

SECTION 02240 - CHEMICAL GROUTING OF SOIL

City of San Diego, CWP Guidelines

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing soil stabilization utilizing chemical grout as designed and installed by a grouting specialist subcontractor. The intent of this Section is to permit open-cut excavation and the application of shotcrete to the face of the excavation without shoring, as indicated and as required.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 01560 Environmental Protection
 - 2. Section 02100 Site Preparation
 - 3. Section 02200 Earthwork
 - 4. Section 03360 Pneumatically Placed Concrete

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ASTM D 4219 Unconfined Compressive Strength Index of Chemical-Grouted Soils

1.4 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300.
 - 1. Completion information (catalog data) of the chemical grout substantiating its suitability for the type of soil to which it shall be applied.
 - 2. Detailed sketches of intended injection techniques and patterns, including necessary data to prove that the chemicals contemplated will meet in all respects the requirements as to properties and qualities required by these Specifications.
 - 3. Test data substantiating the adequacy of the grout from a certified testing laboratory.
 - 4. Documentation substantiating that the company to perform soil stabilization and its personnel have the appropriate qualifications.

1.5 OWNER'S MANUAL

- A. The following shall be submitted in compliance with Section 01300:
 - 1. A copy of the daily grouting log information shall be submitted to the CONSTRUCTION MANAGER daily.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. "Chemical Grout," as referred to herein, shall be a relatively nonviscous solution, not a slurry, that may be injected into a permeable soil mass, undergo chemical reactions that lead to precipitation or polymerization, and result in solidification of that injected soil by binding together the soil grains for the purpose of increasing the load bearing capacity of the soil. The solidified soil shall have an unconfined compressive strength of [50] psi at 28 days as determined in accordance with ASTM D 4219.
- B. The CONTRACTOR shall be responsible for formulation of the grout. Chemicals used shall be sodium silicate based plus reagents and additives that will provide the required characteristics for the chemical grout. Water used shall be compatible with the chemical system to be used.
- C. Considering the chemistry of the gel and the conditions known at the site, the chemical system used shall produce a stable gel. The chemical system used shall stabilize soil to permit open-cut excavation and the application of shotcrete to the face of the excavation without use of any shoring, and shall have a proven record of stability.
- D. The chemicals used shall be so proportioned and mixed as to produce a chemical grout that contains no solids in suspension, may be pumped without difficulty, will penetrate and fill the voids in the soil mass, and will form a gel of the required strength and stability.
- E. Chemicals mixed into primary solutions before final batching may be held only in accordance with the manufacturer's recommendations and must not be injected if limiting factors imposed by the manufacturer are exceeded. Any solutions not to be used for injection shall be immediately disposed of to the satisfaction of the CONSTRUCTION MANAGER. The chemical grouting system shall not be detrimental to the environment. The injected solution and its components shall be nontoxic. Comply with requirements of Section 01560.

2.2 SITE PREPARATION

- A. The project site consists of [an upper layer of fill sands overlaying dense terrace deposits of sand and silty sand, as indicated in the Soils Report].
- B. The site clearing, grubbing, and removal shall be in accordance with Section 02100. After site preparation work is complete, the CONTRACTOR shall commence soil stabilization.

2.3 MIXING

- A. All materials shall be accurately measured by weight or volume for mixing in compliance with the manufacturer's recommendations. If a variable proportioning pump system is used, positive controls shall be incorporated to ensure accurate proportioning. Care shall be taken not to contaminate mixing vessels with reactive chemicals by spillage, splash, etc.
- B. Quality of the grout mix shall be checked by means of taking a test sample from every injection batch and checking its viscosity, setting (gelation) time and decantation. The CONTRACTOR shall keep records of test results. These data shall be submitted to the CONSTRUCTION MANAGER on a daily basis.
- C. If any sample fails to show the proper gelation, the potential area of failure shall be reinjected to achieve the indicated stabilization. The CONTRACTOR shall notify the CONSTRUCTION MANAGER of such instances of failure including the methods used for correction.

PART 3 - EXECUTION

3.1 APPLICATION

- A. The CONTRACTOR shall determine the extent of the soil stabilization required to solidify the soil so that it attains an unconfined compressive strength of [50] psi at 28 days, per ASTM D 4219. The CONTRACTOR shall keep records to establish the point of injection for each injection batch.
- B. Care shall be taken in the placing of injection points to secure accurate injection and the proper overlapping of injection cylinders.
- C. Injection rates and pressures shall be closely controlled to prevent blowout, localized "quick" conditions, and to ensure the proper filling of voids to attain the desired stabilized section.
- D. Quantities of chemical grout injected at each point shall be governed by calculated volume, back pressure, or a combination of these two factors. If it appears, at any point, that a large void exists, proper steps shall be taken to ensure stabilization of the desired soil section.

3.2 DAILY LOG

- A. The CONTRACTOR shall keep a daily log of its grouting operations including detailed information about the location of grout injection points, quantity of grout injected, injection pressures, and grout sample test results.

**** END OF SECTION ****