

### **Section 26 Aggregate Bases**

- 4-2601 General**
- 4-2602 Before Work Begins**
- 4-2603 During the Course of Work**
- 4-2604 Level of Inspection**
- 4-2605 Quality Control**
- 4-2606 Payment**



### Section 26 Aggregate Bases

#### 4-2601 General

This section provides guidelines for inspecting aggregate bases for work specified under Section 26, "Aggregate Bases," of the *Standard Specifications*.

Aggregate base is designated as Class 2 or Class 3. The bid item list and plans specify the class and unit of measurement, and the *Standard Specifications* and special provisions provide the requirements for each class.

Typical cross section sheets of the contract plans show the thickness and layer placement of aggregate base within the pavement structure, and layout sheets show where to place it.

#### 4-2602 Before Work Begins

Before placement begins, review the contract plans and specifications to determine the aggregate base requirements. For sampling and testing requirements, including frequency of testing, refer to Chapter 6, "Sampling and Testing," of this manual.

Include the following steps in the preliminary review and inspections:

- Obtain the contractor's quality control plan, which details the methods the contractor will use to ensure quality of work and conformance with the *Standard Specifications* requirements.
- If mutually agreed with the contractor, hold a preconstruction meeting with the contractor and the district Materials Unit prior to construction to discuss the quality control plan and contractor's method for performing each element of work affecting material quality, including acceptance testing priorities, shipping of samples, lines of communication for test results, timeframes for reporting quality control and acceptance test results, and any contractual testing dispute resolution processes.
- If the pavement structure cross sections show aggregate base to be placed on soil, verify the design R-value by testing the basement material at the grading plane to verify the planned aggregate base thickness shown in the pavement structure. Complete testing early enough before placement to allow time for any redesign needed. (Refer to Topic 614, "Soil Characteristics," in the *Highway Design Manual* for a discussion of R-value and pavement structure design.)
- Test potential sources of aggregate base when the contractor requests such testing in writing. Deduct applicable Caltrans costs for sampling and testing from contract payments as required under Section 6-1.03, "Local Materials," of the *Standard Specifications*.
- Review compaction tests of the subgrade that is to receive aggregate base. Examine the subgrade to ensure that it has not deteriorated since it was tested

and that it is still firm and stable. Give special attention to isolated areas where pumping occurs.

- Measure the subgrade grading plane for compliance with elevation tolerance requirements for the material involved. When measuring for compliance, spot-check the staked locations and areas between stations where stakes are set. Determine the extent of this measurement based on factors such as the nature of material, the efficiency of the contractor's operation, and the accuracy of the grading operation (as indicated during the early stages of checking). The subgrade tolerances can be found in the specification for the subgrade material. The grade will be established from markings on the final grade stakes that Caltrans Surveys set. (Refer to the *Staking Information Booklet* for information on Caltrans-furnished construction surveys.)
- When subgrade is cohesionless soil and you decide that the subgrade is unstable for placing aggregate base on the roadbed in layers or windrows, you may give the contractor written permission to dump aggregate base in piles and spread ahead.
- Determine whether the contractor has complied with all requirements related to the use of local materials. Refer to Section 5-1.20B(4), "Contractor-Property Owner Agreement," of the *Standard Specifications*.

#### **4-2603      During the Course of Work**

During work operations, do the following:

- Sample the aggregate base at the time it is deposited on the roadbed. Observe delivered aggregate base to ensure that it is clean of debris and other harmful materials. For requirements related to material quality, perform the tests at the frequencies shown in Section 6-1, "Sample Types and Frequencies," of this manual. The frequency table has a provision for reducing R-value testing, but exercise caution when doing so. Consider reducing frequency when the initial test results show R-values significantly exceeding the specified R-value and ongoing gradation and sand equivalent test results indicate acceptable and consistent material quality. Do not reduce R-value frequency when failing or borderline test results occur. Include in the project records an explanation of why you reduced R-value testing.
- Compare sand equivalent and grading test results with requirements for operating range and contract compliance. (Refer to Section 3-609A, "Operating Range and Contract Compliance," of this manual.) Note that it is prudent to take frequent samples, especially with borderline test results, but test only at the frequency shown in the table in Section 6-1 of this manual. If a test result fails to meet the requirement for contract compliance, you may test additional previously taken samples to determine the quantity of material represented by the failing test result.

- If aggregate base will be paid for by weight, obtain the optimum moisture content from the aggregate base moisture-density compaction curve and sufficient moisture samples to determine pay quantity adjustments.
- Ensure that the aggregate base is spread on the subgrade without significant segregation. Normally you would verify this through observation, but if problems persist, support your observations with a sieve analysis. If segregation is taking place, it can sometimes be avoided by wetting the material before it is hauled to the job or before spreading operations start. Watering and compacting go hand in hand. It is important that the proper amount of water is evenly distributed in the aggregate at the time of compaction.
- Where geosynthetic materials are shown, ensure materials are properly placed, including overlapping requirements and securely holding materials in place during aggregate base placement. Ensure that the geosynthetic materials are not damaged during placement, spreading, and compaction of the aggregate base. Specifications provide limits on the contractor's equipment and operations. Ensure any damaged materials are repaired or replaced. Refer to Section 4-96, "Geosynthetics," of this manual for additional guidance on geosynthetics.
- Observe the spreading and compacting operation to ensure that it conforms to the layer thickness requirements of the specifications. Note in the daily report any wasting of material.
- If payment is by weight, measure waste and deduct those quantities. Some material may be lost during any trimming, and district personnel will decide when to measure the trimmings. In general, measure trimmings when the cost of such measurement does not exceed the anticipated deduction.
- Test the relative compaction of aggregate base layers using the area concept procedures under California Test 231, "Method of Test for Relative Compaction of Untreated and Treated Soils and Aggregates Using Nuclear Gages."
- Observe the compacting operation to ensure that the material forms a uniformly firm, stable base.
- Measure the surface of the finished aggregate base for conformance to tolerances specified in Section 26-1.03E, "Compacting," of the *Standard Specifications*. Use the markings on the final grade stakes that Caltrans set to determine compliance with the planned elevation of the aggregate base surface. Require corrective action for any deficiencies.
- Measure the thickness of the completed aggregate base. Use your judgment to determine the number of measurements necessary. The minimum acceptable thickness equals the planned thickness minus the sum of the specified tolerance for high subgrade and the specified tolerance for low-finished aggregate base surface. The *Standard Specifications* allow the engineer to accept a deduction for deficient thickness in lieu of other corrective action. However, Caltrans policy is to ensure that thickness complies with requirements by ordering corrective action if thickness is deficient. Therefore, apply the deduction in only the most extenuating circumstances. Keep adequate records for payments on progress

payment and final estimates. The type and frequency of measurement for your records will depend on measurement and payment clauses of the contract.

- Note in the daily report any inspections performed on items that are not otherwise part of a permanent record. For instance, you do not need to note any compaction tests taken, because these are recorded elsewhere. However, you do need to explain in the daily report any absence of testing. You also need to note that construction is being performed according to specified layer thicknesses, because this information is not recorded elsewhere.
- If the contractor disputes Caltrans' acceptance results, follow Section 23-1.01D(1)(b), "Test Result Disputes," of the *Standard Specifications*. An independent third party performs referee testing as specified, must have no prior direct involvement with the contract, and be mutually selected with the contractor.

#### **4-2604 Level of Inspection**

Suggested levels of inspection for typical aggregate base work activities are:

- Benchmark inspection of subgrade grading plane.
- Intermittent sampling and testing of aggregate base materials.
- Intermittent inspection for verification of material deliveries where aggregate base is paid for by weight.
- Intermittent inspection of placement, spreading, and compaction operations.
- Intermittent review of contractor's quality control program including quality control test results.
- Benchmark inspection of finished surface grading plane.

#### **4-2605 Quality Control**

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

- Ensure the contractor is actively performing quality control on aggregate base materials throughout production operations by reviewing copies of quality control records, including quality control test results.
- The quality control plan must include, but is not limited to:
  - Frequency of quality control sampling and testing that meets or exceeds specification requirements as listed in Section 26-1.01D(2)(d), "Quality Control Testing," of the *Standard Specifications*.
  - Time and frequency of submitting test results.
  - Action and suspension limits, and details of corrective action to be taken if any process is outside of those limits. Suspension limits must not exceed specified acceptance criteria.
  - Responsibilities of subcontractors and testing laboratories.

- Quality control manager if the quantity of aggregate base exceeds the requirements listed in the “QC Testing Frequencies” table of Section 25-1.01D(2)(d), “Quality Control Testing,” of the *Standard Specifications*.

#### **4-2606 Payment**

Review the quantity calculations in the resident engineer’s file to determine if they are sufficiently detailed and accurate to be used in the project records.

If aggregate base is paid for by weight, refer to the discussion of weighing and metering procedures in Section 3-902E, “Weighing Equipment and Procedures,” of this manual.

If aggregate base will be paid for by volume, calculate the volume based on the dimensions shown on the plans. Make quantity calculations as early in the project as possible.