

## **Chapter 6**

# **Geotechnical Exploration and Report**

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## Chapter 6

### Geotechnical Exploration and Report

#### 6.1 General

The geotechnical exploration and report shall determine any special geotechnical conditions and make recommendations regarding the special conditions, grading, foundations, and pavement.

#### 6.2 When Required

For public improvement projects, the determination as to when soils reports will be required will be determined on an individual, case-by-case basis by the City Engineer.

#### 6.3 Soil Exploration

**6.3.1 General.** When geotechnical explorations are required, all sampling and testing of the soil shall be performed in accordance with the appropriate AASHTO (American Association of State Highway and Transportation Officials) and ASTM (American Society for Testing and Materials) designations.

**6.3.2 Sampling.** Representative samples of the soils shall be obtained by drilling shallow penetration soil borings along the route of the existing or proposed public right-of-way.

**6.3.2.1** Borings shall extend to a minimum depth of 5.0 feet below the proposed subgrade foundation, or 2.0 feet below the flow line elevation of any pipe or conduit. Every third boring, or a minimum of one boring, shall be of sufficient depth, or a minimum of 10 feet, for monitoring of the ground water elevation.

**6.3.2.2** Borings will be performed at close enough intervals to determine the boundaries of each significant soil type present.

**6.3.2.3** A random technique shall be used to select sampling locations.

**6.3.2.4** Spacing of the borings will vary with the uniformity of the soil profile and the topography. The maximum interval between soil borings may not exceed 400 feet.

**6.3.2.5** Where the original ground line is to be covered with fill material, 5-foot depth borings are necessary to determine the character of the support.

**6.3.2.6** Where drainage areas are crossed or boggy areas are encountered, the spacing of the borings shall be at closer intervals in order to determine the boundaries of the "soft" area. At these "weak" areas, the depth of the borings may also have to be increased in order to determine if and to what depth improved subgrade material will be required to provide uniform support for the construction.

**6.3.2.7** Representative samples from the borings shall be collected for submittal to a soils testing laboratory for evaluation.

**6.3.2.8** A boring log shall be maintained for each soils boring performed. The boring log shall contain a complete record of the soil material observed.

### **6.3.3 Testing.**

**6.3.3.1** The tests required are those for identification and classification purposes. These tests include a standard sieve and hydrometer analysis (ASTM D422 or AASHTO T-88) and Atterburg Limits (ASTM D423 and 424 or AASHTO T-89 and 90). The test results are used to give a soil a descriptive name and letter symbol (in accordance with the Unified Soils Classification System) indicating its principle characteristics. Based on the test results, similar soil types can be placed into several major groups.

**6.3.3.2** These major groups shall be plotted on a profile sheet to determine their limits. The profile sheet is used with the laboratory data in selecting what soil types further testing should be performed on. Additional testing includes the moisture-density relationship (AASHTO T-99 or T-180) and California Bearing Ratio (MIL STD 621 Method 101 or ASTM D1883). The moisture-density relationship determines the maximum dry density and optimum moisture content for that particular soil. The CBR test is performed at 95 percent of the maximum dry density and at the optimum moisture content. The results of the CBR test determine the relative bearing value of the subgrade and is used in the pavement thickness design. A minimum of a three-point curve will be utilized for the CBR testing with a five-point curve preferred. If the various soil type areas are not large enough to justify separate pavement designs, a single design shall be made on the worst soil type.

## **6.4 Report**

**6.4.1 General.** The report shall identify any geotechnical special conditions found in the exploration and recommendations to ameliorate the special conditions along with grading, foundations, and subgrade and pavement requirements. The recommendations may be divided into three parts: geotechnical special conditions, grading and foundation, and subgrade and pavement.

**6.4.2 Special Geotechnical Conditions.** The special conditions portion of the report shall consider ground water, frost susceptibility, erosion potential, soils creep, landsliding, expansive soils, soil corrositivity, and any other special geotechnical conditions the Geotechnical Engineer becomes aware of.

**6.4.3 Grading and Foundation.** The grading and foundation portion shall include data regarding the distribution and engineering characteristics of the various soil materials, data about groundwater levels, recommendations about the need for mitigation measures for special geotechnical conditions, grading criteria, foundation design criteria, and any other information the Geotechnical Engineer considers pertinent.

**6.4.4 Subgrade and Pavement.** The subgrade and pavement portion shall include data regarding the distribution of various subgrade materials and design tests (such as CBR, R-value, and/or plate bearing) to be made. Where soils are susceptible to erosion, recommendations shall be made for preventing the undermining of pavements. The pavement design may be included in this report or prepared and submitted separately by the Engineer responsible for preparation of the construction plans and contract documents.