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Standard Test Method for Measurement of Collapse Potential of Soils[1]

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1. Scope

1.1 This test method covers the determination of the magnitude of one-dimensional collapse that occurs when unsaturated soils are inundated with fluid.

1.2 This test method may be used to determine the magnitude of potential collapse that may occur for a given vertical (axial) stress and an index for rating the potential for collapse.

1.3 This test method specifies the technique for specimen preparation, apparatus, and procedure for quantifying the amount of height change associated with collapse and procedures for reporting test results.

1.4 The procedures given in this test method are applicable to both undisturbed and remolded specimens.

1.5 The values stated in SI units are to be regarded as the standard. The inch-pound units given in parentheses are for information only.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 653 Terminology Relating to Soil, Rock, and Contained Fluids[2]

D 2216 Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock[2]

D 2435 Test Method for One-Dimensional Consolidation Properties of Soils[2]

D 4829 Test Method for Expansion Index of Soils[2]

3. Terminology

3.1 Refer to Terminology D 653 for standard definitions of terms. Additional terms are as follows:

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *collapse*—decrease in height of a confined soil following wetting at a constant applied vertical stress. A collapsible soil may withstand relatively large applied vertical stress with small settlement while at a low water content, but this soil will exhibit settlement (that could be large) after wetting with no additional increase in stress. Large applied vertical stress is not necessary for collapse.

3.2.2 *collapse index (I_e)*, percent—relative magnitude of collapse determined at 200 kPa (2 tsf) and calculated using (Eq 1).

3.2.3 *collapse potential (I_c)*, percent—relative magnitude of soil collapse determined at any stress level as follows:

$$I_c = \left[\frac{d_f - d_o}{h_o} - \frac{d_i - d_o}{h_o}\right] 100 = \left[\frac{d_f - d_i}{h_o}\right] 100 \quad (1)$$

where:

d = dial reading, mm (in.),
d_o = dial reading at seating stress, mm (in.),
h_o = initial specimen height, mm (in.),
d_f = dial reading at the appropriate stress level after wetting, mm (in.),
d_i = dial reading at the appropriate stress level before wetting, mm (in.),
$(d_f - d_o)/h_o$ = strain at the appropriate stress level after wetting, and
$(d_i - d_o)/h_o$ = strain at the appropriate stress level before wetting.

Eq 1 may be rewritten in terms of void ratio:

$$I_c = \frac{\Delta e}{1 + e_o} \cdot 100 \quad (2)$$

where:

Δe = change in void ratio resulting from wetting, and
e_o = initial void ratio.

or, since the test is conducted as a one-dimensional test:

$$I_c = \frac{\Delta h}{h_o} \cdot 100 \quad (3)$$

where:

Δh = change in specimen height resulting from wetting, mm (in.) and
h_o = initial specimen height, mm (in.).

4. Summary of Test Method

4.1 The test method consists of placing a soil specimen at natural water content in a consolidometer, applying a predetermined applied vertical stress to the specimen and inundating the specimen with fluid to induce the potential collapse in the soil specimen. The fluid should be distilled water when evaluating the collapse index, I_e. The fluid may simulate pore water of the specimen or other field condition as necessary

[1] This test method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.05 on Structural Properties of Soils.

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[2] *Annual Book of ASTM Standards*, Vol 04.08.