Designation: D 5779 – 95a (Reapproved 2001)

Standard Test Method for Field Determination of Apparent Specific Gravity of Rock and Manmade Materials for Erosion Control[1]

This standard is issued under the fixed designation D 5779; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of the specific gravity of rock for erosion control. This test method can be used for all types of materials, both naturally occurring or manmade.

1.2 This is a field test method to measure apparent specific gravity. For laboratory determination of bulk specific gravity see Test Methods C 97.

1.3 The values stated in SI units are to be regarded as the standard.

1.4 *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:*

C 97 Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone[2]

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials[3]

D 653 Terminology Relating to Soil, Rock, and Contained Fluids[3]

D 4753 Specification for Evaluating, Selecting, and Specifying Balances and Scales for Use in Soil, Rock, and Related Construction Materials Testing[3]

D 4992 Practice for Evaluation of Rock to be Used for Erosion Control[4,5]

3. Terminology

3.1 *Definitions:*

3.1.1 *field apparent specific gravity*—the ratio of the weight in air of a unit volume of impermeable rock or manmade material, to the weight of an equal volume of water. This is similar to the definition of apparent specific gravity in Terminology D 653 except that non-distilled water is used for the test and the test can be run under a variety of temperatures.

4. Summary of Test Method

4.1 A specimen (block, chunk, slab, or piece) of rock or manmade material is weighed in air and then weighed again while immersed in water. Using the weights, the field specific gravity is calculated. The determined specific gravity can then be used to determine a mass per unit volume.

5. Significance and Use

5.1 Specific gravity is one factor used to determine the required mass of individual particles used as gabion-fill, riprap, armor stone, breakwater stone, or other types of rock products used for erosion control applications, and acceptibility of these materials for their intended use.

6. Apparatus

6.1 *Balance*—A balance or scale conforming to the requirements of Specification D 4753 readable (with no estimation) to 1 % or better of the mass of the test specimen. For masses over 50 kg a load-cell, spring scale, or some other device accurate to within 1 % of the mass may be used.

6.2 *Specimen Container*—A wire basket or sling or pan capable of holding a specimen of rock and suspending it in water.

6.3 *Water*—A volume of water large enough to submerge the specimen and its container.

7. Sampling

7.1 A source of rock to be sampled shall be guided by Practice D 4992. A source that is macroscopically uniform in color, texture, mineralogy, or some other visual property shall be represented by a sample consisting of a minimum of five specimens of rock. A macroscopically nonuniform source shall be represented by a minimum of eight samples of rock. Rock types that comprise less than 5 % of the total source, as determined from their macroscopic properties, may be ignored, unless their presence will greatly affect the test results and

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[1] This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.17 on Rock for Erosion Control.

Current edition approved Dec. 10, 1995. Published March 1996. Originally published as D 5779 – 95. Last previous edition D 5779 – 95.

[2] *Annual Book of ASTM Standards*, Vol 04.07.

[3] *Annual Book of ASTM Standards*, Vol 04.02.

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

[5] *Annual Book of ASTM Standards*, Vol 04.09.

subsequent proposed use of the rock. Sample the rock types in their approximate proportion to the types that occur at the source.

7.2 Specimens shall be clean and without any soil particles or other materials adhering to them that will affect the test results. Washing of the samples followed by air-drying may be necessary.

7.3 Air-dry specimens until all surfaces are visually dry.

7.4 Each specimen shall be a minimum of 2.3 kg (5 lb) in mass. The maximum mass shall be limited only by the size of the scale and water-filled tank. Small pieces of rock shall be combined to produce a specimen having a minimum of 2.3-kg mass for weighing.

NOTE 1—Evaluation of the properties of rock is best performed by testing the largest possible samples.

8. Procedure

8.1 Perform the test in the field at any temperature above the freezing temperature of water.

8.2 Determine the air-dry mass of each block and record its mass to the nearest 1 %.

8.3 Place each specimen in the specimen container and immerse it completely in water.

8.4 Determine the mass of each block while immersed in water and record the mass to the nearest 1 %.

NOTE 2—The tare value of the specimen container shall be adjusted or determined while the container is immersed in water without the specimen. The apparatus shall be immersed to the same level (depth) during the test to reduce error caused by the mass of the equipment above and below the water level.

NOTE 3—Specific gravities of samples of large rock can be made using power equipment, slings, and load cells or some other means of determining its mass.

9. Calculation

9.1 *Specific Gravity*—Calculate the air-dried apparent specific gravity for each specimen of rock as follows:

$$\text{apparent specific gravity} = \frac{\text{mass in air}}{\text{mass in air} - \text{mass in water}} \quad (1)$$

NOTE 4—For those circumstances requiring results reportable to 0.01 specific gravity unit, a laboratory determination using Test Methods C 97 may be used.

9.2 *Average Apparent Specific Gravity*—Calculate the average air-dried apparent specific gravity of the rock source as follows:

$$\frac{\text{average apparent}}{\text{specific gravity}} = \frac{\text{summation of specific gravities}}{\text{number of samples tested}} \quad (2)$$

NOTE 5—The average specific gravity shall be calculated for a specimen of combined small pieces. The specific gravity of individual pieces shall not be required.

10. Report

10.1 Report the following information:

10.1.1 Source of the samples, its location, the date sampled and tested, and the geological formation if known,

10.1.2 Description and type of materials,

10.1.3 Name of the individuals performing the test,

10.1.4 Specific gravities of all specimens to the nearest 0.1 specific gravity unit,

10.1.5 Average specific gravity for the source to the nearest 0.1 specific gravity unit,

10.1.6 Variability in test results if multiple tests are made on the same specimens,

10.1.7 Type of equipment used to perform the test, that is, balance with basket in tank, crane with sling and load cell, and so forth, and

10.1.8 Photograph of specimens and equipment used in testing. This is optional.

11. Precision and Bias

11.1 *Precision*—The following estimates of precision are based on the results of testing conducted by six laboratories on five different kinds of dolomite and limestone.

11.1.1 *Single-Operator Precision*—The single-operator standard deviation of a single test result has been found to be 0.008.[6] Therefore, results of two properly conducted tests by the same operator should not differ by more than 0.02.[6]

11.1.2 *Multilaboratory Precision*—The multilaboratory standard deviation of a single test result has been found to be 0.027.[6] Therefore, results of two properly conducted tests in different laboratories on the same material should not differ by more than 0.08.[6]

11.2 *Bias*—There is no accepted reference value for this test method; therefore, bias cannot be determined.

12. Keywords

12.1 riprap; rock; rock material properties; specific gravity

[6] These numbers represent, respectively, the (ls) and (d2s) limits as described in Practice C 670.