



Designation: D5779/D5779M – 24

Standard Test Method for Field Determination of Rapid Specific Gravity of Rock and Manmade Materials for Erosion Control¹

This standard is issued under the fixed designation D5779/D5779M; 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 rapid specific gravity of rock or man-made materials for erosion control.

1.2 This procedure is intended to be performed in the field, for example, quarry, work site, etc., and as such lacks the accuracy that laboratory method, [D6473/D6473M](#) has. For example, there is no requirement for measuring temperature of the water or calculation of the density of water as is required in [D6473/D6473M](#).

1.3 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.4 The text of this standard refers to notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of this standard.

1.5 All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice [D6026](#), unless superseded by this standard.

1.5.1 For purposes of comparing measured or calculated value(s) with specified limits, the measured or calculated value(s) shall be rounded to the nearest decimal or significant digits in the specified limits.

1.5.2 The procedures used to specify how data are collected/recorded or calculated, in this standard are regarded as the industry standard. In addition, they are representative of the significant digits that generally should be retained. The procedures used do not consider material variation, purpose for obtaining the data, special purpose studies, or any considerations for the user's objectives; and it is common practice to

increase or reduce significant digits of reported data to be commensurate with these considerations. It is beyond the scope of this standard to consider significant digits used in analytical methods for engineering design.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- [C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials](#)
- [D653 Terminology Relating to Soil, Rock, and Contained Fluids](#)
- [D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction](#)
- [D4753 Guide for Evaluating, Selecting, and Specifying Balances and Standard Masses for Use in Soil, Rock, and Construction Materials Testing](#)
- [D4992 Practice for Evaluation of Rock to be Used for Erosion Control](#)
- [D6026 Practice for Using Significant Digits and Data Records in Geotechnical Data](#)
- [D6473/D6473M Test Method for Specific Gravity and Absorption of Rock for Erosion Control](#)
- [E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods](#)

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.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard



E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Terminology

3.1 *Definitions*—For definitions of common technical terms in this standard, refer to Terminology D653.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *rapid specific gravity, n* —the ratio of the mass in air of a unit volume of relatively impermeable rock or man-made material, to the mass of an equal volume of water measured at ambient field temperatures.

4. Summary of Test Method

4.1 An air-dried specimen (block, chunk, or slab) of rock or manmade material, such as concrete or masonry rubble from paving and building demolition, is weighed in air and then weighed again while suspended in water. Using the masses, the field rapid 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 Riprap and armor material are composed of pieces of natural rock or manmade material that are placed on construction projects, shorelines, streambeds, bridge abutments, pilings and other structures to minimize the effects of erosion. The ability of rock or manmade material to withstand deterioration from weathering affects both the effectiveness of the project and its cost. The specific gravity and absorption provide useful information that can be used in evaluating possible deterioration of rock or manmade material.

5.2 Test specimens equal in size to the proposed design size would provide the best correlations between laboratory tests and actual field performance; however, this is usually neither practical nor economically feasible.

5.3 This test method has been used to evaluate different types of rocks and manmade material. There have been rare occasions when test results have provided data that have not agreed with the durability of rock or manmade material under actual field conditions.

NOTE 1—Specific gravity is an index property that is an indicator of potential quality (durability). Other features, such as clay mineralogy, crystalline strength, pore (void) spaces and sizes, stylolites, chert bands and nodules, and other micro and macro features may more greatly influence a particles resistance to deterioration in the environment.

5.4 The results of this test is not to be used as the sole basis for determination of durability, but should be used in conjunction with the results of other tests.

NOTE 2—The quality of the result produced by this standard is dependent upon the competence of the personnel performing it, and the suitability of the equipment and facilities used. Agencies that meet the criteria of Practice D3740 are generally considered capable of competent and objective testing/sampling/inspection. Reliable results depend on many factors; Practice D3740 provides a means of evaluating some, but not all, of those factors.

6. Interferences

6.1 The limitations of this test are threefold.

6.1.1 First, this is a field test method using simple apparatus and limited specimen inundation durations to measure rapid specific gravity. Though this method produces test results quickly, the results may not be as accurate as a more highly controlled method. For laboratory determination of specific gravity see Test Method D6473/D6473M.

6.1.2 Second, certain rock types and manmade materials with small, interconnected pore space could internally entrap air when, during rapid total immersion, water migrates from three dimensions. Capillary tension draws the water inward, but as it does so the air may become entrapped preventing the water from migrating into the center of the rock. Incremental submersion or vacuum saturation methods may aid in lessening air entrapment in this type of material and is beyond the scope of this procedure.

6.1.3 Third, the test specimens may not be representative of the quality of the larger rock and manmade material samples used in construction. Careful examination of the source and proper sampling are essential in minimizing this limitation.

7. Apparatus

7.1 *Balance*—A balance or scale conforming to the requirements of Guide D4753 readable (with no estimation) and accurate to 1 % or better of the mass of the test specimen. For masses over 50 kg [110 lb] a load-cell, spring scale, or some other device accurate to within 1 % of the mass may be used. The balance shall be equipped with suitable apparatus for suspending the sample container in water from the center of the platform or pan of the balance.

7.2 *Specimen Container*—A wire basket, sling, or pan to be attached to the scale and capable of holding the specimen and suspending it in water.

7.3 *Water Container*—A vessel filled with a volume of water large enough to submerge the specimen and specimen container without touching any of the vessel's sides.

7.4 An example apparatus is shown in Fig. 1.

8. Sampling and Test Specimens

8.1 Rock source sampling shall be guided by Practice D4992. Manmade material source sampling shall be guided, where applicable, by the general principles outlined in Practice D4992. 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. A macroscopically non-uniform source shall be represented by a minimum of eight specimens.

8.2 Rock and manmade material 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 subsequent proposed use.

8.3 Sample the rock or man-made material types in their approximate proportion to the types that occur at the source.

8.4 Specimens shall be clean and without soil particles or other adherent materials. Specimens shall have all loose parts and adherent material removed by brushing with a stiff brush (including the use of water, as necessary).