

Payment will be made under:

Item No.	Pay Item	Pay Unit
30501XX	Graded Aggregate Base Course (<i>thickness</i>)" Uniform)	Square Yard
3050199	Graded Aggregate Base Course	Ton
4010005	Prime Coat	Gallon

SECTION 306

(RESERVED)

SECTION 307

CEMENT STABILIZED EARTH BASE COURSE

307.01 Description. This work shall consist of the construction of a base course composed of a combination of local soil and portland cement uniformly mixed, moistened, compacted and shaped, and the applying of a curing coat in accordance with these specifications. The completed base course shall conform to the typical cross-section shown on the plans and to the lines and grades furnished by the Engineer.

MATERIALS

307.02 Portland Cement. Portland cement shall conform to the requirements of Subsection **701.02** of these specifications except that the allowable maximum alkali content ($\text{Na}_2\text{O}+0.658\text{K}_2\text{O}$) is increased to 1.0%.

307.03 Water. Water shall meet the requirements as specified in Subsection **701.12**.

307.04 Soil. The soil for the cement stabilized earth base course shall consist of natural material in the roadbed, hauled in material or a combination of these materials proportioned as directed. Hauled-in material shall meet the requirements for Sand-Clay in Section **303**, unless otherwise provided. Unless otherwise specified in the proposal, the Contractor shall furnish all soil and no payment for overhaul or for purchase of the soil will be made. The soil shall be free of roots, sod, weeds, or other deleterious materials. Samples shall be submitted to the Research and Materials Laboratory for approval of materials and for determining the correct cement content at least thirty (30) days prior to beginning construction of the cement stabilized earth base course.

307.05 Bituminous Material. The material for the bituminous curing coat shall be MC-30, RC-30 RS-2, CRS-2, or EA-P Special and shall meet the requirements as set forth for bituminous materials in Section **406**.

CONSTRUCTION REQUIREMENTS

307.06 Weather Limitations. No cement shall be applied unless the temperature is above 40°F in the shade and rising. The work shall not be performed on a frozen or excessively wet subgrade.

307.07 Preparation of the Existing Roadbed. Before any stabilizing operations are started, the existing roadway shall be graded and shaped to conform to the lines, grades and

cross-sections required. Additional soil needed shall be placed as the Engineer may direct and any unsuitable material shall be removed and replaced with suitable material.

The subgrade shall be firm and shall support the construction equipment without displacement. The subgrade must be compacted as specified. Soft or yielding subgrade shall be corrected and made stable before construction proceeds.

When the stationary plant method of mixing is specified, the subgrade shall be constructed in accordance with the requirements of Section **208**.

307.08 Conditioning of Base Course Materials. The base course materials shall be pulverized so that at the completion of the moist mixing, 100%, by dry weight, passes the 1 1/2 inch sieve, and a minimum of 80% passes the No. 4 sieve exclusive of gravel and stone retained on the sieve.

During mixing operations, the moisture content of the soil shall not exceed the amount that will permit a uniform and intimate mixture of the soil and cement. It shall not exceed the optimum moisture content of the mixture by more than two percentage points.

307.09 Mixing and Placing Materials. Unless otherwise provided, the base course shall be mixed by the stationary plant method. The road mix method may be used when so specified in the proposal form. The quantity of portland cement to be added to the soil will be a percentage by weight of the dry soil and shall be at the rate directed by the Engineer with the tolerance hereinafter specified.

A. Stationary Plant Method. The soil, cement, and water shall be mixed in a pugmill, either of the batch or continuous-flow type. The plant shall be equipped with feeding and metering devices that will add soil, cement, and water into the mixer in the specified quantities. In all

plants, the weight or rate of feed of the cement shall be within 5% of the amount designated by the Engineer. Mixing shall continue until a uniform, homogeneous mixture is obtained. The Engineer may increase the mixing time when necessary to secure a proper blend of the different materials.

The mixture shall be hauled to the roadway in trucks with protective covers. The mixture shall be placed on a moist subgrade in a uniform layer by an approved spreader. The layers shall be of such contour and thickness that the completed base course will conform to the required grade and cross-section. Dumping of the mixture in piles or windrows will not be permitted.

Not more than thirty (30) minutes shall elapse between the placement of the base course mixture in adjacent lanes except at longitudinal construction joints. Not more than sixty (60) minutes shall elapse between the start of moist mixing and the start of compaction.

B. Road Mix Method. Before the application of portland cement, the roadway to be stabilized shall be loosened and pulverized to the required base course width and to sufficient depth to give the compacted thickness shown on the plans. The loosened soil then shall be shaped to the approximate line and grade shown on the plans.

Portland cement shall be spread over the loosened roadway at the rate established by the Research and Materials Laboratory. This rate will be established in the laboratory using samples representative of the material to be stabilized.

The cement shall be spread with equipment that can be calibrated and adjusted so that the established rate will be attained uniformly throughout the length and width of the roadway.

The spreading equipment shall have adjustable openings or gate headers and will not be solely dependent on vehicle speed to obtain the required spread rate. A tolerance of $\pm 5\%$ will be allowed in the spread rate for individual sections of roadway; however, adjustments should be made in order to keep the actual spread rate as close as possible to that established by the Research and Materials Laboratory. Equipment other than that used in the spreading and mixing will not be allowed to pass over the freshly spread cement.

Immediately after the cement is spread, it shall be mixed with the loosened soil for the full depth of the stabilization. Care must be exercised to avoid mixing below the desired depth. Mixing shall be accomplished by the use of an approved road mixing machine. Disc harrows, road graders, and other equipment may only be used to supplement the mixing done by the approved road mixer. Sufficient passes of the mixing equipment shall be made to insure a homogeneous mixture that is uniform in appearance.

The moisture content of the soil and cement mixture shall be determined upon completion of the mixing operation and, if required, water shall be added as directed. Water supply and distribution equipment shall be available that will permit the continuous application within three (3) hours of all the water required on the section of base course being processed. The water shall be added into the mix in such a manner as to avoid a concentration of water near the surface.

After all necessary water has been added, mixing shall be continued until the water is uniformly distributed throughout the base course. Particular care shall be exercised to insure satisfactory moisture distribution along the edges of the section. When the moist mixing is complete, the percentage of moisture in the mixture shall not be below or more than two percentage points above the speci-

fied optimum moisture. In no case shall the moist mixture be allowed to remain undisturbed for more than thirty (30) minutes before compaction is started.

307.10 Compaction. Before the beginning of the compaction, the mixture shall be in a loose condition for its full depth and then shall be uniformly compacted. Compaction shall continue until the entire depth of the base course mixture is uniformly compacted to not less than 95% of the maximum density. The maximum density of the composite mix shall be determined by AASHTO T 134, SC-T-25 or SC-T-29. Should tests show that the 95% requirement is not being met, the Contractor shall adjust his construction operations to obtain the required density. Compaction work shall be completed within a period of two (2) hours from the initial rolling.

After the mixture is compacted, the surface of the base course shall be reshaped as necessary to conform to the required lines, grades, and cross-section. Light scarifying may be required to obtain a uniform surface and prevent scaling.

The surface shall be thoroughly compacted and finished by rolling with an approved smooth wheel tandem roller, pneumatic-tired roller or other means satisfactory to the Engineer. Rolling shall be supplemented by broom dragging when required. The compacting and finishing shall be done in such a manner as to produce a smooth, closely knit surface, free from equipment imprints, cracks, ridges or loose material. The moisture content of the surface material shall be maintained within two percentage points of the specified optimum moisture content during finishing operations.

307.11 Construction Joints. At the end of each day's construction, a straight transverse construction joint shall be formed by cutting back into the completed work to form a true vertical face. The base course for large wide areas shall be built in a series of parallel lanes of convenient length and width meeting the approval of the Engineer. Straight longitudinal joints shall be formed at the edge of each day's con-

struction by cutting back into the completed work to form a true vertical face free of loose or shattered materials.

307.12 Construction Limitations. The area over which the cement or soil and cement mixture is spread shall be limited in order that all operations specified in Subsections **307.09** and **307.10** can be continuous and all work completed within daylight hours, unless adequate artificial light is provided and within six (6) hours after the application of water to the soil and cement mixture when scarifying is required, otherwise all work shall be completed within three (3) hours.

If operations are interrupted for a continuous period of greater than two (2) hours after the cement has been mixed with the soil, the entire section thus affected shall be reconstructed in accordance with these specifications. When the uncompacted mixture of soil and cement is wetted so that the moisture content exceeds that specified, it may be manipulated and aerated to reduce the moisture to the specified content, provided the base course can be completed within the time limits of these specifications.

307.13 Reconstruction. If the construction of the base course is proceeding with the approval of the Engineer and the un-compacted soil and cement mixture is wetted by rain so that the moisture exceeds that allowed and cannot be reduced to the specified moisture within the time limits of these specifications, the Contractor will be paid for the additional cement used in reconstructing the section. If the reconstruction of any section is made necessary by the negligence or omission of the Contractor or unsatisfactory performance of his equipment, or if any section does not comply with the allowable variation in thickness, the Contractor will be required to reconstruct the section without additional compensation.

307.14 Surface Smoothness. The finished surface of the base course shall not vary more than 3/8 inch from a straight edge 10 feet long when applied parallel to the centerline of the road, nor more than 1/2 inch from the typical cross-section shown on the plans.

The finished surface of the base course shall not be disturbed after the final finishing and compaction. The removal of random knots will not be permitted after the base course has hardened. Where low areas or depressions result in the finished surface of the base course, the same material that the base course is to receive as the next component of the pavement structure shall be used in truing-up the finished surface, except in cases when the same material is considered unsatisfactory, the Engineer may specify the material to be used. Such corrective work and materials shall be performed by the Contractor without any additional compensation.

307.15 Tolerance in Base Course Thickness. The thickness of the completed base course shall be measured at staggered intervals not to exceed 250 feet in length for two-lane roads. The depth measurements shall be made by test holes through the base course. Where the base course is deficient by more than 1/2 inch, the Contractor shall correct such areas. Where the measured thickness is more than 1/2 inch thicker than shown on the plans, it shall be considered as the specified thickness, plus 1/2 inch. The average job thickness shall be the average of the depth measurements determined as specified above. Should this average thickness be more than 1/4 inch below the specified thickness, an adjusted unit price shall be used in payment. This adjusted unit price shall bear the same ratio to the contract unit price as the average thickness bears to the specified thickness.

When the contract includes more than one road, each road shall be considered separately.

307.16 Curing Coat. After the base course has hardened, but not later than twelve (12) hours after the completion of finishing operations, a bituminous curing coat, as specified in Subsection **307.05**, shall be applied at a rate of 0.15 to 0.20

gallons per square yard of residual asphalt. The finished soil-cement shall be kept continuously moist until the curing coat is applied. At the time the bituminous material is applied, the base course surface shall be dense, free of all loose and extraneous material and shall contain sufficient moisture to prevent penetration by the bituminous material.

The Engineer may, at his discretion, depending upon temperature and weather conditions, permit the application of the curing coat, on base course that is placed and completed during the latter portion of a day, to be deferred until the early part of the following day.

307.17 Opening to Traffic. Unless otherwise directed by the Engineer, the Contractor shall furnish such personnel and barricades along with other devices necessary to prevent construction equipment or other traffic, regardless of the type vehicle or its reason for being on the project, from using the finished base course. The subgrade shoulders or completed pavement, when available, shall be used in transporting materials, men and equipment throughout the length of the project. The finished base course may be crossed at locations designated by the Engineer after the seven (7) day curing period. Such designated crossing shall be covered with at least 8 inches of earth as protection of the completed base course. When the paving operation is commenced, the completed section of the base course may be opened to light construction equipment for a distance not to exceed 1000 feet in advance of the paving work after the seven day curing period has elapsed. When necessary to provide for normal traffic, the Engineer may permit use of the base course for such purposes. Should the bituminous material for the curing coat not be sufficiently dry to prevent pickup when the base course is opened to traffic as outlined above, a granular cover shall be applied before opening.

307.18 Maintenance. The Contractor shall maintain the entire base course, during and after the curing period, within the limits of his contract, in a good and satisfactory condition from

the time he first starts work until the work is completed and accepted. Maintenance shall include the immediate repairs of any defects that may develop. Should any repairs or patching be necessary, they shall extend to the full depth of the base course and shall be made in a manner that will insure the restoration to a uniform and durable base course.

307.19 Method of Measurement.

A. Cement Stabilized Earth Base Course. Cement Stabilized Earth Base Course, complete in place with curing coat and accepted, will be measured by the square yard along the surface of the base course. Materials placed outside the designated area will not be measured for payment.

When the contract does not contain a unit price for a thickness of base course, the base course for which there is no unit price shall be converted to equivalent square yards of base course for which there is a contract unit price. The conversion shall be based on the base course whose thickness is nearest that of the base course in question.

B. Portland Cement for Cement Stabilized Earth Base Course. The quantity of portland cement shall be the number of tons of portland cement accepted and used in the work. Portland cement used in excess of 5% of the amount specified will not be measured for payment.

The quantity of portland cement will be determined by scale weights or by delivered weights. The Contractor shall furnish the Engineer invoices of all cement received.

When the stationary plant method of mixing is used, the quantity of portland cement may be determined by calculating the weight of the composite mix using the actual dry density of the mix for a given area, the depth of the base course specified in the plans, constructed within

the tolerance specified in Subsection **307.15** and the percent cement placed in the mix not in excess of 5% of the amount specified.

C. Unstable Material. Any unsuitable soil removed and replaced and any additional soil required for the base course in accordance with Subsection **307.07** shall be measured in accordance with Section **203**.

307.20 Basis of Payment.

A. Cement Stabilized Earth Base Course. The base course measured as provided in Subsection **307.19A** will be paid for at the contract unit price for Cement Stabilized Earth Base Course with curing, which price and payment shall be full compensation for furnishing all materials (except portland cement), tools, equipment, labor, maintenance, and incidentals necessary to complete the work described.

Base course that is deficient in thickness will be paid for at the reduced unit price as provided in Subsection **307.15**.

B. Portland Cement for Cement Stabilized Earth Base Course. Portland cement measured as provided in Subsection **307.19B** will be paid for at the contract unit price for Portland Cement for Cement Stabilized Earth Base Course, which price and payment shall be full compensation for the material accepted and used in the work as described in this Section.

C. Unclassified Excavation. Any unsuitable soil removed and replaced and any additional soil required and measured in accordance with Subsection **307.19C** will be paid for at the contract unit price for Unclassified Excavation.

Payment for each item includes all direct and indirect costs or expenses required to complete the work.

Payment will be made under:

Item No.	Pay Item	Pay Unit
30710XX	Cement Stabilized Earth Base Course (<i>thickness</i>)" Uniform)	Square Yard
3072000	Portland Cement for Cement Stabilized Earth Base Course	Ton

SECTION 308

CEMENT STABILIZED AGGREGATE BASE COURSE

308.01 Description. This work shall consist of the construction of a base course composed of aggregates and portland cement uniformly mixed, moistened, shaped, and compacted, and application of a curing coat in accordance with these specifications. The completed base shall conform to the typical cross-section shown on the plans and to the lines and grades furnished by the Engineer.

MATERIALS

308.02 Portland Cement. Portland cement shall meet the requirements as specified in Subsection **701.02** of these specifications except that the allowable maximum alkali content ($\text{Na}_2\text{O}+0.658\text{K}_2\text{O}$) is increased to 1.0%.

308.03 Water. Water shall meet the requirements as specified in Section **701.12**.

308.04 Aggregate. The aggregate shall meet the requirements of macadam base course or marine limestone as specified in Section **305**. Samples shall be submitted to the Research and Materials Laboratory for approval of materials