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Committee D18 on Soil and Rock
Subcommittee D18.03 on Plasticity and Density Characteristics of Soils

Research Report D18-1011

Interlaboratory Study to Establish Precision Statements for ASTM D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table and D4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

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ASTM REFERENCE SOIL TEST PROTOCOL*
For
ASTM Test Method D 4253 - 2000,
Maximum Index Density and Unit Weight of Soils Using a Vibrating Table
And
ASTM Test Method D 4254 - 2000,
Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density When Testing ASTM Reference Soil: SP-1

1. Introduction

The purpose of this document is to assist you in performing ASTM Test Methods D 4253 – 2000 and D 4254 – 2000 when testing ASTM Reference Soil SP-1 (Poorly Graded Sand (SP), Frederick Sand). This Test Protocol and the revision of D 4253 and D 4254 were developed as part of the ASTM Reference Soils and Testing Program. That program produced the data used to develop the ASTM Reference Soil Summary Analysis Sheet; i.e., limits of acceptable test results.

This document supplements Test Methods D 4253 and D 4254 by giving specific directions where these test methods may permit different options and where the instructions provided in those standards need clarification. Do not begin testing until you have read the attached Test Methods D 4253 and D 4254, the ASTM Sampling Protocol for SP-1, and this Test Protocol. Section numbers in this Test Protocol refer to sections of Test Methods D 4253 or D 4254.

Warning—You need to follow the ASTM Reference Soil Protocols and Test Methods D 4253 and D 4254 exactly to obtain test results which can be compared to the " limits of acceptable test results" presented in the ASTM Reference Soil Summary Analysis Sheet.

The same test specimen will be used for D 4254 (Minimum) and D 4253 (Maximum). **Since D 4253 may cause particle degradation, it is essential that Test Method D 4254 be completed before the test specimen is used for D 4253.** For D 4254, Method A shall be followed using the ½-in.-pouring device and 0.1-ft^3 mold. For D 4253 (Maximum), the dry method of testing is to be used (Test Method 1A or 2A) and the 0.1-ft^3 mold; **do not use the wet method**.

Included with this protocol is the ASTM test data sheet used in the ASTM Reference Soils and Testing Program. The data sheet is included for reference purposes only. One does not have to use it in order to compare your data with the ASTM Reference Soil Summary Analysis Sheet. The test data sheet included is:

- Maximum (Vibrating Table) And Minimum Index Unit Weight of Soils: D 4253 - 2000 & D 4254 - 2000

2. Additional Guidance to Supplement Standard D 4254 (Minimum Index Unit Weight):

2.1 General

Determine the minimum, dry unit weight meeting the requirements given in D 4254 and those below, before initiating D 4253.

2.2 Apparatus and Calibrations

Use the ½-in.-pouring device.

Use a standard 0.1 ft^3 mold as shown in FIG. 1 of D 4254, calibrated in accordance with Section 8, and a pouring device fitted with a 1/2 in. inside diameter spout (tube) about 6 in. long. **Warning** – The instructions given in Section 8 for calibrating the molds are different from those given in previous published versions of this standard.

2.3 Procuring Test Specimen

Do not follow Section 7 in the D 4254. Select the specimen for testing from the bucket using the ASTM Sampling Protocol for Reference Soil SP-1. The specimen obtained shall have a mass (at the as-received water content) of about 10,000 g (10 kg).

2.4 Preparation of Test Specimens

Record the sand description following the method typically used in your laboratory and then oven dry the specimen (soil). Process the oven-dried soil over a No. 4 (4.75 mm) sieve to:

- thoroughly break up any weakly cemented aggregations (7.5.1); and,
- remove any particles which will not pass through the No. 4 sieve. Discard the retained particles.

During this process, make sure you do not lose any fines. Hand sieve the soil by transferring the relatively small quantities of dry soil, from the drying container, onto the sieve directly above another pan. Keep the No. 4 sieve slightly above the pan, so dust is kept to a minimum.

2.5 Testing

For each trial, use the ½-in. pouring device and 0.1-ft^3 mold, and follow the steps outlined in 9.2 through 9.2.4, omitting 9.2.3 and 9.2.3.1. In following these steps, determine and record all masses to four significant digits, and calculate and record the dry unit weights to the nearest 0.1 ft^3 or four significant digits. After each trial, return the soil to the specimen and mix the soil. Repeat this method until two consecutive values of unit weight agree within 1%, see 9.2.5. Care should be taken to avoid loss of fines during testing and mixing.

2.6 Calculations