

Section 24 Stabilized Soils

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Section 24 Stabilized Soils

4-2401 General

Soil stabilization is used to improve the shear strength, stability, and durability of basement material, the native subgrade soils, to meet the pavement design requirements and for successful pavement performance. Stabilization methods include reworking existing soils by blending or increased compaction by mechanical stabilization, or by adding a chemical stabilization agent. Soil stabilization can also be accomplished by removing the native basement material and replacing it with a higher quality material. Section 24, "Stabilized Soils," of the *Standard Specifications* provides requirements for chemical stabilization of soil by adding lime as the stabilizing agent.

Lime stabilization is effective for basement material containing a large percentage of clay particles. The lime stabilization process includes spreading lime over the basement material, thoroughly mixing it in place, compacting it at an appropriate moisture content, and curing. The special provisions specify the amount of lime to be added to the basement material. If necessary, to achieve the compressive strength designated in the special provisions, the resident engineer may order an adjustment in the percentage of lime to be used.

4-2402 Before Work Begins

Before work begins, take the following steps:

- Obtain samples of the materials to be treated. Ask the district Materials Unit to run initial tests to determine the amount of lime required to meet the design criteria. Advise the contractor of the percentage of lime required and optimum moisture content for each soil type.
- If necessary, obtain samples of the water that will be mixed with the soil and lime, and test the water for compliance with the specifications. Generally, potable water will meet the specification requirements.
- Obtain a lime sample with a certificate of compliance, including a statement certifying the lime to be furnished is the same as on the Authorized Materials List.
- Observe the preparation of the material that will be treated. Make sure the material is scarified and thoroughly broken up to the width and depth specified. Make notes of such inspections in the daily report.
- If required by the specifications, observe a test strip that demonstrates the contractor's equipment and methods provide uniform distribution of lime and achieve the specified compaction.
- If necessary, prepare a change order to provide for the removal and disposal of any oversized material.

- Prohibit lime stabilization when ground temperature is below specified temperature or expected to fall below specified temperature before mixing and compaction can be completed.

4-2403 During the Course of Work

Once work begins, do the following:

- Verify that the preparation of the basement material that requires that stabilizing conforms to the requirements in Sections 24-1.03B and 24-2.01D(1)(b), “Preparing Basement Material,” of the *Standard Specifications*.
- For each delivery of lime, obtain the certificate of compliance and the weighmaster certificate. Obtain samples of the lime at the frequency rate shown in Section 6-1, “Sample Types and Frequencies,” of this manual.
- Observe the spreading of the lime to determine that the equipment and method used meet the specified requirements.
- Check the spread rate of the lime. When dry lime is spread, the rate of spread may be checked by either of the following means:
 1. Placing building paper on a section before spreading and then weighing the material from a known length of spread, such as 8 feet to 10 feet, similar to the drop pan or calibration pan method.
 2. Weighing the distributor before and after spreading a known length.
- When lime is spread in a slurry, the rate is normally checked by either of the following means:
 1. Weighing the spreader before and after spreading.
 2. Determining the volume of slurry spread for a known length and reducing the resulting value to the weight of lime.
- Prohibit any method of spreading lime that precludes determining the spread rate. Record daily spread rates, both spot-check and overall, in the daily report.
- Decide how far ahead of the mixing operation the lime may be spread and advise the contractor accordingly. Base the decision on the variables involved in each particular situation. The contractor must not spread the lime so far ahead of the mixing operation that wind might blow it away. Neither must lime in a slurry form be spread so far ahead of the mixing operation that it would dry before being mixed.
- After the spreading of the lime and until the end of the specified curing period, prohibit any traffic, except equipment performing the work, from passing over the basement material.
- During the mixing operation and throughout the mellowing period, sample and test the material to verify the moisture content exceeds the optimum required for compaction.
- Verify that rolling equipment meets specifications.

- Make necessary measurements to verify that the thickness of each compacted layer conforms to the specifications. Note the results of such measurements in the daily report.
- Test the mixture with a phenolphthalein alcohol indicator. If the reaction produces a nonuniform color, require the contractor to perform additional mixing.
- Check that the depth of mixing meets the required thickness of the stabilized material. Where mixing depth exceeds the specified tolerance, make sure additional lime is added proportionally. Note this in the daily report, including the additional lime quantity provided at the contractor's expense.
- Verify that the contractor completes all mixing within the specified time.
- After final mixing, make sure compaction begins within the specified time.
- To determine maximum density, obtain samples of the mixed material, and test the material before initial compaction.
- Test for compaction in accordance with Sections 24-1.03E and 24-2.03E, "Compaction," of the *Standard Specifications*.
- Assure any disputes regarding test result discrepancies follow Section 23-1.01D(1)(b), "Test Result Disputes," of the *Standard Specifications*.
- Order trimming of any material above the grade tolerance, and make sure subsequent rolling is performed.
- Check that the compacted surface is kept moist until the placement of a subsequent layer or curing is applied.
- Verify that the contractor uses one of the specified methods for curing. Also, obtain necessary certificates of compliance and samples where a curing seal is used.
- Verify that the contractor meets the time and temperature requirements for the curing seal. Order any necessary repairs to the damaged curing seal.
- Where a curing seal is used, decide the curing seal's application rate, and advise the contractor accordingly. Base the decision on an amount that will provide a complete membrane without appreciable thickness. To check that the correct application rate, also check the curing seal's spread rate. Record measured spread rates in the daily report.

4-2404 Level of Inspection

Suggested levels of inspection for typical stabilization work activities are:

- Continuous inspection of the test strip work.
- Intermittent inspection of preparing basement material.
- Continuous inspection of applying and mixing of lime. For projects where the stabilization work will span multi-week durations, the level of inspection can be reduced to intermittent inspection if inspection and testing of the initial work

shows that the contractor's operations are consistent and result in satisfactory stabilization work.

- Intermittent inspection of sampling and testing of materials, compaction, and applying curing seal.
- Benchmark inspection of finish grading.

4-2405 Quality Control

Verify that the contractor's quality control laboratory is certified in accordance with Caltrans' Independent Assurance Program. Make sure the contractor submits the time and location of quality control sampling and testing with sufficient advance notice to allow Caltrans staff to intermittently witness quality control sampling and testing.

4-2406 Payment

To determine the pay quantity for lime stabilization, make area measurements of the planned surface.

At the point of delivery, collect weighmaster certificates for the lime. Deduct the weight of any wasted or unused lime from the pay quantity for lime and document these quantities in the daily report. If the contractor has added additional lime to compensate for depths exceeding the specified allowance, make the required adjustment to the scale weights of the lime.

Measure the quantity of curing seal in accordance with Section 94, "Asphaltic Emulsions," of the *Standard Specifications*. Payment for water cure or moist material blanket curing methods is included within the lime stabilization pay item.