Revised: June 27, 2007

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

SUPPLEMENTAL SPECIFICATION

Section 209—Subgrade Construction

1.1 Scope

This work includes placing, mixing, compacting, and shaping the top 6 in (150 mm) or the Plan-indicated thickness of the roadbed in both excavation and embankment areas through traditional means or through the use of the use of GPS controlled equipment.

This work also includes subgrade stabilization, select material subgrade, and shoulder stabilization.

1.1.01 Definitions

General Provisions 101 through 150.

1.1.02 Related References

A. Standard Specifications

Section 109—Measurement and Payment

Section 412—Bituminous Prime

Section 803—Stabilizer Aggregate

Section 810—Roadway Materials

Section 815—Graded Aggregate

B. Referenced Documents

GDT 7

GDT 20

GDT 21

GDT 24a

GDT 24b

GDT 59

GDT 67

1.1.03 Submittals

General Provisions 101 through 150.

1.2 Materials

A. Subgrade Materials

If the Plans do not show the source of material for subgrade, the Engineer will direct the Contractor according to the Specifications, or implement a Supplemental Agreement to ensure a satisfactory subgrade.

If the existing roadway excavation or borrow materials are not suitable or available for stabilizing the subgrade, use the quantity of stabilizer materials defined below in Subsection 223.2.B.

B. Subgrade Stabilizer Materials

Material	Section
Type I Stabilizer Aggregate	803.2.01
Type II Stabilizer Aggregate	803.2.02
Class IIB3 or Better Soil	810.2.01.A.1
Type III Stabilizer Aggregate	803.2.03
Type IV Stabilizer Sand	803.2.04

C. Select Material Subgrade

Material	Section
Class IIB3 or Better Soil	810.2.01.A.1
Graded Aggregate	815

D. Shoulder Stabilization

Material	Section
Shoulder Stabilization	803.2.02, Type II

1.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

1.3 Construction Requirements

1.3.01 Personnel

General Provisions 101 through 150.

1.3.02 Equipment

GPS Equipment needed to construct subgrade should include but is not limited to:

1. Department-reviewed and issued electronic files that contain all data needed to construct the project. These files will be issued in the Department's standard format; it is the responsibility of the Contractor to ensure the files compatibility with the Contractor's GPS equipment.
2. Fixed or movable base station setup at a known location on the project to serve as a point of reference for the project. As the project progresses, the movable base station shall be moved for proper system function. If the base station is at a fixed location, radio repeaters may be utilized to ensure the signals from the base station are received throughout the project.
3. A GPS sensor mounted atop a mast that is fixed to the blade attachment of a motor grader. The masts may be arranged in a dual mast setup with a mast on each end of the blade attachment or in a lone mast setup. The sensor will be able to receive signals from the base station and/or a laser transmitter.
4. A blade position sensor mounted on the motor grader's circle that can detect blade attitude and elevation of the motor grader blade and that can relay this information to the motor grader operator. Blade attitude is defined as the orientation of the blade with respect to the three spatial axes in relation to a reference plane.

5. An operator-visible display mounted in the cab of the motor grader that allows the operator to visually receive all necessary data in real-time from the GPS system and the motor grader to properly construct the subgrade. The display will also reflect any changes made by the operator to any operation of the motor grader blade.
6. The Engineer can require the use of a laser transmitter if the conformity to the cross sections with the prior listed equipment is unsatisfactory to the Department. A laser transmitter is to be placed not farther than 800 feet (244 m) from the motor grader(s) intended to be assisted by use of the laser transmitter. Projects that have work progressing in different work sites more than 800 feet (244 m) apart necessitate the use of more than one laser transmitter to ensure accuracy required in Subsection 1.3.06. When selecting a location for setting up the laser transmitter, the Contractor should select a location that has a change in elevation of 25 feet (7.62 m) or less from the laser transmitter to the sensor mounted on the mast of the motor grader. If project geography necessitates the use of more than one laser transmitter, the setup of the transmitters needs to be such that the elevation difference between two consecutive transmitters in an array is not more than 25 feet (7.62 m); and this array cannot exceed a total change in elevation of 100 feet (30.5 m).

1.3.03 Preparation

General Provisions 101 through 150.

1.3.04 Fabrication

General Provisions 101 through 150.

1.3.05 Construction

A. Subgrade Construction

Construct subgrade as follows:

1. Plow, harrow, and mix the entire surface of the in-place subgrade to a depth of at least 6 in (150 mm).
2. After thoroughly mixing the material, bring the subgrade to Plan line and grade and compact it to 100 percent of the maximum laboratory dry density.
3. If the subgrade needs to be stabilized, or if a subsequent contract provides for base construction, do not apply density requirement at this stage.

   If a subsequent Contract provides for base construction, eliminate mixing and compact the in-place subgrade to 95 percent of the laboratory maximum dry density.
4. Ensure that the subgrade can firmly support construction equipment before placing subsequent layers of base and paving materials. The subgrade must support construction equipment without excessive movement regardless of compaction.
5. Rework unstable areas of subgrade to a moisture content that will provide stability and compaction. The Engineer may direct the Contractor to proof roll the subgrade with a loaded dump truck.
6. Compact the subgrade using a sheepsfoot roller.

   Where the subgrade soils are predominantly sands, the Engineer may permit the use of vibratory rollers.

B. Subgrade Stabilization

Construct a stabilized subgrade according to Plans or as directed:

1. Undercut and dispose of the amount of subgrade material that will be displaced with the aggregate or selected material according to the Engineer's direction.
2. Leave material off the subgrade in fill sections requiring stabilization.
3. Place the amount of material specified in Subsection 209.2.B. on the subgrade as specified on the Plans or established by the Engineer.
4. Thoroughly incorporate the material into the existing subgrade to a depth of 6 in (150 mm), or as indicated on the Plans. Plow, disk, harrow, blade, and then mix with rotary tillers until the mixture is uniform and homogeneous throughout the depth to be stabilized.
5. Finish the stabilized subgrade to the Plan line, grade, and cross-section. Compact it to 100 percent of the maximum laboratory dry density as defined in Subsection 209.3.06.

Plant mixing is permitted as an alternative to the mixed-in-place method.

6. Eliminate the mixing and scarifying method before compaction in undercut areas where Type III Stabilizer Aggregates are specified, unless otherwise specified by the Engineer.

C. Select Materials Subgrade

Place select materials as follows:

1. Place a uniform blanket of select material consisting of Class I or II soil or graded aggregate on the prepared subgrade (according to Plan dimensions or as directed by the Engineer).
2. Use the select material reserved from the grading or borrow operations. If material is not available through this source, obtain it from other sources.
3. Finish and compact the material according to Subsection 209.3.05.A.

D. Shoulder Stabilization

Stabilize the shoulder as follows:

1. Spread the stabilizer aggregate at the rate and to the dimensions indicated on the Plans.
2. Mix the aggregate with the in-place shoulder material thoroughly to the Plan depth.
3. Compact the area thoroughly and finish it to Plan dimensions.
4. Prime the stabilized area according to Section 412 when a paving course is required on the shoulders.

E. Finishing Subgrade

When finishing subgrade use the following procedure:

1. Leave the underlying subgrade in cuts and fills low enough to accommodate the additional material when the work requires either subgrade stabilization, select material subgrade, or stabilization for shoulders.
2. Test short sections in curb and gutter areas might be necessary to obtain the proper elevation.
3. Blade the surface of the completed subgrade to a smooth and uniform texture.

1.3.06 Quality Acceptance

The Department will test representative samples of compacted material to determine the laboratory maximum dry density using GDT 7, GDT 24a, or GDT 67 as applicable.

The Department will determine in-place density of the compacted subgrade according to GDT 20, GDT 21, or GDT 59, as applicable.

Ensure that the centerline profile conforms to the established elevations with an acceptable tolerance of ±0.5 in (±13 mm). The acceptable tolerance under a template conforming to the designated cross section shall be ±0.25 in (±6 mm). To ensure acceptance, conformity to the cross section will be verified by the Engineer every 300 feet for English projects or 100 meters for Metric projects.

Have the Department test the maximum dry density using methods according to Subsection 209.3.05.A. When base construction is not in the same Contract, the tolerances may be 1 in (25 mm), 0.5 in (13 mm), and 95 percent respectively.

1.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

1.4 Measurement

A. Subgrade Construction and Finishing Subgrade

The Department will make no separate measurement or payment for the work described in this Section.

B. Subgrade Stabilization

Subgrade stabilization materials, as defined in Subsection 209.3.05.B is measured by the ton (megagram), cubic yard (meter), or square yard (meter) of the specified thickness if none of the existing Roadway Excavation and/or Borrow Materials are suitable and available for stabilizing the subgrade.

C. Select Material Subgrade

Select materials, conforming to Subsection 209.3.05.C are measured by the cubic yard (meter) in the hauling vehicle, per ton (megagram) according to Subsection 109.01, or by the square yard (meter) of the specified thickness when roadway excavation and/or borrow materials are not available or suitable for this Item.

D. Shoulder Stabilization

Shoulder stabilization is measured by the cubic yard (meter) or ton (megagram) as specified in Subsection 209.4.B.

1.4.01 Limits

General Provisions 101 through 150.

1.5 Payment

A. Subgrade Construction

The Department will make no separate payment for subgrade construction or for finishing subgrade.

B. Subgrade Stabilization

Subgrade stabilization complete and accepted according to Subsection 209.3.05.B will be paid for at the Contract Unit Price per cubic yard (meter), per ton (megagram), or per square yard (meter). This price is full compensation for furnishing the materials, hauling, placing, mixing, compacting, and finishing the stabilized subgrade.

C. Select Material Subgrade

Select material complete, accepted, and measured according to Subsection 209.4.C will be paid for at the Contract Unit Price per cubic yard (meter), per ton (megagram), or per square yard (meter). This price is full compensation for furnishing the material where required, hauling, placing, mixing, compacting and finishing the select material subgrade.

D. Shoulder Stabilization

This Item will be measured by Subsection 209.4.B. and paid for according to Subsection 209.5.B. This Item also includes furnishing and applying bituminous prime.

Payment will be made under:

Item No. 209	Stabilizer materials (class), (type), (thickness)	Per ton (megagram), cubic yard (meter), or square yard (meter)
Item No. 209	Select material subgrade (class), (type), (thickness)	Per ton (megagram), cubic yard (meter), or square yard (meter)
Item No. 209	Stabilizer aggregate for shoulders	Per ton (megagram), or cubic yard (meter)

1.5.01 Adjustments

General Provisions 101 through 150.