

## **SECTION 540: SOIL CEMENT**

### **540.1 DESCRIPTION**

This work consists of preparing the roadbed, providing, applying, mixing and processing Portland Cement with the subgrade materials, and compacting the mixture in accordance with the contract and as directed by the City Engineer or designee.

### **540.2 MATERIALS**

#### **540.2.1 General**

The Contractor shall furnish uncontaminated materials of uniform quality that meet the requirements of the contract and will notify the City Engineer or designee of the proposed material sources and of changes to material sources. The City Engineer or designee will verify that the contract requirements are met before the sources can be used and may sample and test project materials at any time before compaction.

The Contractor will provide a soil cement design mix in accordance with Section 500 Portland Cement Concrete Materials that includes the target cement and optimum moisture contents.

### **540.3 CONSTRUCTION REQUIREMENTS**

#### **540.3.1 Subgrade Preparation**

The Contractor shall treat the subgrade or base with Portland cement accordance with the mix design.

The Contractor shall identify and correct soft areas, then shape the subgrade to the grades shown in the contract before adding Portland cement. The Contractor shall ensure that the scarified depth of the treated subgrade (shown in the Plans) is free of deleterious material and stones retained on a three (3.0) inch sieve.

The Contractor shall:

1. Not perform work during wet or inclement weather.
2. Mix and place the Portland cement-treated only if the air temperature is at least 40 °F and rising in the shade.
3. Not mix or place cement-treatment on a frozen subgrade. When the air temperature is forecast to fall below 32 °F within a 48-hour period, the Contractor shall cease work or ensure the subgrade temperature will not fall below 40 °F.
4. Proof-roll the material with equipment, approved by the City Engineer or designee, to expose and correct the soft areas.

Where unstable subgrade is encountered in cuts or existing grades, due to no fault or neglect of the Contractor, sub-excavation and borrow will be paid for and measured as per Section 202 Excavation, Embankment and Borrow. Engineered designs will be measured and paid for on an item by item basis or as specified in the contract. The Contractor shall conduct operations in such a way that the City Engineer or designee can take the necessary cross-sectional measurements before the backfill is placed.

#### **540.3.2 Portland Cement Treated Subgrade**

Prior to the addition of Portland cement, the Contractor shall pulverize the subgrade to the specified depth so that at least 80% (by weight) passes through a No. 4 sieve.

The Contractor shall:

1. Apply Portland cement at the specified application rate and to the depth required in the contract or as indicated on the approved mix design.
2. Ensure that cement dust is not a hazard to the public or workers when processing the Portland cement-treated subgrade.
3. Perform mixing, placing, compacting, and finishing on the same day as the cement placement.

#### **540.3.2.1 Mixing**

The Contractor shall uniformly apply cement using dry placement unless otherwise provided in the contract.

##### **540.3.2.1.1 Dry Placement**

Before applying cement, the Contractor shall bring the prepared roadway to approximately optimum moisture content. The Contractor shall mix the Portland cement, soil, and water with a self-propelled rotary-type mixing machine (approved by the City Engineer or designee) to provide a uniform mixture. Overlap at least six (6) inches between passes.

The City Engineer or designee will consider streaks and pockets of Portland cement as evidence of unacceptable mixing.

The Contractor shall ensure the material moisture content ranges between optimum to five percent (5%) over optimum within the entire treated depth.

##### **540.3.2.1.2 Slurry Placement**

The Contractor shall mix the required quantity of cement with water, as shown on the approved mix design. The Contractor shall provide slurry free of objectionable materials and with a uniform consistency that can be easily applied and agitate the slurry continuously.

The slurry shall be applied within 2 hours of adding water and when the roadway is at a moisture content drier than optimum. The slurry shall be distributed uniformly by making successive passes over a measured section of the roadway until the specified cement content is reached.

#### **540.3.2.2 Finishing Operations**

The Contractor shall:

1. Compact to 95% of maximum density based on ASTM Designation D 1557 in accordance with Section 202 Excavation, Embankment and Borrow, immediately after mixing is complete.
2. Finish to  $\pm 0.1$  foot along centerline and  $\pm 0.05$  foot at right angles to the centerline.
3. Correct deviations from these tolerances.
4. Final roll the surface to finish the completed work and prevent hairline cracking.

5. Finish within four (4) hours of adding the Portland cement.

The Contractor shall allow the cement-treated subgrade to cure for at least seven (7) days before placing base course or subbase material on top of the cement-treated subgrade or as approved by the City Engineer or designee. Maintain a moist, not saturated, condition during the entire curing period, to prevent drying. If permitted by City Engineer or designee, the Contractor may use an alternate curing procedure by applying a CSS-1 or SS-1 emulsified asphalt to the surface so that the surface is fully covered and sealed.

**540.3.3 Protection of Treated Subgrade**

The Contractor shall:

1. Allow only sprinkling or spraying equipment, on the treated subgrade during the curing period, unless otherwise approved by the City Engineer or designee.
2. Install a base, sub-base, or wearing surface before opening the roadway to the public, unless otherwise approved by the City Engineer or designee.

**540.4 METHOD OF MEASUREMENT**

Cement will be measured by the ton (dry weight). When cement is furnished in trucks, the weight of cement will be determined on certified scales, or the Contractor must provide a set of standard platform truck scales at a location approved by the Engineer.

When cement is furnished in bags, indicate the manufacturer’s certified weight. Bags varying more than 5% from that weight may be rejected. The average weight of bags in any shipment, as determined by weighing 10 bags taken at random, must be at least the manufacturer’s certified weight.

Cement slurry will be measured by the ton (dry weight) of the cement used to prepare the slurry at the jobsite or from the minimum percent dry solids content of the slurry, multiplied by the weight of the slurry in tons delivered.

Portland cement treated subgrade will be measured by the square yard of surface area. The dimensions for determining the surface areas are established by the widths shown on the plans and lengths measured at placement.

**540.5 BASIS OF PAYMENT**

Except for separate payment for the Portland Cement by the ton, payment by the unit price for Portland Cement-Treated Subgrade shall be considered full compensation for all labor, materials, and equipment associated with providing a complete in-place product. This includes, but is not limited to preparing the subgrade, mixing and processing Portland cement and compacting the mixture, correcting soft areas and reshaping the subgrade before adding the Portland cement, and ensuring the scarified depth of the treated subgrade (as shown in the Plans) is free of deleterious material and stones retained on the three (3.0) inch sieve.

<b>Pay Item</b>	<b>Pay Unit</b>
Portland Cement-Treated Subgrade	Square Yard
Portland Cement	Ton