

**Georgia Department of Transportation
State of Georgia**

Special Provision

Section 301—Soil Cement

Retain Section 301 and add the following:

Section 301—Cement Stabilized Reclaimed Base Construction

301.1 General Description

This work includes constructing a cement stabilized base course by pulverizing the existing pavement structure and mixing with Portland cement to the depth specified on the plans. Construct according to these Specifications and to the lines, grades, thickness, and typical cross-sections shown on the Plans or established by the Engineer.

301.1.01 Related References

A. Standard Specifications

[Section 412—Bituminous Prime](#)

[Section 800—Coarse Aggregate](#)

[Section 814—Soil Base Materials](#)

[Section 821—Cutback Asphalt](#)

[Section 830—Portland Cement](#)

[Section 880—Water](#)

B. Referenced Documents

General Provisions 101 through 150

GDT Test Methods			
GDT 19	GDT 21	GDT 65	GDT 86
GDT 20	GDT 59	GDT 67	

301.1.01 Submittals

Before constructing a test section according to Subsection 301.3.04.E.1, submit a Construction Work Plan to the Engineer. Include proposed equipment and proposed compaction procedures. If the Engineer determines that the Work Plan is not satisfactory, revise the compaction procedure and augment or replace equipment, as necessary, to complete the Work.

301.2 Materials

Ensure that materials meet the requirements of the following Specifications:

Material	Section
Blotter material (sand)	412.3.05.G.3
Coarse Aggregate	800
Soil Base Material	814.2.02

Section 301—Cement Stabilized Reclaimed Base Construction

Cutback asphalt, RC-30, RC-70, RC-250 or MC-30, MC-70, MC-250	821.2.01
Portland Cement (Type I or Type II)	830.2.01
Water	880.2.01

301.3 Construction Requirements

301.3.01 Personnel

Ensure that only experienced and capable personnel operate equipment.

301.3.02 Equipment

Use equipment that has been approved by the Engineer before construction begins. Provide equipment in satisfactory condition capable of continuously mixing materials (pavement structure, soil, water, and cement) to a consistent depth. Use equipment capable of providing a homogenous blend.

301.3.03 Preparation

Loosen and pulverize the in-place pavement structure to the width and depth to be stabilized without damaging the underlying materials. Add water to assist pulverization if necessary.

301.3.04 Construction

A. Weather Limitations

1. Mix cement-stabilized base only when the weather permits the course to be finished without interruption within the time specified.
2. Mix materials only when the moisture of the materials to be used in the mixture meets the specified limits.
3. Begin mixing only when the air temperature is above 40°F (4°C) in the shade and rising.
4. Ensure that the temperature of the pavement course and underlying materials are above 50°F (10°C).
5. If the work is interrupted for more than two hours after cement has been added, or if rain increases the cement's moisture content outside the specified limits, remove and replace the affected portion at no additional cost to the Department.

B. Moisture Adjustment

Adjust the moisture content of the roadway materials to within 100 to 120 percent of the optimum moisture immediately before spreading the cement. The optimum moisture content is determined by the Job Mix Design and can be adjusted by the Engineer.

C. Cement Application

1. Uniformly spread the required amount of Portland cement with a cyclone-type mechanical spreader or its equivalent. Do not use pneumatic tubes to transfer the cement from the tanker directly onto the material to be stabilized.
2. Apply cement at the rate specified on the Job Mix Design (as established by GDT-65) and mix to the depth shown on the Plans. The Engineer may alter the spread rate during the progress of construction if necessary. Maintain the application rate within ± 10 percent of that specified by the Engineer.
3. Provide both equipment and personnel to measure the application rate of cement placed.
4. Apply cement on days when wind will not interfere with spreading.
5. If the cement content is below the 10 percent limit in the mixing area, add additional cement to bring the affected area within the tolerance specified and recalibrate the mechanical spreader's spread rate. If the cement content is more than the 10 percent limit in the mixing area, the excess quantity will be deducted from the Contractor's pay for cement.

Section 301—Cement Stabilized Reclaimed Base Construction

6. Regulate operations to limit the application of cement to sections small enough so that all of the mixing, compacting, and finishing operations can be completed within the required time limits.
7. Pass only spreading and mixing equipment over the spread cement and operate this equipment so that it does not displace cement.
8. Replace damaged cement at no cost to the Department when damage is caused by:
 - Hydration due to rain, before or during mixing operations.
 - Spreading procedures contrary to the requirements stated above.
 - Displacement by the Contractor's equipment or other traffic.
9. Do not spread cement on any areas that "pump" under construction traffic.

D. Mixing

1. Begin mixing as soon as possible after the cement is spread, and continue until a homogeneous and uniform mixture is produced. Make any necessary changes to meet the Engineer's requirements if the equipment does not produce a homogeneous and uniform mixture conforming to these Specifications.
2. Continue pulverizing until the base mixture is uniform in color and conforms to the following gradation requirements
 - 95 percent passing the 2 inch (50mm) sieve
 - 55 percent of the roadway material, excluding gravel, passes the No. 4 (4.75mm) sieve.
3. Add water as needed to maintain or bring the moisture content to within the moisture requirements immediately after the preliminary mixing of the cement and roadway material.
4. Mix the additional water homogeneously into the full depth of the mixture.

E. Compaction and Finishing

1. Test Section
 - a. Use the first section of each constructed cement-stabilized base course as a test section.
 - b. Construct a test section between 350 feet (100m) and 500 feet (150m) long at the designated width.
 - c. The Engineer will evaluate compaction, moisture, homogeneity of mixture, thickness of stabilization, and finished base surface. If the Engineer deems necessary, revise the compaction procedure or augment or replace equipment.
2. Time Limits
 - a. Begin compaction within 45 minutes from the time water is added to the cement mixture.
 - b. Complete compaction within 2 hours.
 - c. Complete all operations within 4 hours, from adding cement to finishing the surface.
 - d. Do not perform vibratory compaction on materials more than 90 minutes old, measured from the time cement was added to the mixture.
3. Moisture Control

During compaction, ensure that the moisture is uniformly distributed throughout the mixture at a level of between 100 and 120 percent of the optimum moisture content.
4. Compaction Requirements
 - a. Use a sheep's foot or steel wheel roller for initial compactive effort unless an alternate method is approved by the Engineer.
 - b. Compact the cement-stabilized base course to at least 98 percent of the maximum dry density established on the Job Mix Design.
 - c. Uniformly compact the mixture and then shape to the grade, line, and cross-section shown on the Plans.
 - d. Remove all loosened material accumulated during the shaping process. Do not use additional layers of cement-treated materials in order to conform to cross-sectional or grade requirements.

Section 301—Cement Stabilized Reclaimed Base Construction

- e. Use a pneumatic-tired roller to roll the finished surface until it is smooth, closely knit, and free from cracks or deformations, and conforming to the proper line, grade, and cross-section.
- f. In places inaccessible to the roller, obtain the required compaction with mechanical tampers approved by the Engineer. Apply the same compaction requirements as stated above in Subsection 301.3.04.E.4.
- g. Perform grading operations immediately after the placement and compaction operations. Roll the stabilized base course again with a pneumatic-tired roller.

F. Construction Joints

1. Form a straight transverse joint at the end of each day's construction or whenever the Work is interrupted.
2. Create the straight transverse joint by cutting back into the completed Work to form a true vertical face free of loose or shattered material.
3. Form the joint at least 2 feet (600mm) from the point where the spreader strike-off plate comes to rest at the end of the day's work, or at the point of interruption.
4. Form a longitudinal joint as described above if cement-stabilized mixture is placed over a large area where it is impractical to complete the full width during one day's work. Use the procedure for forming a straight transverse joint. Remove all waste material from the compacted base.

G. Priming the Base

1. Apply bituminous prime according to [Section 412](#) as soon as possible and in no case later than 24 hours after completion of the finishing operations.
2. Apply prime only to an entirely moist surface. If weather delays prime application, apply prime as soon as the surface moisture is adequate.
3. Maintain and protect the curing seal for seven days.
4. Protect finished portions of the cement-stabilized base course that are used by equipment in the construction of an adjoining section to prevent marring or damaging of the completed Work. Protect the stabilized area from freezing during the curing period.

H. Opening to Traffic

1. Do not permit any traffic or equipment on the finished surface of the base course until the prime has hardened enough so that it does not pick up under traffic. For the first seven days after priming, restrict traffic to lightweight vehicles such as passenger cars and pickup trucks. Do not allow vehicles with an average axle load exceeding 20,000 pounds (9Mg) on the unfinished base at any time.
2. Correct any failures caused by traffic at no additional cost to the Department.

I. Protection of Course

Maintain the base course until the Engineer determines that it has sufficiently cured and is ready to be covered with the pavement course. Make repairs specified in Subsection 300.3.06.B, whenever defects appear. This preservation action does not relieve the Contractor of his responsibility to maintain the Work until final acceptance as specified in Section 105.

301.3.06 Quality Acceptance

A. Compaction Tests

1. Determine the maximum dry density from representative samples of compacted material, according to GDT 19 or GDT 67.
2. Determine the in-place density of finished courses according to GDT 20, [GDT 21](#) or [GDT 59](#), as soon as possible after compaction, but before the cement sets.

B. Gradation Test

Ensure that the gradation of the completely mixed cement-stabilized base course meets the requirements of Subsection 301.3.04.D.2.

C. Finished Surface

Check the finished surface of the cement-stabilized base course transversely.

1. Check the surface using a 15 ft (4.5 m) straightedge parallel to the centerline.

Section 301—Cement Stabilized Reclaimed Base Construction

Additionally, use one of the following tools:

- A template, cut true to the required cross-section and set with a spirit level on non-superelevated sections
 - A system of ordinates, measured from a stringline
 - A surveyor's level
2. Ensure that ordinates measured from the bottom of the template, stringline, or straightedge, to the surface do not exceed 1/4 in (6 mm) at any point. Rod readings shall not deviate more than 0.02 ft (6 mm) from required readings.
 3. Correct any variations from these requirements immediately according to [Subsection 300.3.06.B, "Repairing Defects."](#)

C. Thickness Tolerances

1. Thickness Measurements

Determine the thickness of the cement-stabilized base course, by making as many checks as necessary to determine the average thickness, but not less than one check per 1000 feet (300m) per 2 lanes.

2. Excess Thickness

- a. Determine the average thickness per linear mile (kilometer) from all measurements within each mile (kilometer) increment.
- b. Ensure that the average thickness does not exceed the specified thickness by more than ½ in (13 mm).
- c. If the basis of payment is per cubic yard (meter), and the average thickness for any mile (kilometer) increment exceeds the allowable ½ in (13 mm) tolerance, the excess quantity in that increment will be deducted from the Contractor's payments.
- d. The excess quantity is calculated by multiplying the average thickness that exceeds the allowable ½ in (13 mm) tolerance by the surface area of the base, as applicable.

E. Strength

1. Ensure that the strength of the completed cement-stabilized base course is at least 300psi (2070kPa), as determined from testing the unconfined compressive strength of cores from the completed course in accordance with GDT 86.
2. If a strength test falls below 300psi (2070kPa), do the following:
 - a. Isolate the affected areas by securing additional cores every 75 feet (23m) on each side of the failing area.
 - b. Average all compressive strengths in the affected area to determine the basis for corrective work according to the following table or the Engineer's directions.

Compressive Strength	Corrective Work
300 psi (2070 kPa) or greater	None
200 psi (1380 kPa) to 299 psi (2069 kPa)	6" & 8" (150mm & 200mm) base – add 135lbs/yd ² (75kg/m ²) asphaltic concrete
Less than 200 psi (1380kPa)	Reconstruct affected area
<i>Notes:</i> <ol style="list-style-type: none"> 1) <i>Ensure that a corrected area requiring asphaltic concrete is at least 150ft (45m) long and covers the full width of the cement-stabilized base surface.</i> 2) <i>Perform corrective work requiring asphaltic concrete or reconstruction at no additional cost to the Department.</i> 	

301.4 Measurement

A. Base Material

Measure base material by the cubic yard (meter), loose volume, as specified in Section 109, during mixed-in-place construction when it is necessary to add materials to the roadbed or to build up the base with new material.

B. Cement-Stabilized Base Course

Section 301—Cement Stabilized Reclaimed Base Construction

Measure the surface length along the centerline when payment is specified by the square yard (meter). The width is specified on the Plans. Measure irregular areas, such as turnouts and intersections, by the square yard (meter).

C. Portland Cement

Measure Portland cement by the ton (megagram).

D. Bituminous Prime

Bituminous prime is not measured for separate payment. Include the cost of furnishing and applying bituminous prime according to the provisions of Section 412 in the Unit Price Bid for each individual base item.

E. Coarse Aggregate

Measure coarse aggregate by the ton (megagram).

301.5 Payment

A. Base Material

When it is necessary to add other materials to those in the roadbed, or to build up the base with entirely new materials, the added base materials, will be paid for at the Contract Unit Price per square yard (meter), complete, in place, and accepted. Payment will be full compensation for soil-cement material, mixing in the pit, loading, unloading, and spreading.

B. Cement-Stabilized Base Course

Cement-stabilized base, in-place and accepted, will be paid for at the Contract Unit Price per square yard (meter). Payment will be full compensation for roadbed preparation, mixing on the road, shaping, pulverizing, watering, compaction, defect repair, and maintenance.

C. Portland Cement

Portland cement will be paid for at the Contract Unit Price per ton (megagram). Payment is full compensation for furnishing, hauling, and applying the material. Only Type I or Type II Portland cement incorporated into the finished course will be paid for and no payment will be made for cement used to correct defects due to the Contractor's negligence, faulty equipment, or error.

D. Coarse Aggregate

Coarse aggregate will be paid for at the Contract Unit Price per ton (megagram). Payment is full compensation for furnishing, hauling, spreading, watering, shaping, and compacting the material.

Payment will be made under:

Item No. 301	Base—including material	Per cubic yard (meter)
Item No. 301	Cement Treated Base Course	Per square yard (meter)
Item No. 301	Type I or Type II Portland Cement	Per ton (megagram)
Item No. 800	Coarse Aggregate – including material	Per ton (megagram)