verify that the contractor notifies and cooperates with local authorities wherever the local authorities regulate traffic.

When multiple projects in one area occur at the same time, require contractors to coordinate their efforts by resolving schedule conflicts before submitting their schedules for closures, and verify there are no closure conflicts before implementation. Review these requirements with the contractors before work starts.

#### 4-1202C (1) *Traffic Control Systems*

Verify the contractor removes or covers any construction area signs that duplicate or contradict the signs for a project within 250 feet of another project. Refer to Section 5-1.20 “Coordination with Other Entities,” of the *Standard Specifications*, if applicable, and the special provisions.

- Inspect the signs and equipment the contractor proposes to use, at the contractor’s or subcontractor’s yard if possible, before their first use.
- Verify that all the necessary signs, cones, drums, and other equipment are on hand before the system is set up for the first time. If the proposed materials have been previously used, check them for acceptability listed in the ATSSA publication *Quality Guidelines for Temporary Traffic Control Devices and Features*, which may be obtained from Construction headquarters. Require the contractor to replace any unacceptable equipment. It is easier to correct deficiencies before the system is installed.
- If the contractor is to place the traffic control system repeatedly in the same place, the contractor can request to mark on the shoulder the locations of advance warning signs, cones, and drums. This will speed the placing of closures and allow for a more consistent taper alignment.

#### 4-1202C (1a) Lane Closure System

Contractors are required to request closures using the Caltrans Lane Closure System (LCS) and status closures using the Lane Closure System Mobile web page.

To confirm that contractors can access LCS and LCS Mobile, do the following before work begins:

- Remind the contractor of the requirement to complete the LCS web-based training.
- Provide the contractor with the internet link to access the LCS web-based training.

<https://dot.ca.gov/programs/construction/training>

- Obtain the information of trained contractor representatives, including whether they will be requesting or statusing closures, or both.
- Set up “Requestor” or “Stater” LCS accounts for the trained contractor’s employees accordingly and provide them with their login information within 5 days after they have completed the training. The LCS will send the contractor’s employees a unique password by email after the accounts are created. Create a “Requestor” LCS account and set the option in the account to status closures for those who will request and status closures.

- Contact the district traffic manager for assistance with either of these tasks.

#### 4-1202C (2) *Temporary Pedestrian Access Routes*

Review Sections 12-4.04, “Temporary Pedestrian Access Routes,” and 16-2.02, “Temporary Pedestrian Facilities,” of the *Standard Specifications* for the temporary pedestrian facilities requirements.

If an existing pedestrian route will be affected by the work activities, verify the project includes Bid Item No. 124000 and that a designed temporary pedestrian access route (TPAR) is part of the contract plans or that the TPAR *Standard Plans* are appropriate for the pedestrian route affected by the work activities. If the bid item is not included in the project, process a change order to provide a TPAR.

During the preconstruction conference, discuss:

- TPAR requirements described in the specifications.
- The contractor’s responsibility to provide written notice 5 days before closing an existing pedestrian route.
- The design and construction at the contractor’s expense, when the contractor’s means and methods require the closure of an existing pedestrian route. Caltrans does not pay for providing the TPAR when the pedestrian route closure is the result of contractor’s means and methods. The contractor must submit a work plan and obtain authorization to proceed before starting work.
- The contractor’s responsibility to submit a Form CEM-2311, “Temporary Pedestrian Access Route Contractor Compliance Report,” within 2 business days after construction of a temporary pedestrian access route, and a Form CEM-2312, “Temporary Pedestrian Access Route Contractor Weekly Report,” within 2 business days of completing a weekly inspection. The contractor compliance report forms are available at:

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

Review the contractor’s work plan for compliance with the requirements in Section 12-4.04, “Temporary Pedestrian Access Routes,” of the *Standard Specifications*. Depending on the project conditions, the contractor may use the RSP T30 to T34 of the Revised *Standard Plans* as a baseline for designing and constructing a TPAR.

#### 4-1202C (3) *Bridge Cleaning and Painting Activities*

Review Section 12-4.05, “Bridge Cleaning and Painting Activities,” of the *Standard Specifications*.

Verify signs to be used comply with the specification requirements.

#### 4-1202D Temporary Pavement Delineation

Review Sections 12-6, “Temporary Pavement Delineation” and 84-2, “Traffic Stripes and Pavement Markings,” of the *Standard Specifications* for temporary pavement delineation requirements.

#### 4-1202D (1) *Temporary Pavement Markers*

Verify temporary pavement markers comply with Section 81-3, "Pavement Markers," of the *Standard Specifications*, except for the waiting period before placing pavement markers on new asphalt concrete.

Verify signs to be used comply with the specification requirements.

Refer to Section 12-6, "Temporary Pavement Delineation" and Section 12-7 "Temporary Pavement Delineation for Seal Coats," of the *Standard Specifications* for temporary signing requirements for no-passing zones.

#### **4-1203      During the Course of Work**

Use the most current edition of the American Traffic Safety Services Association (ATSSA) publication *Quality Guidelines for Temporary Traffic Control Devices and Features* to confirm acceptability of traffic control devices. Request the guidelines from Construction headquarters.

Inspect Category 2 temporary traffic control devices to confirm they are labeled with the FHWA acceptance letter code and the name of the manufacturer.

Verify Category 3 temporary traffic control devices are the type shown on the Authorized Material List for Highway Safety Features.

Verify that traffic handling devices meet the visibility and legibility requirements.

Verify the contractor maintains all traffic control devices in good working order throughout the project's life. Verify that all traffic control devices are correctly placed and functioning properly. If temporary traffic control devices are damaged, displaced, or stop operating or functioning as described from any cause during the progress of the work, have the contractor repair, repaint, or replace the components and restore them to their original positions.

Do not allow the contractor to mix different types of temporary traffic control devices on the same alignment. Types include plastic traffic drums, portable delineators, channelizers, tubular markers, traffic cones, and Type 1 and Type 2 barricades.

Verify the contractor removes traffic-handling equipment and devices from the job site when they are no longer needed for controlling traffic.

#### 4-1203A Flagging

Observe the flagging operation to verify that flaggers are using the correct procedures for directing motorists in accordance with California Code of Regulations, Title 8, Section 1599, (8 CCR 1599) "Flaggers," and Chapter 6E, "Flagger Control," of the *California MUTCD*. Also, verify that flagging stations are laid out correctly, are visible to approaching traffic, are illuminated during nighttime, and have correct advance warning signs.

#### 4-1203B Temporary Traffic Control Devices

Inspect all traffic control devices to verify conformity with the specifications. If you authorize the devices for use, record the authorization in the daily reports.

#### 4-1203B (1) *Traffic Cones*

Require the contractor to anchor bases of traffic cones that do not have enough size and weight to keep the cones in an upright position.

Prohibit the use of traffic cones that have been damaged or coated with asphalt or other substances that prevent the cones from functioning as intended.

#### 4-1203B (2) *Plastic Traffic Drums*

Check the contractor's layout work. Allow only one type of plastic traffic drum on the project.

Require ballast for drums according to manufacturer specifications. Do not allow the use of sandbags.

Require proper maintenance of plastic traffic drums.

#### 4-1203B (3) *Portable Delineators*

Allow only one type of portable delineator on the project.

Verify that portable delineators meet the dimension requirements.

Confirm that portable delineators remain upright when unattended, otherwise require the contractor to place a ballast on the delineator's base.

#### 4-1203B (4) *Channelizers*

Check the contractor's layout work.

Verify the pavement is clean and dry and the contractor places the channelizers during conditions that meet the required temperatures. Review Section 81-3, "Pavement Markers," of the *Standard Specifications*. Do not allow the contractor to use the double-stick butyl pads provided by the channelizer manufacturer; these pads do not meet Caltrans requirements.

Ask the contractor to replace channelizers that are displaced or fail to remain in an upright position. The contractor is responsible for the replacement expenses.

#### 4-1203B (5) *Barricades*

Check Type 3 barricades, used as sign supports, for label with FHWA acceptance letter number showing they have been crash tested as a single unit with a sign panel of the size and type used.

According to the Authorized Material List for Signing and Delineation Materials, 0.5-inch Intelplast "Intelcel" or similar material is authorized, and according to FHWA Work Zone Letter 85 from the FHWA's Safety Program website, this type of sign substrate is authorized for use on Type 3 barricades.

Allow the contractor to use only bags of dry sand when weighting is necessary. Verify weights are placed on the feet or lower parts of the frame or stays. Do not allow the contractor to place objects any higher, or use hard objects such as concrete or rocks for weights.

Confirm the contractor maintains barricades in good condition and keeps the reflective surfaces clean.

#### *4-1203B (6) Construction Area Signs*

Remind the contractor to notify the regional notification centers before digging for the installation of signposts. Hand digging is required unless the location is free of underground utilities.

Allow only the use of sandbags when it is necessary to weigh down sign standards to prevent the wind from overturning them. Do not permit rocks, concrete, or other hard objects to be used for this purpose.

Check construction area signs often during the course of the work. Verify visibility and legibility requirements. Require the contractor to keep signs clean and clearly visible, and repair them if damaged.

Verify that construction area signs are placed outside the traveled way, do not block or protrude more than 4 inches into bicycle and pedestrian routes, and comply with Americans with Disabilities Act requirements.

Do not allow the use of nonretroreflective portable signs during hours of darkness.

Check sign posts to confirm compliance with breakaway features.

Verify that the contractor installs, relocates, covers, and removes signs as required. Construction signs should be covered or removed whenever they no longer serve a purpose. Verify that covers placed on sign panels completely block out any messages so that the messages cannot be seen day or night. The covers should also present an acceptable appearance.

#### *4-1203B (7) Telescoping Flag Trees*

Verify telescoping flag trees maintain an upright position when being used.

#### *4-1203B (8) Type K Temporary Railing*

Check the exposed surfaces of Type K temporary railing to verify they have received a fresh coat of white paint before initial placement on the job. Order repainting when needed.

Verify all new and used temporary railing elements comply with requirements for end connection and surface finish. Verify Type K temporary railing is placed on a firm, stable foundation uniformly graded throughout the entire length of the railing.

Check railing alignment for any substantial offset to each other.

Verify staking of railing according to sheet T3B of the *Standard Plans*.

Verify the contractor offsets the approach end of Type K temporary railing by 15 feet minimum from the edge of an open traffic lane, according to Section 7-1.04 "Public Safety," of the *Standard Specifications*.

Verify the contractor protects Type K temporary railing blunt- ends within 15 feet of the edge of the traveled way with temporary crash cushions. If the blunt end is within

8 feet, appropriate approved crash cushion protection other than sand filled modules should be provided.

Check the installation and maintenance of Type P marker panel according to sheet A81C of the *Standard Plans*.

Confirm the contractor installs a reflector on each rail unit placed within 10 feet of a traffic lane.

Verify all threaded rods or dowels are removed and the area is restored to its previous condition or constructed to its planned condition after removal of Type K temporary railing.

#### *4-1203B (9) Temporary Traffic Screens*

After installation, review the screen placement, especially near entrance and exit ramps. If the screen blocks motorist visibility, order its removal and consult with the district traffic engineer concerning alternatives.

Confirm supporting steel pipes are placed on the traffic side of the screen so that if a panel becomes dislodged, the plywood will fall away from traffic.

The specifications require temporary traffic screen to have 3-foot-long openings spaced at 200-foot intervals. The purpose of the gaps is to allow drivers and passengers of vehicles to get behind the barrier in case of a disabled vehicle. If the opening has a drop off behind it that might present a hazard to the public, document in the resident engineer's daily report an exception to the *Standard Plans* note and have the contractor close the gap for public safety purposes.

#### *4-1203B (10) Temporary Crash Cushion Module*

Verify that one type of crash cushion module is used for a single grouping or array.

Verify the crash cushion array is in place before opening traffic lanes adjacent to the protected obstacle.

Verify that crash cushion module arrays are installed according to the manufacturer's instructions. Check that all crash cushion modules are filled with the proper weight of sand. Check pallet heights when used.

Verify a minimum clearance of 8 feet between the array and the nearest traffic lane. Contact the district traffic engineer for recommendations if the clearance to the traffic lane cannot be obtained.

Verify the contractor installs Type P or Type R markers when required.

#### *4-1203B (11) Impact Attenuator Vehicles*

Verify the contractor uses an impact attenuator vehicle as a shadow vehicle in moving closures and during placement and removal of components in stationary closures. After placing components of stationary closures, the contractor may place the impact attenuator vehicle in advance of the work area to protect workers and traffic.

Verify there is enough shoulder width before allowing the use of an impact attenuator vehicle for placement and removal of components on two-lane, two-way highways.

Do not allow the use of a damaged impact attenuator vehicle.

#### *4-1203B (12) Flashing Arrow Signs*

Verify the proper types of flashing arrow signs are used.

- Verify the flashing arrow sign trailer can be leveled and plumbed.
- Verify the lights are dimmed at night and set on bright during daylight hours.
- Verify the lights are not glaring into approaching traffic, especially truck traffic.
- Confirm compliance with the minimum legibility distances.
- Verify the signs are properly aimed at approaching traffic. Pay special attention to the aiming of the sign whenever solar-powered signs are used. The special bulbs used with solar signs have much narrower beams than conventional bulbs and, therefore, require greater care while being aimed.

#### *4-1203B (13) Portable Flashing Beacons*

Confirm the contractor places portable flashing beacons according to the plans and removes them from the traveled way at the end of each night's work.

Verify portable flashing beacons operate according to the specifications.

#### *4-1203B (14) Portable Changeable Message Signs*

PCMS are required only during times, places, or activities stated in the plans and specifications and are not required when the traffic control system is nonoperational or for discretionary use. PCMS can be used in place of an advanced flagger to remove workers from the roadway to improve worker safety from traffic.

Verify that the trailer bearing the sign can be leveled and that the sign operates within the required minimum and maximum heights. Verify the contractor delineates a PCMS with a taper consisting of nine traffic cones.

Confirm the sign is placed where it is most visible to approaching motorists. Check that the sign complies with the visibility and legibility requirements. Pay special attention to locations where vertical or horizontal curvature restricts the sight distance. Drivers should be able to read the entire message at least two times before passing the sign.

Confirm the signs display only pre-approved messages and that the messages conform to the *Changeable Message Sign Guidelines*, and district and Caltrans policy. The *Changeable Message Sign Guidelines* developed by the Division of Traffic Operations provide a listing of approved abbreviations for PCMS. Prohibit messages that do not convey real-time information to the motorist. Examples of unacceptable messages include "Drive carefully," "Have a Nice Day," and "Thank you."

PCMS are working equipment when actively displaying a message, otherwise they are nonoperating. Ask the contractor to remove nonoperating portable message signs from the job site away from traffic or protect it in accordance with Section 7-1.04 "Public Safety," of the *Standard Specifications*. Consult with the district traffic engineer for other acceptable means to protect the sign instead of the Type K temporary railing required by the specifications. In many cases, placing a PCMS behind existing guard railing will protect it.

#### *4-1203B (15) Portable Signal Systems*

Verify the planned signal system includes a backup power source and automatic transfer switches.

Do not allow the use of power from private parties to power the temporary signal system.

If a system shutdown occurs, planned or unplanned, the contractor should provide flaggers to control traffic until the traffic signals are functioning correctly.

Periodically review the portable signal system to document its maintenance. Record inspection dates and conditions observed in the project records.

#### *4-1203B (16) Temporary Flashing Beacon Systems*

Verify the temporary flashing beacon system includes a backup power source and automatic transfer switches.

Do not allow the use of power from private parties to power the temporary flashing beacon system.

Verify temporary flashing beacon systems are relocated as work progresses according to the specifications.

#### *4-1203B (17) Automated Work Zone Information Systems*

Provide the contractor with the message content and the thresholds used for triggering when the messages will be displayed. Consult with the district traffic manager for assistance with these items.

When necessary, ask the contractor to adjust placement or message content of signs based on changing project or traffic conditions.

#### *4-1203B (18) Portable Transverse Rumble Strips*

Make sure that portable transverse rumble strips are placed before closing the lane to traffic.

Verify that the color of the portable transverse rumble strips is black or orange and arranged in accordance with Standard Plan T13.

Check that portable transverse rumble strips are not placed on sharp horizontal or vertical curves or through pedestrian routes.

If the portable transverse rumble strips become out of alignment or skewed by more than 6 inches, have the contractor readjust them to the original location.

#### *4-1203B (19) Portable Radar Speed Feedback Sign Systems*

Make sure that the contractor places the portable radar speed feedback sign systems as shown on Standard Plans T18, T19, T20, and T21 and as far from the traveled way as practical, where it is visible and legible to approaching traffic, taking into account any vertical or horizontal roadway curvatures.

Verify that additional speed limit signs indicating the reduced speed limit are placed within the construction work zone as specified.

For continuous construction work zone speed limit reduction, verify that advisory warning signs are posted to alert motorists of the roadway condition as specified and as shown on the standard plans.

#### *4-1203B (20) Automated Flagger Assistance Devices*

Automated flagger assistance devices (AFAD) can be used in place of flagger to remove workers from the roadway to improve worker safety from traffic.

Confirm that AFAD are placed in accordance with the plans and where clearly visible to the AFAD operator and to approaching traffic.

When AFAD are in use, allow the contractor to use portable vehicle transverse rumble strips, but do not allow the use of a 48-inch-by-48-inch C9A(CA) sign or gate cones.

When an AFAD becomes inoperable, notify the contractor to immediately replace it with an identical device, use a flagger with the appropriate-size advance warning sign and gate cones as shown in Standard Plan T13 or stop all construction activities that require the device to be in operation.

#### *4-1203B (21) Temporary Automated End of Queue Warning System*

Verify that the contractor provides a Type 1 or Type 2 for each closure as shown on Standard Plan T26 and T27, respectively.

Make sure the temporary automated end of queue warning system is in operation only during work, unless special provisions require one for 24 hours a day, 7 days a week for certain construction activities.

Obtain a weekly temporary automated end of queue warning system operations report.

### 4-1203C Maintaining Traffic

#### *4-1203C (1) Traffic Control Systems*

Do not allow the contractor to close two adjacent ramps in the same direction of travel unless necessary because of the operation or project conditions. Require the

contractor to set up an off-the-highway detour before closing all ramps in both directions of travel at the same interchange.

Verify the contractor follows the notification and signing requirements before setting up any traffic control systems.

Remind the contractor of Americans with Disabilities Act requirements if the traffic control system will affect pedestrian traffic and a temporary pedestrian access route is needed.

#### 4-1203C (1a) Closure Schedules

Confirm the contractor submits a schedule of planned closures in advance as required by Section 12-4.02A(3), "Submittals," of the *Standard Specifications*. Closures that will reduce horizontal or vertical clearances require even more notification. Inform the Transportation Permits Unit 15 days in advance of the closure. This notification allows Caltrans to coordinate work within the highway corridor.

Confirm that the contractor's closure requests comply with the closure charts. Review the requests to avoid oversights and overbooking.

#### 4-1203C (1b) Contingency Plans for Closures

If the contractor fails to reopen the highway according to the closure charts, suspend work and request a detailed written construction contingency plan demonstrating that the highway will be opened as soon as possible. Refer to Section 2-214D, "Construction Contingency Plan," of this manual.

Do not permit any closures until the contractor submits this plan and it is authorized in accordance with the specifications.

When an operation is terminated before the time the specifications allow because of circumstances beyond the contractor's control, consider granting time, compensation, or both, within the terms of the contract. If the operation is terminated before completion of the planned work because of circumstances within the contractor's control or because of equipment breakdown, do not allow compensation and charge a working day as appropriate.

#### 4-1203C (1c) Lane Closure System

- Confirm the contractor's employee uses the assigned user identification to submit the closure requests in the LCS. The closure requests are stored with a "SAVED" status.
- Review the closure requests for compliance with the closure requirements charts and other contract requirements. If you accept a closure request, the status will change to "PENDING." If you reject a closure request, LCS will send the contractor an email asking for a correction and resubmission.

- Verify the district traffic manager reviews a closure request for conflicts before approving it. The status in LCS will change to “APPROVED.” The LCS will notify the contractor by email of the approval or rejection.
- Confirm that the contractor cancels scheduled closures that are not needed at least 2 days in advance, using the LCS. The LCS will generate email notifications to the resident engineer and the district traffic manager when the contractor cancels a closure.

#### 4-1203C (1d) Status Updates for Authorized Closures

During the course of work, monitor the contractor’s activities to verify closures are statused in LCS as follows:

- Stationary closures on a traffic lane are 10-97 before placing the first cone on the traffic lane, and 10-98 after removing all the cones from the traffic lane.
- Stationary closures on the shoulder are 10-97 before placing the first cone after the last advance warning sign, and 10-98 after removing the last cone before the advance warning signs.
- Moving closures are 10-97 before the actual start time of the closure, and 10-98 after the actual end time of the closure.
- Closures not needed on the authorized date are 10-22 within 2 hours after the authorized start time.

The LCS will notify the resident engineers and designated inspectors by email when the contractor changes the status of a closure.

If a contractor is unable to access the LCS Mobile web page, obtain the closure status from the contractor and notify the transportation management center.

Keep the project’s completion dates current in the LCS. The contractor will not be able to access projects in LCS after the completion date.

#### 4-1203C (1e) Field Adjustments

Field adjustments to the traffic handling plans are frequent occurrences.

Adjustments should be made to create adequate sight distance, to avoid locations that require drivers to make multiple decisions, to accommodate expected queues, and to coordinate activities at multiple locations. The following are typical situations in which field adjustments are necessary:

- T Series Standard Plans—Show minimum acceptable standards for traffic control. Increasing taper lengths, adding signs, and increasing sign spacing to allow for traffic queuing are all acceptable measures as long as the *Standard Plans* minimum requirements are met.
- Signs—Review sign line of sight visibility and verify it complies with Section 12-3.11, “Construction Area Signs,” of the *Standard Specifications*. Signs should not be placed at the apex of horizontal curves, crests of vertical curves, or where trees or bushes hinder visibility of the sign.

- Vertical and horizontal curves—Verify tapers are visible for their entire length to approaching traffic. Do not hide the taper of a traffic control system behind a vertical or horizontal curve. Extend the straight section, known as the tangent portion of the closure, to better position the taper. (Under ideal conditions, all advance warning signs and the taper would be in a tangent with the taper placed on a slight upgrade for improved visibility.)
- Ramps and connectors—Managing ramps and connectors within a closure requires additional consideration. Extend exit ramp tapers back through the closure as an extension of the ramp’s shoulder line. Avoid sharply angled tapers. Extend entrance ramps through the closed lane by projecting the left shoulder line.
- Traffic queues—Contain traffic queues completely within the advance warning signs of any closure. Containment may require modestly increasing the spacing between signs or require the placing of additional signs. Some districts have adopted a practice of providing motorists additional warning by displaying information a mile or more in advance of the closure using portable or fixed changeable message signs. In metropolitan areas, this type of warning may be feasible with cooperation of the transportation management center. Refer to Section 12-4.02C(10), “End of Queue Monitoring and Warning With Truck Mounted Changeable Message Sign,” of the project special provisions for monitoring traffic end of queue and warning approaching traffic.
- Multiple closures and inter-project coordination—Avoid multiple closures with overlapping sign patterns. Connect closures by extending the tangents. Confirm that the contractors are coordinating placement and pick up of the closure so that the traffic control system is maintained in accordance with the *Standard Plans* at all times.
- Length of closure—Avoid long closures with no evidence of activity. Consider placing supplemental tapers within an existing closure. When the work has safely progressed beyond the supplemental taper, remove the upstream taper and tangent. Confirm that advance warning signs for the new taper are located correctly.

If long closures are unavoidable, protect the active work area by placing barricades or drums across the closed lanes, upstream of the work area. Also, when possible, use barrier vehicles or an impact attenuator vehicle between the approaching motorist and workers on foot.

#### 4-1203C (1f) Placement Sequence and the Start of Work

Verify the contractor completely installs the traffic control system before commencing work. An impact attenuator vehicle must be used for the placement and removal of temporary traffic control devices when required by the contract. The following are some possible installation procedures that may be used by the contractor, depending on the situation in which the system will be used:

- Systems affecting traffic only in one direction—Start with the first device that the drivers will see as they enter the work zone (usually a W20-1 “Road Work Ahead” sign). Additional devices are placed in sequence, moving in the direction of the traffic flow. Move the workers and equipment onto the closed lanes only after all system components are in place.
- Systems affecting traffic in both directions—Install the first sign drivers will see traveling in the opposing direction. Then install in sequence all remaining signs and devices in the opposing direction of travel. Next install the first sign drivers will see in approaching the work area from the affected direction. Place all remaining signs and devices in sequence through the work area. If flaggers are to be used, have flaggers take their stations; then move workers and equipment onto the road.
- Removal of the traffic control system—Remove all workers and equipment from the roadway. Then remove the devices and signs in the reverse order of placement. Restore all signs and signals to normal operation.

#### 4-1203C (1g) Drive-Through Inspection

After installation and when the inspector is available, make a drive-through inspection of the system. During the inspection, drive through the system as though you had no knowledge of the work zone. Confirm the intended vehicle path is clearly visible. Remember that the motorist has no knowledge of the traffic control plan and is entirely dependent on the system for warning and guidance. Document this inspection in the daily report; indicate weather, traffic conditions, and time of inspection.

#### 4-1203C (1h) Maintenance

Verify contractors are assigning personnel and maintaining closures in accordance with the T Series *Standard Plans*. Maintaining such closures is a full-time assignment, and the assigned worker should have no other duty. Ideally, the assistant resident engineer should be able to communicate directly with the contractor’s maintenance person by radio or cell phone. The maintenance person should have spare cones, signs, and barricades available to replace or restore system elements displaced or damaged by traffic.

#### 4-1203C (1i) Reverse Operations Inside Closures

Workers may operate vehicles opposite the flow of traffic inside a closed lane only with the prior authorization of the resident engineer. Certain equipment, such as dike placement machines, can only operate off one side of the equipment and may need to be operated against live traffic. Similarly, certain striping operations require the operator to operate against live traffic because of clearances.

The following practices are recommended if opposing operations are undertaken:

- During daylight operations, the vehicles facing oncoming traffic should have their headlights and their flashing amber lights turned on at all times.

- During night operations, the vehicles should have their headlights turned off and their hazard lights and flashing amber lights turned on.
- At no time should a U-turn be permitted in traffic.

#### *4-1203C (2) Temporary Pedestrian Access Routes*

- Confirm the contractor provides a temporary pedestrian access route (TPAR) nearby, off the traveled way, when the construction activities require the closure of an existing pedestrian route.
- If closure of an existing pedestrian route is required because of the contractor's means and methods, remind the contractor of their responsibility to design and construct a TPAR at their expense, and obtain authorization to proceed with the work activities. Do not pay the contractor for providing the TPAR.
- Verify TPARs are constructed in compliance with the requirements in Section 12-4.04, "Temporary Pedestrian Access Routes," of the *Standard Specifications* before allowing use by pedestrians. Use Form CEM-2301, "Temporary Pedestrian Access Route Compliance Inspection Report," to document initial construction compliance of TPARs.
- Obtain from the contractor the completed Form CEM-2311, "Temporary Pedestrian Access Route Contractor Compliance Report," within 2 business days after construction of a temporary pedestrian access route.
- Verify the contractor provides overhead covering, overhead lighting, or both when required.
- Inspect TPARs weekly to verify that they are clean and unobstructed and comply with the Americans with Disabilities Act and the work plan required by the specifications. Use Form CEM-2302, "Temporary Pedestrian Access Route Weekly Inspection Report," to document that TPARs are maintained in compliance during the course of work.
- Obtain from the contractor, the completed Form CEM-2312, "Temporary Pedestrian Access Route Contractor Weekly Report," within 2 business days of completing a weekly inspection.
- Form CEM-2303, "Temporary Pedestrian Access Route Sidewalk Detour Inspection Report," may be used by the engineer and the contractor to report weekly inspections if the temporary pedestrian access route is provided using an existing pedestrian route.
- File completed ADA compliance reports in Category 23, "Temporary Pedestrian Access Routes," of the project files.

#### *4-1203C (3) Bridge Cleaning and Painting Activities*

- Verify the required signs are placed during the cleaning and painting activities and removed at the end of each work shift.
- Verify the traveled way is free of obstructions and residue before opening the area to traffic.

#### 4-1203D Temporary Pavement Delineation

- Verify temporary or permanent pavement delineation is in place before opening the traveled way to traffic.
- Verify temporary pavement markers are the same color as the lane line or centerline markers being replaced. Confirm the contractor uses the long-term temporary pavement marker for 180 days or less and the short-term temporary pavement marker for 14 days or less.
- Do not allow the application of temporary pavement delineation over existing pavement delineation.
- Verify removal of any temporary delineation that conflicts with any subsequent or new traffic pattern for the area.

#### *4-1203D (1) Temporary Pavement Markers*

- Do not allow the use of epoxy adhesive to place pavement markers in areas where the removal of the pavement markers is required.
- Temporary pavement markers will not adhere to a cold in-place recycling surface. Use alternate methods to delineate this type of surface.
- Use of 180-day temporary pavement markers on an open-graded surface is not advised; when removed, the marker glue can peel up the open grade.

#### *4-1203D (2) Channelizers*

- Verify channelizers used for temporary edge line delineation are predominantly orange and the surface-mounted type.

#### *4-1203D (3) Temporary Lane Line and Center Delineation*

- Verify pavement marker spacing.
- Verify the contractor installs the temporary no-passing zone signs if no-passing centerline pavement delineation is obliterated. Determine the exact location of the temporary signs and when they are no longer needed for the direction of traffic.
- Verify no-passing zone signs are removed when no longer required.

#### *4-1203D (4) Temporary Edge Line Delineation*

- Verify the contractor cements the bases of channelizers used for temporary edge line delineation as specified.
- Allow the use of paint only if the temporary traffic stripe is not required to be removed.

#### 4-1203D (5) *Temporary Traffic Stripe Tape*

- Verify that temporary traffic stripe tape for use more than 14 days is applied according to the specifications, and temporary traffic stripe tape to remain in use 14 days or less is applied according to the manufacturer's instructions.

#### 4-1203D (6) *Temporary Traffic Stripe Paint*

- Review Section 84-2.03, "Construction," of the *Standard Specifications* for the application requirements for temporary traffic stripe paint.

#### 4-1203D (7) *Temporary Pavement Marking Tape*

- Verify that temporary pavement marking tape to remain in place more than 14 days is applied according to the specifications, and that temporary pavement marking tape to remain in place 14 days or less is applied according to the manufacturer's instructions.

#### 4-1203D (8) *Temporary Pavement Marking Paint*

- Review Section 84-2.03, "Construction," of the *Standard Specifications* for the application requirements for temporary pavement marking paint.

#### 4-1203E Temporary Pavement Delineation for Seal Coats

- Verify the contractor installs the temporary no-passing zone signs if no-passing centerline pavement delineation is obliterated. Determine the exact location of the temporary signs and when they are no longer needed for the direction of traffic.
- Verify temporary pavement delineation is maintained until it is replaced with the permanent pavement delineation. Direct the contractor to remove any temporary pavement delineation that conflicts with the permanent pavement delineation.

#### **4-1204 Level of Inspection**

Conduct intermittent day and night inspections to verify compliance with visibility and legibility requirements for:

1. Retroreflective bands on portable delineators.
2. Retroreflective sheeting on channelizers.
3. Retroreflective sleeves on traffic cones.
4. Construction area signs.
5. Portable changeable message signs.
6. Flashing arrow signs.

#### **4-1205 Quality Control**

While specific levels of quality control for temporary traffic control are not included in Section 12, "Temporary Traffic Control," of the *Standard Specifications*, the

contractor is responsible for providing quality control under Sections 5-1.01, "General," and 6-2.02, "Quality Control," of the *Standard Specifications*.

Verify that the contractor schedules and conducts a meeting to discuss the operation of impact attenuator vehicle as required under Section 12-3.23A(4), "Quality Assurance," of the *Standard Specifications*. Verify attendance of subcontractor's and other contractor's personnel involved with traffic control. Make sure your designated staff and other state staff involved with traffic control attend the meeting when possible.

#### **4-1206 Payment**

The following guidelines are for measuring and paying for various traffic control devices for construction areas.

##### 4-1206A Flagging

Compensation for flaggers shown on the contract plans, including advanced flaggers and additional flaggers will be included in the bid item for traffic control system. If advanced flaggers or additional flaggers are not shown or specified, then Caltrans pays 100 percent by change order. For public safety, when flaggers are not shown on the plans or specified and when ordered by the engineer, providing flaggers is change order work for which Caltrans pays 100 percent.

Compensation for flaggers used for all movements of workers, construction vehicles, and equipment on or across lanes open to traffic, will be included in the bid item of work involved.

For public convenience, such as routing traffic through detours when not shown on the plans and when ordered by the engineer, providing flaggers is change order work for which Caltrans pays 100 percent.

##### 4-1206B Temporary Traffic Control Devices

###### *4-1206B (1) Traffic Cones*

Traffic cones are paid for as part of the contract item for the traffic control system.

###### *4-1206B (2) Plastic Traffic Drums*

Count the plastic traffic drums for payment as they are placed in the locations shown on the plans. Drums used instead of cones, barricades, or delineators as part of a traffic control system or used as specified under "Public Safety" section in the contract are not to be paid for at contract item price.

###### *4-1206B (3) Portable Delineators*

Portable delineators are paid for as part of the contract item for the traffic control system.

#### *4-1206B (4) Channelizers*

Channelizers are paid for by the unit. The contract item price includes the costs of maintaining, replacing, and repairing channelizers. The contract item price also includes the costs of work necessary to restore channelizers damaged by public traffic.

#### *4-1206B (5) Barricades*

Initial placement of each barricade is paid for as a contract item at the time of placement. Subsequent relocations of each barricade are paid for as extra work using the force account method. Damaged barricades should be repaired at the contractor's expense, regardless of the cause, including damage by public traffic.

#### *4-1206B (6) Construction Area Signs*

Construction area signs, except those used in traffic control systems for closures, are paid for as a lump sum item. The cost of the contractor's inventory of replacement sign materials is included in the contract price for construction area signs. Additional signs ordered by the resident engineer are paid for as extra work.

The cost of covering, uncovering, and removing signs no longer needed is included in the contract price for construction area signs.

When determining how much to include on a progress pay estimate, withhold some payment sufficient to cover the cost of maintaining and removing the signs.

#### *4-1206B (7) Type K Temporary Railing*

Review the "Public Safety" section in the contract. Do not use the contract item for Type K temporary railing to pay for temporary railing that is placed to fulfill the requirements of the "Public Safety" section.

Withhold some payment from progress pay estimates to cover the cost of removing Type K temporary railing

#### *4-1206B (8) Temporary Traffic Screens*

Measure and pay for temporary traffic screen according to the specifications.

#### *4-1206B (9) Temporary Crash Cushion Modules*

Review the "Public Safety" section in the contract. Do not use the contract item for temporary crash cushion modules to pay for temporary crash cushion modules that are placed to fulfill the requirements of the "Public Safety" section.

Withhold some payment from progress pay estimates to cover the cost of removing temporary crash cushion modules.

#### *4-1206B (10) Impact Attenuator Vehicles*

Impact attenuator vehicles are paid for as part of the contract item for the traffic control system.

#### *4-1206B (11) Flashing Arrow Signs*

Flashing arrow signs are paid for as part of the contract item for the traffic control system.

#### *4-1206B (12) Portable Flashing Beacons*

Portable flashing beacons are measured and paid for at contract item price by the unit except when they are part of a traffic control system. In that case, portable flashing beacons are paid for as part of the contract item for the traffic control system.

Directing the contractor to move the portable flashing beacon after initial placement is change order work.

#### *4-1206B (13) Portable Changeable Message Signs*

The contract item for PCMS, commonly bid as “furnish-each” or “furnish-lump sum,” includes all costs for placement, operation, maintenance, relocation, and removal of the signs.

Direct the contractor to provide PCMS for use not otherwise provided for in the contract, with a minimum notice of 1 full working day. Payment is computed as extra work.

#### *4-1206B (14) Portable Signal Systems*

If the portable signal system is out of operation, the contractor must provide flaggers to control the traffic until the traffic signals are in operation. The cost of providing flaggers is included in the bid item cost for portable signal systems.

#### *4-1206B (15) Temporary Flashing Beacon Systems*

The contract item for a temporary flashing beacon system, commonly bid as “furnish-each” or “furnish-lump sum,” includes all costs for placement, operation, maintenance, relocation, and removal of the system.

#### *4-1206B (16) Automated Work Zone Information Systems*

The lump sum payment for this item includes all costs for placement, operation, maintenance, relocation, and removal of the Automated Work Zone Information System.

#### *4-1206B (17) Portable Transverse Rumble Strips*

This will be paid under a contract bid item.

#### *4-1206B (18) Portable Radar Speed Feedback Sign Systems*

This will be paid under a contract bid item.

#### *4-1206B (19) Automated Flagger Assistance Devices*

This will be paid under a contract bid item.

If automated flagger assistance devices (AFAD) bid item is not shown on the bid item list, providing AFAD is change order work.

#### *4-1206B (20) Temporary Automated End of Queue Warning System*

If the temporary automated end of queue warning system malfunctions for a cumulative period of 4 hours or more, no payment will be made for the day.

#### 4-1206C Traffic Control Systems

For all project work, the lump sum payment for the traffic control system includes payment for all labor, equipment, and materials to install, maintain, and remove the traffic control system as shown on the plans or *Standard Plans*. The contract item for the traffic control system includes payment for portable signs, cones, delineators, and flashing arrow signs as shown on the plans for the traffic control system and impact attenuator vehicle.

Include compensation or credit in the change order when an ordered change in the work affects the contract item for the traffic control system.

Traffic control costs in support of extra work are to be paid as part of the extra work. Compute the payment as a force account or as an adjustment of compensation based on a force account analysis. The change order that authorizes the extra work should reflect these costs.

In addition to adjustments for ordered changes, process change orders that adjust compensation when increased or decreased closures are required because of underruns or overruns in the engineer's estimated quantities. Process change orders for bid items that require traffic control that are not caused by an ordered change for a contract item or items. Calculate the adjustment on a force account basis. The change order must clearly state there will be adjustment on the traffic control system item by reason of this change.

## Section 40 Concrete Pavement

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4-4003E (1) Location of Primary Cores

Table 4-40.1. Calculation Factors to Locate Cores

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4-4003E (3) Thickness Variation

4-4003F Calculation of Deductions in Payment to the Contractor for Deficient Thickness

4-4003F (1) When None of the Primary Cores are Deficient in Thickness by More Than 0.05 Foot

4-4003F (2) When One or More of the Primary Cores are Deficient in Thickness by More Than 0.05 Foot

Figure 4-40.1. Primary Cores

Figure 4-40.2. Secondary Cores

4-4003F (3) Contractor's Requests for Additional Thickness Measurements

4-4003G Handling of Skips in the Original Day's Pour and Secondary Areas to Be Removed and Replaced

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4-4003I Administration

### 4-4004 Level of Inspection

### 4-4005 Quality Control

### 4-4006 Payment



### Section 40 Concrete Pavement

#### 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
- Noncompliant pavement work

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 authorization 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, refer to Section 4-90, "Concrete," of this manual.

#### 4-4002 Before Work Begins

##### 4-4002A General

- Review the plans and specifications to determine the requirements for concrete pavement, including submittals, quality assurance, materials, construction, and payment provisions.
- Coordinate and hold a preconstruction meeting with the specified contractor's personnel before paving activities, including any test strips. Refer to Section 36-1.01D(2), "Preconstruction Meetings," of the *Standard Specifications*. Discuss the contractor's methods for performing each element of the work, including those identified in the quality control plan. For jointed plain concrete pavements, include discussions on the contractor's methods for ensuring proper dowel and tie bar placement relative to constructed contraction joints and their early age crack mitigation system.
- Decide if crossings will be necessary for the convenience of public traffic and whether rapid strength concrete should be used for such crossings. Advise the contractor accordingly.

- When long hauls are involved, review the contractor's proposed placement method to verify that adequate time will be available.
- Discuss pavement areas to receive tapered edge with the contractor and construction methods to be used.
- For concrete pavement widenings placed adjacent to existing pavements, make sure the existing pavement lane or shoulder is ground before new concrete is placed. New concrete pavement must match the grounded 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 for Acceptance of Manufactured or Fabricated Materials and Products," 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 and shrinkage test data. AASHTO laboratory accreditation can be verified at the AASHTO re:source website:  
  
<http://aashtoresource.org/aap/accreditation-directory>
- Determine the pavement climate region for your project by reviewing the pavement design information located on the typical cross section sheet, which may trigger additional concrete mix requirements such as required air entrainment. Refer to Section 4-90, "Concrete," of this manual for information on concrete mix designs. Assistance with the concrete mix design review may be obtained from the district materials engineer.
- Verify that the aggregate material source complies with Section 7-103H (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. Check that the quality control plan has met or exceeded the quality control testing requirements specified in the contract. Make sure that individual suspension limits do not exceed specified acceptance criteria. If requested by the contractor or desired by the resident engineer, hold a separate meeting to discuss the quality control plan that addresses each element affecting pavement quality, including those specified in Section 40-1.01D(3), "Quality Control Plan," of the *Standard Specifications*. For jointed plain concrete pavements, pay extra attention to the contractor's plan for ensuring proper placement of contraction joints, dowel bars, and tie bars, as well

as their planned early age crack mitigation system. The district materials engineer may be available to provide subject matter expertise at this meeting.

- When just-in-time (JIT) training is specified, obtain the contractor's JIT training submittal containing the instructor's name and qualifications, training location, course syllabus, handouts, and presentation materials. You may wave JIT training requirements for individuals who have attended equivalent JIT training within the last 12 months and have provided certification of completion documentation.
- Obtain certificates of compliance when tie bars, threaded tie bar splice couplers, dowel bars, tie bar baskets, dowel bar baskets, joint filler material, and epoxy powder coating items are to be used in concrete pavement.
- For jointed plain concrete pavements, check that the early age crack mitigation system information is provided a minimum of 24 hours in advance of each paving shift and based on predicted weather conditions for the site, including wind speed, ambient temperatures, humidity, and cloud cover. The system assists the contractor in predicting concrete stresses and strength during the initial 72 hours after paving for constructing contraction joints, cure application, and crack mitigation. Verify that the contractor employs the specified portable weather station at the paving site to monitor, update, and report predictions.
- Obtain calibration documentation and operational guidelines for frequency measuring devices for concrete consolidation vibrators.
- For cold weather conditions, obtain the 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 pavement climate region requiring air entrainment (that is, freeze-thaw area).
- Obtain the manufacturer's recommendations and instructions for storage and installation when threaded tie bar splice couplers and joint filler material items are to be used in concrete pavement.
- For continuously reinforced concrete pavements, obtain a plastic chair submittal and plastic chair sample if their use is proposed by the contractor. Refer to Section 40-2.01C, "Submittals," of the *Standard Specifications* for additional information.
- Obtain physical specimens used for the contractor's testing of coefficient of thermal expansion. Make sure the contractor provides test data at field qualification and throughout production as specified. The contractor is also required to submit this test data electronically to the specified website. Note that for continuously reinforced concrete pavements, there is specified acceptance criteria for coefficient of thermal expansion at field qualification; otherwise this is provided for information only.

#### 4-4002C Training

- Make sure that JIT training is conducted in conformance with contract provisions.

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

- Verify that field qualification of proposed mix proportions is performed by an American Concrete Institute-certified Concrete Laboratory Technician, Grade 1. Obtain copies of certifications for project records. Review concrete field qualification data and certified test reports for conformance with contract requirements.
- Verify that the contractor performs coefficient of thermal expansion sampling, specimen fabrication, and testing as specified. For continuously reinforced concrete pavements, make sure the coefficient of thermal expansion test values meet acceptance criteria as a condition of qualification. Contractor submitted test specimens may be used to verify test results.
- For projects with concrete pavement volumes exceeding 2,000 cubic yards, make sure a test strip is constructed for evaluating compliance with specification acceptance criteria including smoothness; dowel bar and tie bar placement for jointed plain concrete pavements; vertical and lateral stability of reinforcement; and plastic chairs, if proposed, for continuously reinforced concrete pavements, thickness, and final finishing. Test strips not meeting requirements are rejected. Make sure an authorized test strip has been constructed before production paving. 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. Check that arrangements are made to evaluate the test strip within 3 business days of placement. Requests to eliminate the test strip should only be considered when the contractor can fully document that the same personnel and equipment have been successful in completing the same concrete pavement type within the last 12 months on a Caltrans project.

### **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 verify compliance with the specified tolerances for compaction and elevation requirements. Make sure that loose and extraneous materials are removed before paving. Check 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 applicable 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. Check 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.
  - Check that 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. Refer to Section 36-2, "Base Bond Breaker," of the *Standard Specifications* and Section 4-36, "Surfacing and Pavements—General," of this manual for additional information on base bond breakers. 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 for specified attributes, including those for composition, weight, dimensions, and rigidity. Check that the forms are cleaned and oiled before each use.
      - b. Verify 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, check that the contractor uses proper consolidation techniques that produce uniform concrete without segregation. Where vibrators are used, make sure they are operated in conformance with contract requirements.
    4. To verify compliance with the requirements for protecting pavement, examine all equipment that will be placed on previously completed pavement.
  - Check that a sufficient water supply is available for the work.

- Before concrete placement, check that the subgrade is uniformly moist, but free from standing or flowing water.
- Based on the concrete pavement climate region, verify the types of reinforcement, tie bars, dowel bars, tie bar baskets, and dowel bar baskets to be used within the concrete pavement. Refer to Section 40-1.02C, “Reinforcement, Bars, and Baskets,” of the *Standard Specifications*. For continuously reinforced concrete pavements, spot check reinforcement for size, spacing, vertical positioning, clearance, and stability. For jointed plain concrete pavements using dowel bar or tie bar baskets, spot check their anchorage to the base material. If dowel bar or tie bar inserters are used, verify that the contractor is checking inserter alignment before the pour. Check that the specified dowel bar lubricant has been properly applied. Verify that the contractor’s quality control methods for properly locating contraction joints, dowel bars, and tie bars are being applied.
- Verify that equipment for constructing joints is onsite and that it conforms to specifications.
- For jointed plain concrete pavement, verify that the contractor has updated their early age crack mitigation system with the most current weather forecast information and field conditions; for example, grade and concrete temperatures. Discuss any adjustment in their construction operations as a result of predicted weather.
- Determine the curing method the contractor proposes to use. When a 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.
- Verify 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, check 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 weighmaster certificates at the delivery point.
- Check 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 verify that they are replaced immediately.

- Watch for improper proportions or inadequate mixing as concrete is placed. In the daily report, record the reasons for any concrete rejection and the approximate amount involved.
- Observe the operation of equipment on existing pavements to make sure no cracking or other damage occurs. If damage occurs, order immediate corrective action.
- At the start of each day's work, check that the specified date stamp is used to mark the new pavement.
- Make sure acceptance testing is performed on concrete pavement in accordance with Section 40-1.01D(8), "Department Acceptance" 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 (Modulus of Rupture)," 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.
- Check that 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. Make sure fabricated beams are properly handled, cured, and transported before testing.

California Test 523, "Method of Test for Flexural Strength of Concrete (Modulus of Rupture)," follows ASTM C31, "Standard Practice for Making and Curing Concrete Test Specimens in the Field," for making and curing concrete test specimens.

Beam Fabrication: For the beam fabrication, use the following information as described in ASTM C31 (Sections 6 and 9):

<b>Minimum Cross-Sectional Dimension of Beams</b>	
<b>Nominal Maximum Aggregate Size (in)</b>	<b>Minimum Cross-Sectional Dimension (in)</b>
$\leq 1$	4 x 4
Between 1 and 2	6 x 6

<b>Method of Consolidation Requirements</b>	
<b>Slump (in)</b>	<b>Method of Consolidation</b>
$\geq 1$	Rodding or vibration
$< 1$	Vibration

<b>Molding Requirements</b>	
<b>Consolidation Method</b>	<b>Number of Layers of Equal Depth</b>
Rodding	2
Vibration	1

Curing of beams: Initial curing, final curing for acceptance, and field curing for traffic opening are described in the following paragraphs.

Initial Curing: Store standard-cured specimens for as long as 48 hours after molding, while maintaining the temperature and moisture conditions specified in ASTM C31, Section 10.1.2.1.

Temperature range varies according to the specified concrete strength, as summarized in ASTM C31, Section 10.1.2.1.

<b>Concrete Strength (psi)</b>	<b>Initial Curing Temperature Range (°F)</b>
<6000	60 - 80
≥6000	68 - 78

A satisfactory temperature environment can be created during the initial curing of the specimens by one or more of the following procedures: (1) use of ventilation; (2) use of ice; (3) use of cooling devices; or (4) use of heating devices, such as electrical resistance heaters or light bulbs. Other suitable methods may be used if the temperature requirements are met.

A satisfactory moisture environment can be created during the initial curing of the specimens by one or more of the following procedures: (1) immerse molded specimens with plastic lids in water; (2) store specimens in a container or enclosure; (3) place specimens in damp sand pits; (4) cover specimens with plastic lids; (5) place specimens inside plastic bags; or (6) cover specimens with wet fabric. Immersion in water may be the easiest method to maintain required moisture and temperature conditions during initial curing.

Final Curing for Acceptance: Upon completion of initial curing, transport specimens to the laboratory. During transporting, protect the specimens with suitable cushioning material to prevent damage from jarring. During cold weather, protect the specimens from freezing with suitable insulation material. Prevent moisture loss during transportation by wrapping the specimens in either plastic or wet burlap. Moisture loss during transportation can also be prevented by surrounding the specimens with wet sand or tight-fitting plastic caps on plastic molds. Transportation time must not exceed 4 hours.

Within 30 minutes of removing the specimens from their molds, cure specimens with free water maintained on their surfaces at all times at a temperature range of 70-77 degrees Fahrenheit using water storage tanks or moist rooms complying with the requirements of ASTM C511, "Standard Specification for Mixing Rooms,

Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes.”

Beams must be stored in water saturated with calcium hydroxide at 70-77 degrees Fahrenheit at least 20 hours before testing. Drying of the surfaces of the beam shall be prevented between removal from water storage and completion of testing.

Field Curing for Traffic Opening: As nearly as practicable, cure beams in the same manner as the concrete in the pavement. To meet these conditions, specimens made for the purpose of determining when the pavement may be open to traffic must be removed from the molds 44-52 hours after molding. Store specimens representing pavement by placing them on the ground as molded, with their top surfaces up. Bank the sides and ends of the specimens with earth or sand that must be kept damp, leaving the top surfaces exposed to the specified curing treatment. Store concrete pavement specimens as near as possible to the pavement they represent. Provide these specimens with the same temperature protection and moisture environment as the concrete pavement they are representing. At the end of the curing period, leave the specimens in place, exposed to the weather in the same manner as the concrete pavement. Remove all beam specimens from field storage and store in water saturated with calcium hydroxide at 70-77 degrees Fahrenheit for 20-28 hours immediately before time of testing to assure uniform moisture condition.

- Where air entraining admixtures are required by the project’s pavement climate region, in accordance with Section 40-1.02B(4), “Air Entrainment,” of the *Standard Specifications*, 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(8)(b)(ii), “Air Content” of the *Standard Specifications*.
- Monitor the contractor’s conformance with their quality control plan. Verify that control charts for required quality control tests are being updated on each day of paving and adhere to the quality control plan, including action and suspension limits. When deficiencies are observed, notify the contractor and document in the daily report. When deficiencies are not resolved or continue to occur, suspend the contractor’s pavement operations until the contractor provides satisfactory assurances and written documentation of their corrective plans. Where appreciable differences are encountered between the quality control tests and acceptance tests, investigate and resolve these concerns with aid of the district materials engineer as necessary.
- Verify that the contractor performs coefficient of thermal expansion sampling and specimen fabrication, and submits test results and specimens as specified.
- For jointed plain concrete pavements, check that dowel bar baskets, tie bar baskets, and the bars themselves are not being displaced during the concrete placement and paving operations. Check that the contractor is properly identifying and constructing contraction joints relative to pavement references

and bar centroids in conformance with the contract requirements and the contractor's quality control plan.

- For jointed plain concrete pavements, monitor the contractor's timelines from concrete placement to curing application and contraction joint sawing in comparison to their planned schedule from their early age crack mitigation system. Notify the contractor promptly of any deviations and record this information in the daily report along with the location of the work.
- When joints are to be formed rather than sawed, be sure joint material is placed as specified.
- Verify that the contractor constructs a transverse construction joint if the time interval between two successive concrete loads is greater than the specification allowance. Check that such joints are constructed at permissible contraction joint locations.
- Caution the contractor to construct the pavement so it will meet requirements for inertial profile, straightedge, and edge slump before final finishing to minimize corrective work. Inconsistent delivery and nonuniformity of concrete can affect paver performance and have negative effects on the paved surface. Where encountered, document these locations in the field and within the daily record.
- 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.
- Check 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, check that pressure relief joints are constructed as specified and shown on the plans.

#### 4-4003C Finishing Pavement

- Make sure 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 result from "bleed" water that had not evaporated, water 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:
    - 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.
- Check 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 verify that other steps, such as covering, are taken to prevent damage.
  - Before texturing, check that the contractor rounds the pavement edges to specified radii. Observe texturing for compliance with requirements. Verify that the contractor performs initial texturing with a broom or burlap drag to produce striations parallel to the centerline.
  - Check that burlap drags are used as specified and kept sufficiently clean to avoid 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. Grooves are to be constructed over the entire pavement width with the exception of within 3 inches of pavement edges and longitudinal joints. Make sure the cross section of the steel tines complies with specifications. Inspect the pavement surface to verify that grooves meet the specified depth.
  - Before and after the application of curing seal, make sure that the contractor keeps the pavement surface moist as specified.
  - Verify that 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. Make sure the contractor sprays the concrete with a mist of water until the concrete has set before placing the membrane. Make sure water does not flow over or wash the concrete surface.
      - b. Examine the waterproof membrane to see that it meets specifications. For assistance, consult the district materials engineer.

- c. Verify that membrane material is placed and secured and that any damaged sheeting is repaired as the specifications require.
  - d. If polyethylene sheeting is used, monitor maximum concrete temperatures during curing, checking that the maximum allowable is not exceeded.
  - e. Make sure the contractor adheres to the specified curing period.
2. Curing compound:
- a. Check that the contractor applies the curing compound uniformly after tining. See that sawed cuts or other disturbed areas receive additional curing compound. Your inspection should verify the following attributes for the compound:
    - i. It is not contaminated, diluted, or altered before application.
    - ii. It is mixed thoroughly before application.
    - iii. It is applied when concrete surfaces are still visibly moist.
    - iv. 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.
- Verify that concrete pavement joints are constructed in conformance with Section 40-1.03B, "Joints" of the *Standard Specifications*; the contractor's quality control plan; and the contractor's early age crack mitigation system for jointed plain concrete pavements. 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. Check 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, make sure the contractor performs repairs in conformance with Section 40-1.03N(2), "Spall and Ravel Repair," of the *Standard Specifications*.
  - Check that concrete pavement temperature is maintained above 40 degrees Fahrenheit during the initial 72 hours after placement.

#### 4-4003D Post-Paving

- Identify where core locations are to be taken by the contractor. Obtain core submittals throughout pavement operations for determining pavement thickness and air entrainment, which is required when the contractor's quality control air entrainment test results are not verified by Caltrans testing. For jointed plain concrete pavements, obtain cores for evaluating dowel and tie bar placement and concrete consolidation in these areas. Verify that specified placement

tolerances have not been exceeded relative to constructed contraction joints and orientation of pavement edges.

- For jointed plain concrete pavements, examine concrete pavement surfaces once the cure period is complete. If necessary, order the contractor to obtain concrete cores for further evaluation. Verify that partial depth cracks are treated with a high molecular weight methacrylate resin in accordance with Section 40-1.03N(3), “Crack Repair,” and Section 41-3, “Crack Treatment,” of the *Standard Specifications*. Check that working cracks within 0.5 foot of either side of a planned contraction joint and the adjacent unformed contraction joint are treated in accordance with Section 40-1.03N(3). Pavement slabs with full depth cracks other than working cracks require the removal and replacement of slab or slab portions. Spall or ravel areas larger than specified allowance must be repaired under Section 41-4, “Spall Repair,” of the *Standard Specifications*. Slabs with combined raveled areas greater than 5 percent of the slab area or with a single area of more than 4 square feet must be removed and replaced.
- For continuously reinforced concrete pavements (CRCP), examine pavement surfaces for cracking and raveling. Any full-depth cracking with faulting exceeding specified limits will require repair in conformance with Section 40-2.03E(3), “Full-Depth Repair,” of the *Standard Specifications*. High molecular weight methacrylate is not to be applied to any cracks in CRCP. Any raveled areas of specified size must be repaired in conformance with Section 40-2.03E(2), “Partial Depth Repair,” of the *Standard Specifications*.
- Verify that the contractor performs inertial profiling on specified areas. Refer to Section 36-3, “Pavement Smoothness,” of the *Standard Specifications* and Section 4-36, “Surfacing and Pavements—General,” of this manual for additional information. Areas requiring correction for smoothness may be ground under Section 42-3, “Grinding,” of the *Standard Specifications*, subject to meeting minimum pavement thickness requirements. Alternatively, these noncompliant areas may be removed and replaced. Once corrective work has been performed and the contractor’s corrective inertial profile shows compliance, arrange through the district for inertial profile acceptance testing for pavement smoothness. Pavement areas not subject to inertial profiling requirements must meet specified straightedge requirements.
- Obtain contractor’s inertial profiler information and reports for each day of inertial profiling of concrete pavement. Refer to Section 36-3, “Pavement Smoothness,” of the *Standard Specifications* and Section 4-36, “Surfacing and Pavements—General,” of this manual for additional information.
- With the district materials engineer, arrange to measure the coefficient of friction (California Test 342, “Surface Skid Resistance with the California Portable Skid Test”). 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 assure that the required coefficient of friction has been provided. Test areas with visibly smoother texture as completely as necessary to verify compliance or delineate areas that must be corrected.
  2. Tests made at temperatures lower than 40 degrees Fahrenheit 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 at temperatures lower than 40 degrees Fahrenheit.
  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. Do not allow coring machines on fresh concrete while any danger exists of damaging the concrete. Wait at least 72 hours.
  - Check that any required rumble strips are ground into the concrete pavement after the minimum specified time and strength have been obtained. Verify that the completed rumble strip conforms to the tolerances for alignment, spacing, depth, length, and width. Make sure equipment noise restrictions are met. Refer to Section 84-8, "Rumble Strips," of the *Standard Specifications* for additional information concerning rumble strips.
  - Obtain contractor's plan if repair or replacement of noncompliant concrete pavement is required.

#### 4-4003E Measurement of Pavement Thickness

Use the following procedure for determining pavement thickness and any applicable deductions:

- 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.

#### *4-4003E (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 1,200 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, Calculation Factors to Locate Cores," 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.

**4-4003E (2) Location of Secondary Cores**

To determine the limits of secondary units, locate cores in approximately the center of each adjacent panel. Note that for continuously reinforced concrete pavements, panel lengths are defined as 15 feet for this purpose.

**4-4003E (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 determined by California Test 531, “Method of Test for Length of Drilled Concrete Cores.” Record excess thickness by using a plus sign and deficient thickness by using a minus sign.

**4-4003F Calculation of Deductions in Payment to the Contractor for Deficient Thickness**

Take these steps when calculating deductions based on deficient thickness:

**4-4003F (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 following steps.
- To obtain the deficiency adjustment in dollars per square yard, use the table in Section 40-1.01D(8)(c)(iv), "Thickness," 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.

**4-4003F (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 "Deduction for Thickness Deficiency" within Section 40-1.01D(8)(c)(iv), "Thickness," 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.

Following 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(8)(c)(iv), "Thickness," of the *Standard Specifications*.

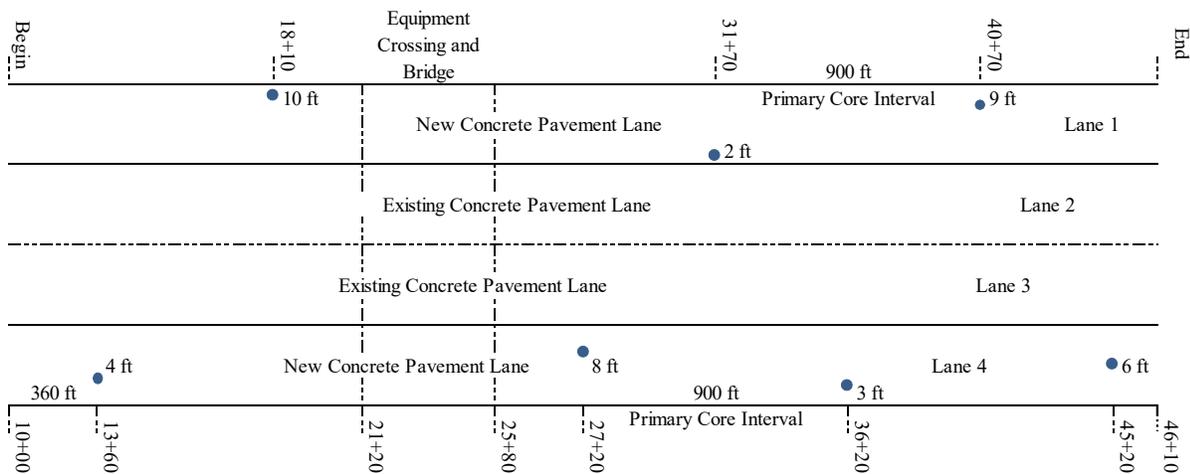
Assume the following:

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 6,300 feet (3,150 feet x 2 lanes). The total area paved on this date was 8,400 square yards.

The engineer calculated the number of cores required for thickness measurements in the primary unit ( $8,400/1,200 = 7$ ) and the core interval ( $6,300/7 = 900$ ). 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**

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



- Length of primary unit =  $6300 \text{ ft} \{[(4610-1000) - (2580-2120)]*2\}$
- Number of cores =  $\text{Area/Core Frequency} = (6300 \text{ ft} \times 12 \text{ ft} \times 1 \text{ sqyd} / 9 \text{ sf}) / (1200 \text{ sqyd/core}) = 7 \text{ cores}$
- 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.

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

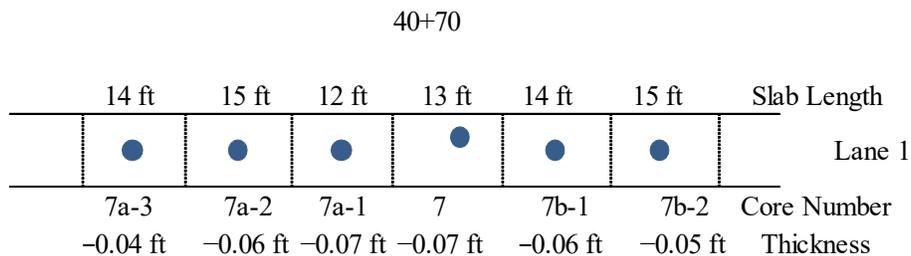
Core 3 is more than 0.02 foot greater than the specified thickness, so + 0.02 foot was used in the calculation to determine thickness deficiency in the primary unit in accordance with Section 40-1.01D(8)(c)(iv), "Thickness," of the *Standard Specifications*.

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 instead 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 preceding 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:

$$8,400 - 72 = 8,328 \text{ square yards.}$$

The deduction from payment to the contractor for thickness deficiency in the primary area in accordance with Section 40-1.01D(8)(c)(iv), "Thickness," of the *Standard Specifications* was calculated as follows:

$$8,328 \text{ square yards} \times \$2.30/\text{square yard} = \$19,154.40$$

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).

#### *4-4003F (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.

#### 4-4003G 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.

#### 4-4003H 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.

#### 4-4003I 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 (include sketches) 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.

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 for primary unit reports.

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 as specified in Section 40-1.03N, "Correcting Noncompliant Pavement Work," and Section 40-4.03B, "Correcting Noncompliant Pavement Work," of the *Standard Specifications*.

#### **4-4004 Level of Inspection**

Suggested levels of field inspection for typical concrete pavement activities are:

- Benchmark inspection of subgrade for compaction and elevation requirements.
- Benchmark inspection of forms and paving equipment.
- Intermittent inspection of reinforcement, dowel bars, tie bars, dowel bar baskets, and tie bar baskets.
- Benchmark inspection of the contractor's early age crack mitigation system for jointed plain concrete pavements.
- Continuous inspection of concrete delivery, placement, finishing, curing, and contraction joint operations.
- Continuous acceptance sampling and testing of fresh concrete.
- Intermittent monitoring of the contractor's adherence to their quality control plan.
- Benchmark evaluation of pavement for cracking, faulting, spalling, and raveling.
- Benchmark inspection of dowel and tie bar placement through coring.
- Benchmark inspection for coefficient of friction, smoothness, and thickness.

#### **4-4005 Quality Control**

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

- Review contractor's quality control plan.
- Make sure the contractor submits a copy of the AASHTO accreditation for the laboratory performing the mix design.
- Review control charts, verify that results for quality characteristics are in compliance, and check that copies of control charts are posted at designated location.
- For jointed plain concrete pavements, check that the contractor performs quality control methods to properly locate contraction joints, dowel bars, and tie bars.
- For jointed plain concrete pavements, review the contractor's early age crack mitigation analysis. As necessary, verify contractor's analysis by performing an independent simulation using high performance concrete paving software.

#### **4-4006 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.