

## **Section 28 Concrete Bases**

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### Section 28 Concrete Bases

#### 4-2801 General

This section provides guidelines for inspecting concrete bases for work specified under Section 28, “Concrete Bases,” of the *Standard Specifications*.

The most common type of concrete base is lean concrete base, which is proportioned, mixed, and placed in a manner similar to concrete pavement. Lean concrete base rapid setting has the same applications, but is usually specified for projects with short construction windows. The bid item list and plans will specify the type of concrete base.

Resident engineers need to plan carefully to fully meet the requirements for inspecting and testing materials. When planning for the inspection of concrete bases, consider the following:

- The production of concrete base.
- The placing, finishing, and curing of concrete base.
- The subgrade, specified equipment, and construction of joints for concrete base.

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 base, refer to Section 4-90, “Concrete,” of this manual.

#### 4-2802 Before Work Begins

For preliminary review and inspections, do the following:

- Obtain the contractor’s quality control plan, which details the methods the contractor will use to assure quality of work. Review the quality control plan for conformance with the *Standard Specifications* requirements.
- Meet before 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.
- Verify that Form CEM-3101, “Notice of Materials to Be Used,” includes the aggregate, cement, and curing material. 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 mix design for conformance with the specifications.
- Examine equipment or tools to be used for placement following the steps listed below. When obvious inadequacies exist, advise the contractor and enter the details in the daily report.
  1. For sideform construction:
    - a. Examine the forms to verify they have the specified attributes for items such as composition, weight, dimensions, and rigidity. Before each use, check that the forms are cleaned and oiled.
    - b. Check that the installation of the forms complies with specifications. Before the placement of concrete, order any necessary corrective work.
    - c. Verify that the paving equipment complies with specifications.
  2. For slipform construction, verify that the paver has the specified attributes. Require the specified demonstration of satisfactory operation and note such activity in the daily report.
  3. For base protection, determine that the contractor meets the requirements by examining all equipment that will travel on the completed base.
- Just before the start of paving, check the accuracy of the final grade stakes.
- Inspect the subgrade to make sure it conforms to the tolerances specified for compaction and elevations. Make sure that any low areas are identified and will be filled with additional base and that any high areas are trimmed as specified. Additional thickness is paid for as part of the lower layer and must not be included when quantifying concrete base.
- When slipform pavers are used, inspect the grade upon which the paver will ride to determine if it is smooth enough to prevent abrupt vertical changes in the finished surface. When the paver controls the grade and alignment by a wire, sight along the wire for any obvious variations, and order necessary corrections. Check that the wire is tensioned sufficiently so no measurable sag occurs between the supporting stakes. Advise the contractor if you anticipate any problems. Keep in mind that the contractor is responsible for compliance with thickness and grade requirements.
- Check the facilities proposed for producing and transporting concrete base. Section 4-90, "Concrete," of this manual covers the items involved.
- Ascertain the curing methods and type of material the contractor proposes to use. Discuss with the contractor the requirements for labeling and packaging the curing compound.
- Verify that equipment for constructing longitudinal weakened plane joints is onsite and conforms to specifications.
- Confirm placement dates with the contractor and arrange Caltrans personnel for plant inspection and testing.

- When the project requires long hauls, review the contractor's proposed placement method to assure adequate time.
- Check that the subgrade is uniformly moist.

#### **4-2803 During the Course of Work**

During the course of work, do the following:

- For acceptance quality characteristics and associated sampling and testing frequencies, refer to Chapter 6-1, "Sample Types and Frequencies," of this manual.
- Before mixing, obtain samples of the aggregate in accordance with the frequency shown in Section 6-1, "Sample Types and Frequencies," of this manual.
- When the results of grading or sand equivalent tests, or both, are outside the limits for contract compliance, determine whether the concrete base represented by the tests is structurally adequate. When concrete base is left in place, even though it does not comply with the contract, the specified payment by the contractor must be made by administrative deduction. Document the reasons for leaving the concrete base in place, and notify the contractor of your decision and the deduction amount.
- Before mixing and placement of concrete base, verify that the subgrade is not frozen and the ambient temperature exceeds the minimum specified.
- As it is placed, observe the concrete base for any improper proportions or inadequate mixing. In the daily report, record the reasons for rejecting any concrete base and the approximate amount rejected.
- Make sure the contractor furnishes the required tachometer. Also, check that frequencies are as specified. Immediately replace inoperative vibrators.
- To assure the correction of any problems related to mixing or hauling, maintain good communication with the engineers who inspect operations at the mixing plant. For more detailed information about transporting concrete and receiving weighmaster certificates at the delivery point, refer to Section 4-90, "Concrete," of this manual.
- Obtain samples of the plastic concrete, and perform penetration, strength, and air content tests in accordance with the frequencies shown in Section 6-1, "Sample Types and Frequencies," of this manual.
- Verify that the material for longitudinal weakened plane joints is placed to the dimensions specified. Also, verify that the contractor vibrates the concrete base to cause an even flow of material surrounding the joint.
- Verify the construction of a contact joint whenever the time interval is greater than the specifications allow for placement of two successive loads of concrete base.

- When the contractor uses side form construction, check that screeding and tamping conform to the specifications. Where the hand-float method is permissible, verify that the contractor uses the specified floats and methods.
- Make sure the surface of the concrete base is textured as specified. Concrete base to be surfaced with hot mix asphalt pavement must have a rough texture to prevent slippage between surfacing and base. Concrete base to be surfaced with concrete pavement must have a smooth texture to allow the pavement to adjust for early thermal and moisture changes without forming random cracks.
- Measure the finished surface of the concrete base. Record the measurements, and require the specified corrections for areas not meeting elevation requirements. Check that high areas are addressed immediately.
- 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, selected with the contractor, performs referee testing and must have no previous direct involvement with the contract as specified.

#### 4-2803A Curing Concrete Bases

- Determine the curing method the contractor proposes to use and check that the curing equipment, material, and application complies with the specifications. The curing material specified depends on whether the overlying surface is concrete or hot mix asphalt pavement.
- When specified, require additional applications of curing material.
- Make sure curing is reapplied on any disturbed areas.
- For curing compound:
  - Verify that shipments of curing compound are labeled and packaged as specified.
  - Obtain a certificate of compliance, including required test results, for each batch of curing compound.
  - Check that the curing compound is properly agitated before and during application to achieve complete mixing. Also, observe that the compound is applied as a uniform membrane at the specified time.
  - Verify that the curing compound is not contaminated, diluted, or altered in any way before application, that it is applied when surfaces are still visibly moist, and that the compound film remains unbroken during the specified curing period.
  - Make sure curing compound is applied at an ambient temperature above the minimum specified.
- For curing seal:
  - Make sure the asphaltic emulsion used for curing seal is diluted, mixed, and uniformly applied as specified.

- Determine the application rate for the curing seal to be used and advise the contractor accordingly. Base the determination on an amount that will provide a complete membrane without appreciable thickness. Verify that the application rate conforms to requirements.

#### **4-2804 Level of Inspection**

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

- Benchmark inspection of subgrade for compaction and elevation requirements.
- Benchmark inspection of forms and paving equipment.
- Continuous inspection of concrete delivery, placement, finishing, curing, and contraction joint operations.
- Intermittent review of contractor's quality control program including quality control test results.
- Continuous acceptance sampling and testing.
- Benchmark inspection of finished surface texture.

#### **4-2805 Quality Control**

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

- Verify that the contractor is actively performing quality control on concrete base materials throughout production operations by reviewing copies of quality control records, including quality control test results.
- The quality control plan must include, but not be limited to:
  - Frequency of quality control sampling and testing that meets or exceeds specification requirements.
  - 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 subbase or 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*.

#### **4-2806 Payment**

For measurement and payment, do the following:

- Review the plans and quantity calculations in the resident engineer's file to determine if there is sufficient detail and accuracy to be used in the project records.

- For information about measurement and payment of curing seal, refer to Section 4-94, “Asphaltic Emulsions,” of this manual.