Designation: D2419 – 22

Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate[1]

This standard is issued under the fixed designation D2419; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method is intended to serve as a rapid field correlation test. The purpose of this test method is to indicate, under standard conditions, the relative proportions of clay-size or plastic fines and dust in granular soils and fine aggregates that pass the 4.75 mm (No. 4) sieve. The term "sand equivalent" expresses the concept that most granular soils and some fine aggregates are mixtures of desirable coarse particles, sand-size particles, and generally undesirable clay or plastic fines and dust.

NOTE 1—For fine aggregates containing clean dust of fracture (clay-size particles that are not clay minerals), test results will depend on the amount of fines present in the material. In this case, other tests such as Methylene Blue Value (AASHTO T 330) or X-ray diffraction (XRD) may be needed to determine if the fines are deleterious.

NOTE 2—Some agencies perform the test on material with a top size smaller than the 4.75 mm (No. 4) sieve. This is done to avoid trapping the clay-size or plastic fines and dust below flaky shaped 4.75 to 2.36 mm (No. 4 to 8) sized particles. Testing smaller top sized material may lower the numerical results of the test.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.2.1 Regarding sieves, per Specification E11 subsection 1.3, "the values stated in SI units shall be considered standard for the dimensions of the sieve cloth openings and the wire diameter used in the sieve cloth. The values stated in inch-pound units shall be considered standard with regard to the sieve frames, pans, and covers." When sieve mesh sizes are referenced, the alternate inch-pound designations are provided for information purposes and enclosed in parentheses.

1.3 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *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

C702/C702M Practice for Reducing Samples of Aggregate to Testing Size

D75/D75M Practice for Sampling Aggregates

D653 Terminology Relating to Soil, Rock, and Contained Fluids

D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

2.2 *AASHTO Standard:*[3]

T 176 Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of Sand Equivalent Test

3. Terminology

3.1 *Definitions:*

3.1.1 *clay size*—that portion of the soil or aggregate finer than 0.002 mm (0.005 mm in some cases) (see Terminology D653).

[1] This test method is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.51 on Aggregate Tests.

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

[3] Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, http://www.transportation.org.

3.1.2 *sand*—particles of rock that will pass the 4.75 mm (No. 4) sieve and be retained on the 0.075 mm (No. 200) sieve (see Terminology D653).

3.1.3 *sand equivalent*—a measure of the amount of silt, clay contamination, or clay-size aggregate particles in the fine aggregate (or soil) as determined by test (see Terminology D653). (For further explanation, see Sections 4 and 5.)

3.1.4 *soil*—sediments or other unconsolidated accumulations of solid particles produced by the physical and chemical disintegration of rocks which may or may not contain organic matter (see Terminology D653).

4. Summary of Test Method

4.1 A measured volume of soil or fine aggregate and a small quantity of flocculating solution are poured into a graduated plastic cylinder and are agitated to loosen the clay-like coatings or clay-size particles from the sand particles in the test specimen. The specimen is then "irrigated" using additional flocculating solution forcing the clay-like or clay-size material into suspension above the sand. After a prescribed sedimentation period, the height of flocculated material is read and the height of sand in the cylinder is determined. The sand equivalent is the ratio of the height of sand to the height of flocculated material multiplied by 100.

5. Significance and Use

5.1 This test method assigns an empirical value to the relative amount, fineness, and character of clay-like material present in the test specimen.

5.2 A minimum sand equivalent value may be specified to limit the permissible quantity of clay-like or clay-size fines in an aggregate.

5.3 This test method provides a rapid field method for determining changes in the quality of aggregates during production or placement.

NOTE 3—The quality of the results produced by this standard are dependent upon the competence of the personnel performing the procedure and the capability, calibration, and the maintenance of the equipment used. Agencies that meet the criteria of Specification D3666 are generally considered capable of competent and objective testing, sampling, inspection, etc. Users of this standard are cautioned that compliance with Specification D3666 alone does not completely ensure reliable results. Reliable results depend on many factors; following the suggestions of Specification D3666 or similar acceptable guideline provides a means of evaluating and controlling some of those factors.

6. Interferences

6.1 Maintain the temperature of the working solution at 72 ± 5 °F (22 ± 3 °C) during the performance of this test.

NOTE 4—If field conditions preclude the maintenance of the temperature range, frequent referee samples should be submitted to a laboratory where proper temperature control is possible. It is also possible to establish temperature correction curves for each material being tested where proper temperature control is not possible. However, no general correction should be utilized for several materials even within a narrow range of sand equivalent values. Samples that meet the minimum sand equivalent requirement at a working solution temperature below the recommended range need not be subject to referee testing.

6.2 Perform the test at a location free from vibration. Excessive vibration may cause the suspended material to settle at a greater rate than normal.

6.3 Do not expose the plastic cylinders to direct sunlight any more than is necessary.

6.4 Occasionally it may be necessary to remove a fungus growth from the working calcium chloride solution container and from the inside of the flexible tubing and irrigator tube. This fungus can easily be seen as a slimy substance in the solution, or as a mold growing on the inside of the container.

6.4.1 To remove this growth, prepare a cleaning solvent by diluting sodium hypochlorite solution (household chlorine bleach) with an equal quantity of water.

6.4.2 After discarding the contaminated solution, fill the solution container with the prepared cleaning solvent: allow about 1 L of the cleaning solvent to flow through the siphon assembly and irrigator tube, then place the pinch clamp on the end of the tubing to cut off the flow of solvent and to hold the solvent in the tube. Refill the container and allow to stand overnight.

6.4.3 After soaking, allow the cleaning solvent to flow out through the siphon assembly and irrigator tube.

6.4.4 Remove the siphon assembly from the solution container and rinse both with clear water. The irrigator tube and siphon assembly can be rinsed easily by attaching a hose between the tip of the irrigator tube and water faucet and backwashing fresh water through the tube.

6.5 Occasionally the holes in the tip of the irrigator tube may become clogged by a particle of sand. If the obstruction cannot be freed by any other method, use a pin or other sharp object to force it out using extreme care not to enlarge the size of the opening.

6.6 Working solution which is more than two weeks old shall be discarded.

6.7 Mixing and storage container(s) for solutions shall be thoroughly rinsed prior to mixing a fresh batch of solution.

6.8 Fresh solution shall not be added to old solution regardless of age.

7. Apparatus

7.1 A graduated transparent acrylic plastic cylinder, rubber stopper, irrigator tube, weighted foot assembly, and siphon assembly all conforming to the respective specifications and dimensions shown in Fig. 1. See Annex A1 for alternative apparatus.

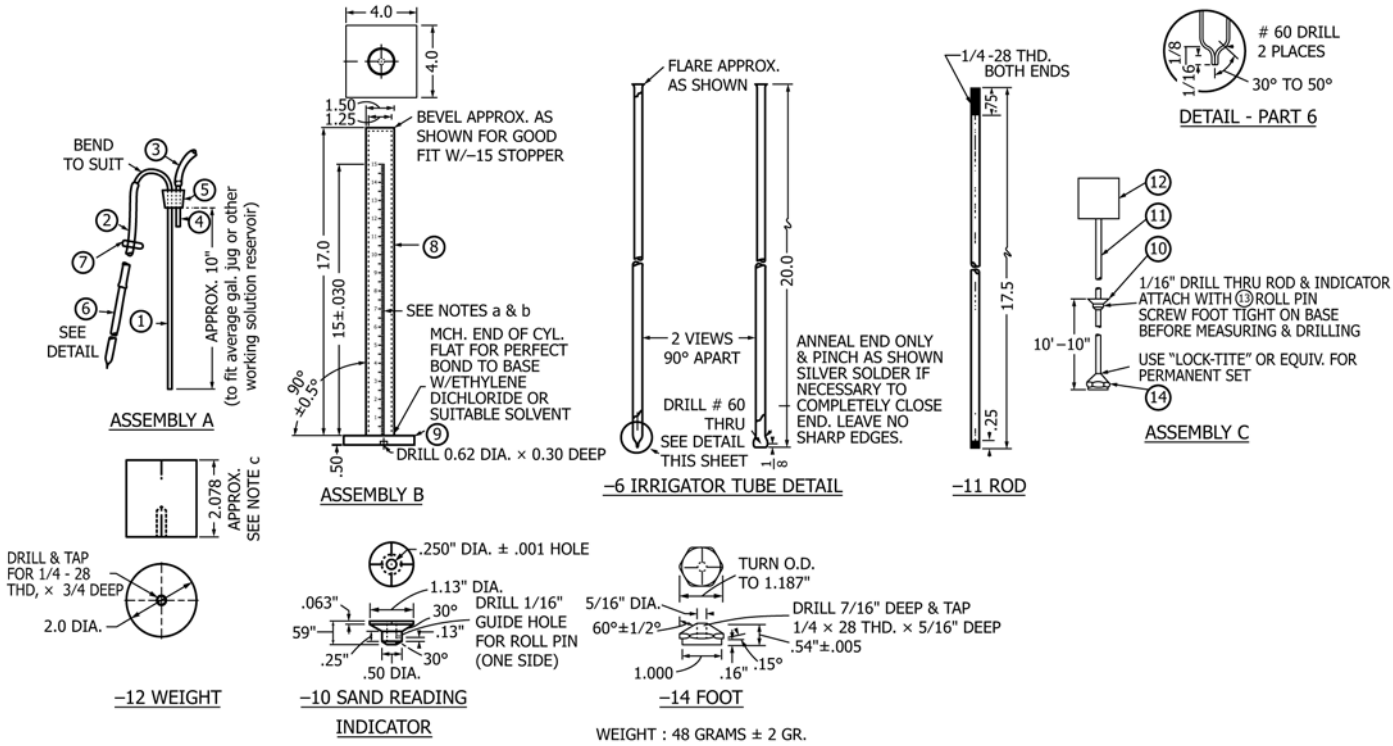
7.2 *Measuring Tin*—A cylindrical tin approximately 2¼ in. (57 mm) in diameter having a capacity of 85 ± 5 mL.

7.3 *4.75 mm (No. 4) Sieve,* conforming to the requirements of Specification E11.

7.4 *Funnel,* wide-mouth, for transferring test specimens into the graduated cylinder.

7.5 *Bottles,* two, 1.0 gal (3.8 L), to store stock solution and working solution.

7.6 *Flat Pan,* for mixing.



List of Material

Assembly	Part No.	Description	Stock Size, in.	Material
A		*Siphon Assembly:*		
	1	siphon tube	¼ diameter by 16	copper tube (may be plated)
	2	siphon hose	3⁄16 ID by 48	rubber tube, pure gum or equivalent
	3	blow hose	3⁄16 ID by 2	rubber tube, pure gum or equivalent
	4	blow tube	¼ diameter by 2	copper tube (may be plated)
	5	2-hole stopper	No. 6	rubber
	6	irrigator tube	¼ OD 0.035 wall by 20 SS tube, Type 316	
	7	clamp	Pinchcock, Day, BKH No. 21730 or equivalent	
B [A,B]		*Graduate Assembly:*		
	8	tube	1.50 OD by 17	transparent acrylic plastic
	9	base	¼ by 4 by 4	transparent acrylic plastic
C [C]		*Weighted Foot Assembly:*		
	10	sand reading indicator	1¼ diameter by 0.59	nylon 101 type 66 annealed
	11	rod	¼ diameter by 17½	brass (may be plated)
	12	weight	2 diameter by 2.078	C. R. steel (may be plated)
	13	roll pin	1⁄16 diameter by ½	corrosion-resistant metal
	14	foot	11⁄16 hex by 0.54	brass (may be plated)
	15	solid stopper	No. 7	rubber

[A] *Assembly B*—Accuracy of scale should be ±0.010 in. per tenth of an inch. Error at any point on scale should be ±0.030 in. of true distance to zero.
[B] *Assembly B*—Graduations on graduate should be in tenths of an inch. Inch marks should be numerically designated as shown. The inch and half-inch division lines should be approximately ¼ in. long. All division lines should be 0.015 in. deep with width across top 0.030 in.
[C] *Assembly C*—Weighted foot assembly should weigh 1000 ± 5 g.

Metric Equivalents

in.	mm	in.	mm	in.	mm	in.	mm
0.001	0.025	0.13	3.30	0.62	15.75	2	50.80
0.005	0.127	3⁄16	4.76	0.63	16.00	2.078	52.78
0.010	0.254	0.25	6.35	0.75	19.05	4	101.60
0.015	0.381	¼	6.35	¾	19.05	10.10	256.54
0.020	0.508	0.30	7.62	1	25.4	15	381.00
0.030	0.762	5⁄16	7.94	1 1⁄16	26.99	16	406.40
0.035	0.889	⅜	9.51	1.24	31.50	17	431.80
1⁄16	1.59	0.50	12.70	1¼	31.75	17.5	444.50
0.100	2.54	0.54	13.72	1.50	38.10	20	508.00
⅛	3.17	0.59	14.99	1½	38.10	48	1219.2

NOTE 1—The sand reading indicator and foot specified by ASTM Method D2419 – 69. Fig. 1 may be used where this equipment is previously available.

FIG. 1 Sand Equivalent Test Apparatus