

Trenching

Manual Soil Analysis Techniques

Introduction

The following information covers the various types of manual soil analysis techniques for cohesiveness and strength.

Cohesiveness Tests

A. Thread Test

The thread test will help to determine if a soil is cohesive or not. This is a necessary part of soil analysis because if a soil shows no cohesiveness it is most likely a Type C soil.

Procedure:

Grab a sample from freshly excavated soil and roll it into a ball. Using the palm of your hands, a clipboard or other flat surface, attempt to roll the ball into a thread. The longer the thread is, the more cohesive the soil. If the thread breaks apart this indicates granular material is contained in the sample.

B. Ribbon Test

The ribbon test is very similar to the thread test and is used to determine the cohesiveness of the soil sample.

Procedure:

From freshly excavated soil grab a sample and roll it into a ball. Using the palm of your hands or other flat surface, roll the ball into a cigar shape. With your thumb and finger pinch the cigar into a flattened ribbon about 1/8-inch thick. The longer the ribbon, the more cohesive the soil. If it breaks off in chunks this indicates granular material is present in the sample.

C. Wet Shake Test

This test will also determine the presents of cohesive material in the soil.

Procedure:

Remove large pieces of gravel and sand from a soil sample and add enough water to mold the sample into a ball about 3/4-inch in diameter that is soft but not sticky. Wipe the surface of the sample to remove any water drops. Shake your hand, palm up, or strike the bottom of your hand to agitate the sample. If water comes to the surface the sample will become shiny, indicating that the soil is granular. More cohesive soils will not become shiny.

Dry Strength Test

This test is used to determine the approximate strength of a soil sample.

Procedure:

Find a clump of dry soil sample or dry a clump of soil on an engine block. Attempt to break up or crush the dry sample. If the sample crumbles easily this indicates a granular soil. If the sample breaks into smaller pieces and the smaller pieces can only be crushed with difficulty this indicates the clay may be present with granular material. If the sample cannot be broken into smaller pieces this indicates cohesive material.



Date: _____

Attended By: _____

Strength Test for Unconfined Compressive Strength

A. Thumb Penetration Test

Even though this test is not as accurate as other strength tests it is accepted by OSHA for determining the approximate strength of soil but does rely on the experience of the person performing the test.

Procedure:

Find a sample of freshly excavated soil or a large clump of soil in the spoil pile. With your thumb push as hard as possible into the sample. Soil that is only slightly indented with the tip of the thumb indicates Type A soil. Soil that is indented with moderate effort could be Type B and soil that is easily indented could be Type C soil.

B. Pocket Penetrometer Test

The pocket penetrometer directly reads the unconfined compressive strength (ucs) of a soil in tons per square foot (tsf).

Procedure:

Find a sample of freshly excavated soil from the spoil pile. With push the tip of the pocket penetrometer into the sample with a slow even thrust up to the indicator at the tip of the device. (Usually a line located about 1/4 inch up on the tip). Pull the device out of the soil and read the side of the device to find the unconfined compressive strength in tsf. (Read the manufacturers directions to determine how/where to find the reading). Type A soils have a ucs reading of 1.5 tsf; Type B soils have a reading of 0.5 - 1.5 tsf; Type C soils have a reading of less than 0.5 tsf. Make sure you take a few reading and then average your findings.

Torvane Shear Strength

This device finds the shear strength of a soil sample so the reading must be multiplied by 2.

Procedure:

Find a sample of freshly excavated soil from the spoil pile that has a relatively flat surface. Find the standard vane and attach it to the device if not already attached. (Consult the manufacturer's requirements to find the standard vane). Rotate the device slowly until it tears out the soil. (A circular impression should be seen). Read the numbers on the device and convert these from kilograms per square centimeter to tsf by multiplying by a factor of two. Take a few sample tests to find an average.

