

219-R-723 CEMENT STABILIZED SUBGRADE SOIL

(Adopted 11-19-20)

The Standard Specifications are revised as follows:

SECTION 219, BEGIN LINE 1, INSERT AS FOLLOWS:

**SECTION 219 - CEMENT STABILIZED SUBGRADE SOIL**

**219.01 Description**

*This work shall consist of stabilizing 12 in. of subgrade soils by uniformly mixing portland cement to achieve the specified unconfined compressive strength in accordance with 105.03.*

**219.02 Materials**

*Materials shall be in accordance with the following:*

<i>Portland Cement, Type I.....</i>	<i>901.01(b)</i>
<i>Water .....</i>	<i>913.01</i>

*Note: Portland cement may be used dry or as a slurry.  
Soils shall meet the requirements of 215.02.*

**CONSTRUCTION REQUIREMENTS**

**219.03 Construction Requirements**

*Construction requirements shall be in accordance with 207.03 and as specified herein.*

**219.04 Testing and Mix Design**

*Testing and mix design shall be in accordance with 215.03. The Contractor shall be responsible for all tests required to determine the optimum cement content for producing cement stabilized subgrade soil with a minimum unconfined compressive strength of 300 psi at seven days. The quantities of portland cement shall be based on 6% of the maximum dry density of the soils. Laboratory testing and mix design shall be performed by an approved geotechnical consultant in accordance with the Department’s Design Procedures for Soil Modification or Stabilization. The unconfined compressive strength test shall be performed in accordance with AASHTO T 208. Sulfate tests for water shall be performed in accordance with ASTM D516.*

*The mix design, test results, and the geotechnical consultant recommendations shall be submitted to the Engineer and to the Department’s Geotechnical Services Division for approval at least five business days prior to use.*

*The Contractor shall submit a QCP in accordance with ITM 803. The QCP shall address all of the testing requirements for the section as specified.*

**219.05 Storage and Handling**

*Storage and handling shall be in accordance with 215.04.*

**219.06 Weather Limitations**

*Weather limitations shall be in accordance with 215.05.*

**219.07 Preparation of Soils**

*Soil preparation shall be in accordance with 215.06. All rocks greater than 2 in. encountered before or after mixing the soils and chemical modifiers shall be removed.*

*When stabilization of foundation soils with cement is required in a cut or at-grade section, the top 12 in. of soil for cement stabilized subgrade soil shall be removed and stockpiled prior to constructing the 14 in. thick stabilization of foundation soils with cement. When the stabilization of foundation soils with cement is complete, the 12 in. of cement stabilized subgrade soil shall then be placed.*

*When stabilization of foundation soils with cement is required in a fill section, it shall be constructed prior to placement of the 12 in. of soil for cement stabilized subgrade soil.*

**219.08 Spreading and Mixing of Cement**

*Spreading of cement shall meet the requirements of 215.07. The soil, cement, and water shall be in accordance with 215.08.*

*Cement, soil, and water shall be mixed using a power-driven transverse type mixer equipped with a computer controlled volumetric water readout. Mixing shall continue until the cement is thoroughly incorporated into the soil and the mixed materials are a uniform color. Water shall be added in sufficient quantity to hydrate the cement. Water shall be introduced through the mixer to bring the mixed material to at least optimum moisture content. One hundred percent of the material, exclusive of rock particles, shall pass a 1 in. (25 mm) sieve and at least 80% shall pass a No. 4 (4.75 mm) sieve. Water shall not be added when the moisture content of the soil exceeds 3 percent above optimum moisture content. The mixing and compaction shall be completed once the water has been added to the mixture. The mixing depth shall be 12 in. The moisture content shall be determined during soils cement mixing in accordance with ITM 506.*

**219.09 Compaction**

*Compaction of the mixture shall begin as soon as practicable after mixing and shall be in accordance with 203 or 207.03 as applicable. Compaction after mixing shall be completed within 1 h of portland cement placement and grading, and final compaction shall be completed within 3 h after mixing.*

*Initial compaction equipment shall consist of a vibratory tamping-foot roller.*

*Final compaction shall be performed with a smooth drum roller.*

**219.10 Trimming**

*Stabilized soil shall be prepared, and adequate drainage shall be provided at all times to prevent water from standing on the subgrade. The grade and cross section of the subgrade shall be finished within a tolerance of 1/2 in. from the subgrade elevation shown on the plans.*

*Even though the subgrade has been previously accepted, the condition of the subgrade shall be in accordance with 105.03 and 207.04 at the time paving material is placed.*

*Finishing within this tolerance by blading or other mechanical means without the use of side forms will be allowed. If these methods do not finish within this tolerance, side forms shall be used.*

### **219.11 QC Testing**

*QC testing shall be performed as follows:*

- (a) QC testing for compaction of cement stabilized subgrade soils shall be performed on the finished grade with an LWD in accordance with 203.24(b) with the exception that the interval for LWD testing shall be every 1,000 sq yd. Testing for the cement stabilized subgrade soils shall begin seven days after compaction. Construction traffic or equipment exceeding 5 t in weight shall not be allowed on the treated soils until the area has passed LWD testing.*
- (b) Moisture testing of soil cement mixtures shall be performed in accordance with ITM 506 at every 1,000 sq yd during cement and soils mixing.*
- (c) One gradation test shall be performed for every 1,000 sq yd of cement modified soil. Gradation tests shall be performed in accordance with ITM 516.*
- (d) Two test specimens shall be prepared at 95% of the Standard Proctor and cured for seven days. Specimens shall be taken every 1,000 ft of length by lane width and shall be obtained by the Contractor. Unconfined compressive strength tests shall be performed in accordance with AASHTO T 208. The sample of the cement stabilized soils mixture shall be taken during pulverization and mixing.*
- (e) Cement spread rate shall be checked at every 2,000 ft of length by lane width. Spread rate shall be in accordance with ITM 516.*
- (f) The soil cement mixing depth shall be checked at every 2,000 ft of length by lane width in accordance with ITM 516 after mixing and prior to compaction.*
- (g) All tests performed by the Contractor shall be compiled and submitted to the Engineer on a weekly basis for documentation of strengths obtained.*

**219.12 Quality Assurance, QA, Testing**

Moisture tests based on ITM 506 for soil cement mixtures will be performed at every 2,000 sq yd during cement and soils mixing.

Acceptance testing for compaction of cement stabilized subgrade soils will be performed on the finished grade with an LWD in accordance with 203.24(b) with the exception that the interval for LWD testing will be every 2,000 sq yd. The acceptance test for the cement stabilized subgrade soils will begin seven days after compaction. The allowable average deflection and maximum deflection for cement stabilized subgrade soil shall be in accordance with the following:

<i>Material Type</i>	<i>Allowable Average Deflection (mm)</i>	<i>Maximum Deflection at Single Test Location (mm)</i>
<i>Cement Stabilized Subgrade Soil</i>	$\leq 0.14$	0.17

**219.13 Curing**

The surface shall be maintained in a moist condition with no visible dry areas for the first seven days after mixing with cement. Liquid membrane forming compound shall be applied in accordance with 504.04(a) to the surface and reapplied as applicable for the first seven days to aid in curing and prevent loss of moisture.

**219.14 Proofrolling**

The entire stabilized soil shall be proofrolled in accordance with 203.26. Deflection or ruts greater than 1/4 in. shall be corrected as directed.

**219.15 Method of Measurement**

The accepted cement stabilized subgrade soil will be measured by the square yard, complete in place.

**219.16 Basis of Payment**

The accepted quantity of cement stabilized subgrade soil will be paid for at the contract unit price per square yard.

Approved adjustments for cement that exceed the limit of 219.04 will be included in a change order for materials only and paid for as additional cement for subgrade soil stabilization. Payment for additional cement for subgrade soil stabilization will be made for direct delivered material costs incurred by the Contractor and will not include any other markups.

Payment will be made under:

**Pay Item**

**Pay Unit Symbol**

Cement Stabilized Subgrade Soil..... SYS

The cost of performing mix design, services of an approved geotechnical consultant, scarification of the soil, spreading and mixing of the cement and soil, compaction of the resultant mixture, shaping the soil, work required due to adjustments of

*modifier proportioning, work required due to weather conditions, correction of deficient areas, water required for the stabilization process, soil trimming, liquid membrane forming compound, and all operations needed to meet the requirements of this specification shall be included in the cost of the pay item.*

---