

DENSITY DETERMINATIONS ON UNCONSOLIDATED MATERIALS

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Introduction

This paper discusses aspects of performing density determinations on unconsolidated materials such as near-surface broken or soft rocks.

Site Selection and Preparation

An appropriate site is selected based upon the rock units that need to be sampled. The area is cleaned and all loose material is removed so that undisturbed bedrock is exposed.

The cleaned area should be on the order of 2 m by 2 m to ensure that no loose material can contaminate the sample. The sample area should be carefully leveled and surface irregularities minimized.

The area should then be thoroughly cleaned.

Surface Contour Volume Mapping

In order to obtain an accurate measurement of the rock sample volume, the irregularities of the surface need to be mapped.

This is done by placing a wooden frame on the surface of the rock and then very carefully leveling it. A thin plastic sheet is then placed in the frame and smoothed to minimize bunching of the plastic.

Water is then used to fill the frame and the volume of the water is carefully measured and recorded.

This procedure is repeated three times to get an average volume. If any one of the volume measurements is significantly different than the other measurements, the process is repeated until the volume is considered reliable.

Sample Excavation

The plastic liner is carefully removed from the frame and the outline of the inside of the frame is carefully marked on the rock, immediately below the frame. The outside of the frame is carefully

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marked to allow the frame to be reset over the hole after the sample is excavated. The frame is removed and a portable rock saw is used to cut the sample edges along the line marking the inside of the frame. Once a cut is begun, it must be completed because loose material will fall into the hole and be removed if the groove is re-entered with the saw.

Eight cuts, four for the outline, and four interior cuts allow for easy removal of the sample. The position of the saw cuts and the number of cuts must be recorded.

The sample is then carefully removed from the pit and placed in poly sample bags.

Pit Volume Measurement

The frame is re-set over the pit, carefully oriented exactly as it was for the surface mapping exercise. The pit is lined with plastic and filled with a known volume of water until the water just overflows the frame. The volume of water is then recorded.

Sample Weighing and Drying

The sample bags are weighed and then placed in an oven to dry. The samples are then re-weighed until a constant weight is achieved, possibly as much as several days to a few weeks to completely dry. The final weight of the sample is then recorded.

Density Calculations

The sample volume is calculated by subtracting the surface map volume from the pit volume. The density is then the ratio of the sample weight to the sample volume. The volume lost to the saw cuts should be calculated and factored back into the final density calculation.