shall be at least 98 percent of the mean density obtained in the approved control strip. In addition, each individual test value obtained within a test section shall be at least 95 percent of the mean density obtained in the approved control strip.

(b) **Shoulders:**

1. **Aggregate shoulders:** The density of each test section of select or aggregate material used in the construction of shoulders will be evaluated based on the results of five tests performed at randomly selected sites within the test section. The mean density obtained for the five tests in each test section shall be within 95 ± 2 percent of the mean density obtained in the approved control strip. In addition, each individual test value obtained in a test section shall be within 95 ± 5 percent of the mean density obtained in the approved control strip.

2. **Asphalt shoulders:** The density of each test section of asphalt concrete used in the construction of shoulders will be evaluated based on the results of five tests performed at randomly selected sites within the test section. The mean density obtained for the five tests in each test section shall be at least 98 percent of the mean density obtained in the approved control strip. In addition, each individual test value obtained within a test section shall be at least 95 percent of the mean density obtained in the approved control strip.

304.06—Measurement and Payment.

This item is considered incidental to the cost of furnishing, placing, and compacting the specified course and will not be measured for payment. The cost of constructing density control strips shall be included in the cost of the material for which the control strip is required.

SECTION 305—SUBGRADE AND SHOULDERS

305.01—Description.

This work shall consist of constructing the subgrade in reasonably close conformity to the cross section shown on the plans and constructing the shoulders in reasonably close conformity with the plans and these specifications.

305.02—Materials.

Materials may consist of material in place, treated material in place, or imported material. Imported material may be borrow material, select material, or other material as shown on the plans or specified in the Contract.

Materials other than regular excavation or borrow material that are shown on the plans or specified in the Contract shall conform to the applicable requirements of these specifications.

Geotextile materials used for subgrade stabilization shall conform to the requirements of Sections 245.

305.03—Procedures.

(a) **Shaping and Compacting Subgrade:**

1. **Subgrade consisting of material in place:** The subgrade area shall be scarified to a depth of 6 inches for a distance of 2 feet beyond the proposed edges of the pavement on each side. If sandy or other soil is encountered that will not compact readily, clay or other suitable material shall be added or water applied in such quantity and within the allowable moisture content specified herein as will permit compaction of the subgrade. Subgrade material shall be compacted at optimum moisture, within ±20 percent of optimum. The density of the subgrade when compared to the theoretical maximum density as determined in accordance with the requirements of VTM-1 shall conform to the following:

% Retained on No. 4 Sieve	Min. % Density
0–50	100
51–60	95
61–70	90

Percentages of material will be reported to the nearest whole number.

The subgrade shall then be shaped and checked to ensure a typical cross section and uniform grade prior to placement of any subsequent courses. If the subgrade becomes eroded or distorted prior to placement of material for subsequent courses, it shall be scarified, reshaped, and recompacted in accordance with the original requirements.

At the time of placing material for subsequent courses, the subgrade shall be compacted to the required density, free from mud and frost, and in a condition that will permit compaction of subsequent courses without distortion.

If the approved subgrade becomes unstable after placement of the subbase or base course and becomes mixed with the aggregate therein, material from the unstable area and contaminated aggregate shall be removed. The area shall then be backfilled and compacted, and the subsequent course thereon reconstructed.

2. **Subgrade consisting of treated materials in place:** Subgrade shall be treated in accordance with the requirements of the applicable provisions of Sections 306 and 307 except that the tolerance for depth will be waived when lime or cement is being used to bridge or correct extremely weak areas.

   If lime can be satisfactorily manipulated during initial mixing, and bridging of the weak area has been performed satisfactorily, additional mixing and compacting will not be required. Additional layers of fill may be placed without delay.

   Field density determinations will be performed in accordance with the requirements of AASHTO T191, T205, or T214, modified to include material sizes used in the laboratory determination of density; with a nuclear density testing device; or by other approved methods. When a nuclear device is used, the nuclear density determination for treated in-place subgrade material will be related to the density of the same material tested in accordance with the requirements of VTM-1 or VTM-12 and a control strip will not be required.

3. **Subgrade consisting of imported material:** The area to receive the material shall be graded to a true crown and cross section.

   Material shall be placed and compacted in accordance with the requirements of the applicable specifications governing the type of material. When select material is used, material shall be placed and compacted in accordance with the requirements of Section 308 except that the provision for mixing will be waived. The top 6 inches of the finished subgrade shall be compacted in accordance with the requirements of the provisions of 1. herein.

   The provisions of 1. herein that are not specifically amended herein shall apply. Imported material shall be placed in approximately equal layers not more than 8 inches for commercial material and 6 inches for local material, compacted measure. Material will be tested after compaction for thickness and density. If material fails to conform to thickness requirements, it shall be corrected by scarifying, adding material if necessary, mixing, reshaping and recompacting, or removing and replacing. If the material fails to conform to density requirements, additional rolling will be required until the required density is obtained provided the material is compacted at optimum moisture, within ±20 percent of optimum. If the moisture content is outside the allowable tolerance, the layer shall be scarified, brought to optimum moisture within the allowable tolerance, and recompacted to the specified density.

   An aggregate spreader will not be required in the placement of select material and other imported materials used as subgrade and shoulder courses.

(b) **Treatment of Unsuitable Subgrade:** When solid rock occurs in cuts or the material is not suitable for subgrade or finishing purposes, the roadbed shall be excavated below the grade shown on the plans in accordance with the standard drawings.

When solid rock or other unsuitable material has been removed, excavated areas shall be backfilled in accordance with the standard drawings.

(c) **Finishing Subgrade:** The Contractor shall provide effective drainage for the subgrade and maintain it in a satisfactory condition until the next course is placed.

When practicable, the subgrade shall be prepared at least 500 feet ahead of placement of any subbase, base, or surface course. Material for subsequent courses shall not be placed until the subgrade has been checked and approved. The finished subgrade elevation shall be within ±0.04 foot of the plan elevation unless otherwise specified. When imported material is used, acceptance of the course will be based on the requirements of Section 308.04.

(d) When geotextile for subgrade stabilization is required it shall be placed as shown on the plans. Geotextile shall be spliced by an overlap of at least 2 feet or by sewing double stitched seams with stitching spaced 1/4 inch to 1/2 inch apart or as shown on the plans. The strength of sewn seams shall be no less than 85 percent to that of the geotextile when tested in accordance with ASTM D4884.

Once geotextile for subgrade stabilization is placed, the initial lift of material to be placed atop shall be free draining and shall be end dumped onto the geotextile and spread to thickness as shown on the plans. Free draining material shall be any material having 15 percent or less of which will pass the No. 200 sieve. If the geotextile becomes punctured or torn, the Contractor shall repair the area with geotextile lapped at least 3 feet all around the damaged area.

(e) **Shoulders:** Aggregate shoulder material shall be placed in accordance with the requirements of the applicable specifications governing the type of material or construction being used and shall be compacted at optimum moisture, within ±2 percentage points of optimum. Except when aggregate material No. 18 is used, the density of the aggregate shoulder material, when compared to the theoretical maximum density as determined in accordance with the requirements of VTM-1 or VTM-12, shall conform to the following:

% Retained on No. 4 Sieve	% Density
0–50	95–100
51–60	90–100
61–70	85–100

Percentages of material will be reported to the nearest whole number.

When aggregate material No. 18 is used, the density, when compared to the theoretical maximum density, shall be not less than 90 or more than 95 percent.

Aggregate in the guardrail section of fills (1 foot from the roadway side of the guardrail face to the outside of the shoulder) shall be compacted until a density of at least 90 percent of the theoretical maximum density has been obtained. The asphalt mixture in this area shall be sealed immediately after the hot mixture is spread. Rolling of the asphalt mixture shall continue until roller marks are eliminated and a density of at least 85 percent of the theoretical maximum density has been obtained.

Stabilized and paved shoulders shall be constructed in accordance with the requirements of the applicable specifications for pavement stabilization. If the aggregate shoulder material becomes overconsolidated prior to final finishing, it shall be scarified for the approximate depth, reshaped, and recompacted to conform to the typical cross section.

Shoulders shall be constructed simultaneously with nonrigid types of base or surface courses other than asphalt concrete or in advance of the base or surface course so as to prevent spreading of base or surface materials. The area of shoulders 12 inches adjacent to the pavement shall be rolled simultaneously with the course being deposited.

Where base or surface courses are being constructed under traffic and are more than 1 inch in depth, shoulder material adjacent thereto shall be placed within 72 hours after placement of the base or surface course.

305.04—Measurement and Payment.

When material in place is used for the subgrade and shoulders, no measurement will be made. Treated material in place will be measured in accordance with the method of measurement for the specified stabilizing material. When imported material is specified, it will be measured as follows:

(a) **Select material, Type I,** will be measured in tons.

(b) **Select material, Types II and III,** will be measured in cubic yards in its original position.

(c) **Borrow:** Borrow will be computed in its original position by cross sectioning the area excavated. If cross sectioning the area excavated is not practical, the quantity will be determined from compacted measurements in the road and then converted to pit volume.

When cubic yard measurement is specified and the plans do not show the thickness of material required, the material will be measured in the original position by the cross-section method. Where it is impractical to cross section the area, measurement will be made in trucks in accordance with the requirements of Section 109.01.

When the ton unit is specified, the quantity shall be determined in accordance with the requirements of Section 109.01.

Moisture in excess of optimum, +2 percentage points, will be deducted from the net weight of both truck and rail shipments.

Allowance will not be made for unauthorized depths beyond those shown on the plans and the allowable tolerances. When tonnage measurement is used, deduction for material exceeding the allowable tolerance will be based on 110 pounds per square yard per inch of depth.

When material in place is used for subgrade and shoulders, no separate payment will be made. The cost thereof shall be included in the price for other applicable pay items.

When imported materials are used, the subgrade and shoulders will be paid for at the contract unit price per cubic yard or per ton as specified. Treated material in place will be paid for in accordance with the requirements of the applicable specification.

Stabilized or paved shoulders shown as a pay item will be measured and paid for in accordance with the requirements of Sections 306, 307, 312, or 315, as applicable.

Geotextile for subgrade stabilization will be measured in square yards complete-in-place. Overlaps and seams will not be measured for separate payment. The accepted quantity of geotextile will be paid for at the contract unit price per square yard, which price shall be full compensation for furnishing, placing, lapping or seaming material and for all materials, labor, tools, equipment and incidentals necessary to complete the work.

These prices shall include furnishing, hauling, placing, manipulating, and compacting material; clearing and grubbing local pits; material royalties; and access roads.

Payment will be made under:

Pay Item	Pay Unit
Borrow excavation	Cubic yard
Select material (Type and min. CBR)	Cubic yard or ton
Aggregate material (No.)	Cubic yard or ton
Aggregate base material (Type and no.)	Cubic yard or ton
Geotextile (Subgrade stabilization)	Square yard