

**KANSAS DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION TO THE
STANDARD SPECIFICATIONS, 1990 EDITION**

NOTE: This special provision is generally written in the imperative mood. The subject, "the *Contractor*" is implied. Also implied in this language are "*shall*", "*shall be*", or similar words and phrases. The word "*will*" generally pertains to decisions or actions of the Kansas Department of Transportation.

CEMENT TREATED SUBGRADE

1.0 DESCRIPTION.

Mix soil, cement, and water to construct cement treated subgrade according to the details in the Contract Documents.

BID ITEM	UNIT
Cement	Ton (megagram)
Manipulation for Cement Treated Subgrade	Square Yard (square meter)
Water for Cement Treated Subgrade (Set Price)	1000 Gallons (megagram)

2.0 MATERIALS.

If necessary, provide bituminous materials, either emulsified asphalt (SS-1 or CSS-1) or medium cure cutback asphalt (MC-250), that complies with the requirements of **Section 1200**.

If necessary, provide admixtures for portland cement that comply with the requirements of **Section 1400**.

Provide portland cement or blended hydraulic cement that complies with the requirements of **Section 2000**.

Provide water for cement treated subgrade that complies with the requirements of **Section 2400**.

3.0 CONSTRUCTION REQUIREMENTS.

Prepare the subgrade to the lines and grades shown in the Contract Documents. If the project has more than 20,000 square yards (16 000 m²) of manipulation, use automatic grade controlled equipment (accomplish control of grade and cross slope by using sensors actuated by a taut reference line) to trim the subgrade. The Engineer may waive the use of automatic grade controlled equipment in areas of irregular dimensions where the operation of such equipment is impractical.

Use equipment with a recycling/mixing drum and an automatic water proportioning system to pulverize the subgrade to the specified depth, and incorporate cement and water into the pulverized subgrade.

The Engineer will conduct laboratory tests according to the requirements of Kansas Test Method KT-12 on the site materials and the specified cement content to establish the required moisture content. The Engineer will verify the moisture content in the field according to the requirements of Kansas Test Method KT-11.

Before adding cement to the pulverized subgrade, if necessary, adjust the moisture content of the pulverized subgrade. Mix and blend water added to the pulverized subgrade. If the Contractor demonstrates that he can control the moisture content of the mixture, the Engineer may allow the incorporation of water at the same time the cement is mixed into the pulverized subgrade.

Before adding the cement to the pulverized subgrade, blade the roadway to allow uniform distribution of the cement. Distribute the cement in a manner that minimizes loss of the material. Do not apply the cement if conditions are such that the material is lost due to the wind. Do not use cement that was not properly stored and handled in weatherproof containers. Immediately following the spreading of the cement, if specified, apply a uniform coverage of a retarder admixture to the cement. If the moisture content of the pulverized subgrade will accommodate additional moisture, the retarder admixture may be diluted with water to ensure a uniform application.

Mix the pulverized subgrade and cement. Continue mixing until a homogeneous, friable mixture that complies with these size requirements is obtained:

Percent Retained - Square Mesh Sieves*	
1½" (37.5mm)	½" (12.5 mm)
0	50 maximum

*The Engineer will determine the percent retained on the specified sieves according to the requirements of Kansas Test Method KT-Cement.

Complete the mixing within 30 minutes of adding the cement to the pulverized subgrade.

The uniform moisture content of the mixture immediately before being compacted must be within ± 3 percentage points of the optimum moisture content. If the moisture content of the mixture exceeds the specified moisture content, the Contractor must add additional cement (at his expense) to lower the moisture content. Sprinkle the mixture as necessary to maintain the specified moisture content during the compaction operations.

For the initial compaction of the mixture, use a vibratory roller having a minimum operating mass of 12 tons (11 Mg), with a minimum centrifugal force of 24 tons (214 kN). Use a rubber-tired or smooth-wheeled roller to complete the compaction of the surface. Compact the mixture beginning at the bottom, and continuing to the surface of the specified thickness. Compact the modified subgrade to a minimum of 95 percent of the combined materials dry density. The Engineer will determine the density according to the requirements of Kansas Test Method KT-13 or KT-51. The compacted subgrade must have uniform density and remain stable under construction traffic. Complete the compaction operations within 2 hours of incorporating the cement into the subgrade. If any of these requirements are not satisfied, reprocess, recompact, and refinish the deficient areas.

After compaction of the modified subgrade, trim the surface to the specified lines and grades. If the project has more than 20,000 square yards (16 000 m²) of manipulation, use automatic grade controlled equipment (accomplish control of grade and cross slope by using sensors actuated by a taut reference line) to trim the compacted modified subgrade to the specified lines and grades. The Engineer may waive the use of automatic grade controlled equipment in areas of irregular dimensions where the operation of such equipment is impractical. Compact the trimmed surface of the modified subgrade with a smooth-wheel or a pneumatic-tire roller. If necessary, lightly scarify and blade the surface (to eliminate equipment imprints) while doing the final rolling.

Protect the finished subgrade against drying for at least 7 days, or until the subgrade is covered with base or surfacing provided the base or surfacing is placed in less than 7 days after the completion of the subgrade. Protect the finished subgrade from drying by sprinkling with water to maintain a continuous moist condition, or by sealing the finished subgrade with an asphaltic prime coat.

4.0 MEASUREMENT AND PAYMENT.

The Engineer will measure the accepted cement used in the mixture by the ton (megagram) (to the nearest 0.1 ton [megagram]). The Engineer will not measure additional cement added to the mixture to reduce the moisture content.

The Engineer will measure the manipulation for cement treated subgrade by the square yard (square meter) (to the nearest square yard [square meter]), measured according to the dimensions shown in the Contract Documents.

The Engineer will measure the accepted quantity of water used for cement treated subgrade by the 1000 gallons (megagram) (to the nearest 0.1 M gallon [megagram]) by means of calibrated tanks or water meters. The Engineer will measure water used for subgrade preparation, mixing, compacting and curing the cement treated subgrade. The Engineer will not measure water used for dust control, water wasted through the Contractor's negligence, or water in excess of the quantity required for mixing and compacting the cement treated subgrade.

If the Contractor opts to use bituminous material to cure the cement treated subgrade, the Engineer will not measure the bituminous material for payment.

Payment for "Cement," and "Manipulation for Cement Treated Subgrade" at the Contract unit prices and for "Water for Cement Treated Subgrade" at the Contract set price is full compensation for the specified work.

09-10-02 M&R(SP) (RB)

ADDENDUM

SIEVE ANALYSIS FOR ACCEPTANCE OF CEMENT TREATED SOILS (Kansas Test Method KT-Cement)

a. SCOPE.

This method of test covers the procedure for determining the amount of material retained on the 1½ and ½ inch sieves. This test is performed as an acceptance test for cement treated soils.

b. REFERENCED DOCUMENTS.

b.1. AASHTO M 92; Wire-Cloth Sieves for Testing Purposes

b.2. AASHTO M 231; Balances Used in the Testing of Materials

c. APPARATUS.

c.1. The balance shall conform to the requirements of AASHTO M 231 for the class of general purpose balance required for the principal sample weight of the sample being tested.

c.2. Sieves meeting AASHTO M 92 of specified sizes for the soil being tested. A nest of sieves shall include the 1½ and ½ inch.

d. TEST SAMPLES.

Obtain samples of road mixed material from the subgrade or borrow area. The original sample before splitting shall weigh approximately 75 pounds.

Reduce sample by quartering or splitting to a weight of not less than 30 pounds. Exercise extreme care to prevent segregation and/or degradation during the splitting operation.

e. TEST PROCEDURE.

The sample prepared as above shall be accurately weighed and sieved through the sieve series in the applicable specification. Conduct the sieving operation by means of a lateral and vertical motion accompanied by a jarring action to keep the sample moving continuously over the surface of the sieve. (In no case shall fragments in the sample be turned or manipulated through the sieve by hand nor shall a coin or other foreign object be placed in the sieve along with the sample to aid in the sieving operation.) Continue sieving until no more than 1 percent by weight of the residue passes any sieve during one minute. When mechanical sieving is used, the thoroughness of sieving shall be tested by using the hand method of sieving as described above. Before using a mechanical shaker, in addition to hand shaking, for production control, comparison tests should be run to check the results against hand shaking only. The time on the mechanical shaker should be adjusted so that the same results are obtained as by the hand method.

In no case shall the fraction retained on any sieve at the completion of the sieving operation weigh more than 4 g/in² of sieving surface. (This amounts to 200 grams on an 8-inch diameter sieve.) This may be accomplished by removing excess material from the screen, placing it in a suitable container, sieving the material remaining on the screen, then sieving the material retained in the container.

f. CALCULATIONS.

The percent retained on the 1½ and ½ inch sieves is calculated as follows:

$$\text{Percent Retained} = \frac{100(A)}{B}$$

Where: A = Weight of the retained fraction of the original sample determined to within 0.1 percent of the original sample weight as obtained by sieving over the specified sieve.
B = Original weight of sample.