



Designation: D 1140 – 00

Standard Test Methods for Amount of Material in Soils Finer Than the No. 200 (75- μ m) Sieve¹

This standard is issued under the fixed designation D 1140; 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 Department of Defense.

1. Scope *

1.1 These test methods cover determination of the amount of material finer than a 75- μ m (No. 200) sieve by washing.

1.2 Two methods for determining the amount of material finer than the No. 200 sieve are provided. The method to be used shall be specified by the requesting authority. If no method is specified, the choice should be based on the guidance given in 4.2 and 7.3

1.2.1 *Method A*—Test specimen is not dispersed prior to wash sieving.

1.2.2 *Method B*—Test specimen is dispersed by soaking in water containing a deflocculating agent prior to wash sieving

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 702 Practice for Reducing Field Samples of Aggregate to Testing Size²

D 75 Practice for Sampling Aggregates³

D 422 Test Method for Particle-Size Analysis of Soils⁴

D 2216 Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass⁴

D 2487 Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)⁴

D 3740 Practice for Minimum Requirement for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction⁴

D 4753 Specification for Evaluating, Selecting, and Specifying Balances and Scales for Use in Soil, Rock, and Related Construction Materials for Testing⁴

D 6026 Practice for Using Significant Digits in Geotechnical Data⁵

E 11 Specification for Wire-Cloth Sieves for Testing Purposes⁶

E 145 Specification for Gravity-Convection and Force-Ventilation Ovens⁶

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods⁶

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method⁶

3. Summary of Test Method

3.1 A specimen of the soil is washed over a 75- μ m (No. 200) sieve. Clay and other particles that are dispersed by the wash water, as well as water-soluble materials, are removed from the soil during the test. The loss in mass resulting from the wash treatment is calculated as mass percent of the original sample and is reported as the percentage of material finer than a 75- μ m (No. 200) sieve by washing.

4. Significance and Use

4.1 Material finer than the 75- μ m (No. 200) sieve can be separated from larger particles much more efficiently and completely by wet sieving than with dry sieving. Therefore, when accurate determinations of material finer than 75- μ m sieve in soil are desired, this test method is used on the test specimen prior to dry sieving. Usually the additional amount of material finer than 75- μ m sieve obtained in the dry sieving process is a small amount. If it is large, the efficiency of the washing operation should be checked, as it could be an indication of degradation of the soil.

4.2 With some soils, particularly clayey soils, in order to keep the finer material from adhering to the larger particles, it will be necessary to soak the soil prior to washing it through the sieve. A deflocculating agent (dispersing agent) should be added to the soil when it is soaked.

¹ This standard is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.03 on Texture, Plasticity and Density Characteristics of Soils.

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² Annual Book of ASTM Standards, Vol 04.02.

³ Annual Book of ASTM Standards, Vol 04.03.

⁴ Annual Book of ASTM Standards, Vol 04.08.

⁵ Annual Book of ASTM Standards, Vol 04.09.

⁶ Annual Book of ASTM Standards, Vol 14.02.

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

NOTE 1—The quality of the result produced by this standard is dependent on the competence of the personnel performing it, and the suitability of the equipment and facilities used. Agencies that meet the criteria of Practice D 3740 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with Practice D 3740 does not in itself assure reliable results. Reliable results depend on many factors; Practice D 3740 provides a means of evaluating some of those factors.

5. Apparatus

5.1 *Balance*—A balance or scale conforming to the requirements of Specification D 4753, readable (with no estimation) to 0.1 % of the test mass, or better. To determine the balance needed, multiply your test mass by 0.001 and check Table 1 of Specification D 4753 for the class of balance readable to the number observed.

5.2 *Sieves*—A minimum nest of two sieves is recommended, the lower must be a 75- μm (No. 200) sieve and the upper may be a 425- μm (No. 40) or larger sieve. Choose a sieve with a diameter sufficient to handle the size of specimen required by 6.2. The 75- μm sieve should have a backing to prevent damage. The sieves shall conform to the requirements of Specification E 11. Stainless sieve mesh is preferred, as it is less prone to damage or wear.

5.3 *Oven*—An oven of sufficient size, capable of maintaining a uniform temperature of $100 \pm 5^\circ\text{C}$ ($230 \pm 9^\circ\text{F}$) and which meets the criteria of Specification E 145.

5.4 *Deflocculating Agent*—A solution of Sodium Hexameta-phosphate of any concentration sufficient to cause particle separation can be used. A common amount is 40 g per 1000 mL of water.

6. Sampling

6.1 Sample the soil in accordance with Practice D 75.

6.2 Thoroughly mix the soil sample and reduce the quantity to an amount suitable for testing using the applicable method described in Practice C 702. The test specimen shall be the end result of the reduction. Reduction to an exact predetermined mass is not permitted. The mass of the test specimen, after drying, shall conform with the following except as noted (6.2.1 and Note 2):

Maximum Particle Size (100 % Passing)	Standard Sieve Size	Recommended Minimum Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	$\frac{3}{8}$ "	500 g
19.0 mm	$\frac{3}{4}$ "	2.5 kg
37.5 mm	$1\frac{1}{2}$ "	10 kg
75.0 mm	3"	50 kg

6.2.1 If the same specimen is to be tested for sieve analysis according to Test Method D 422, comply with the applicable mass requirements of that Test Method.

NOTE 2—When a minimum mass is not available (split spoon sample, and the like), a smaller mass can be used. The report shall indicate the mass used.

7. Procedure

7.1 Dry the test specimen to a constant mass at a temperature of $110 \pm 5^\circ\text{C}$ ($230 \pm 9^\circ\text{F}$) and determine its mass to the nearest 0.1 g. To determine the balance needed, multiply the

mass by 0.001, check the resultant number with Table 1 of Specification D 4753 for the required balance.

7.1.1 For example: Minimum readability = $276 \text{ g (mass)} \times 0.001 = 0.3 \text{ g}$. A GP-2 with a readability of 0.1 g would be suitable. A more sensitive balance could also be used.

7.1.2 As an alternative, select an auxiliary water content specimen and determine the water content (nearest 0.1 %) in accordance with Test Method D 2216. Calculate the oven-dry mass of the test specimen from the moist mass (nearest 0.1 % of its mass, or better (see 5.1)) and the water content.

7.2 Method A:

7.2.1 After preparing the specimen in accordance with 7.1, place the specimen on the uppermost (coarsest) sieve. Wash the specimen (material) on the sieve(s) by means of a stream of water from a faucet (Note 3). The material may be lightly manipulated by hand, to facilitate the washing process, taking care not to lose any of the retained material. No downward pressure should be exerted on the retained material or sieve to avoid the forcing of particles through the sieve or damage to the sieve. Continue the washing until the water coming through the sieve(s) is clear (Note 4).

NOTE 3—A spray nozzle or a piece of rubber tubing attached to a water faucet may be used for the washing. The velocity of the water, which may be increased by pinching the tubing, shall not cause any splashing of the material over the sides of the sieve. The water temperature should not exceed 32°C (90°F) to avoid expanding the sieve fabric.

NOTE 4—Care should be taken not to let water accumulate on the 75- μm (No. 200) sieve due to clogging of the screen. The clogging can cause overflow of the sieve and loss of material. Lightly hand tapping the sides of the sieve or the bottom of the screen with a fingertip(s) should prevent clogging. Directing a stream of water up from below the screen is another method to unplug the sieve without physically damaging it. Be careful not to overload the screen by sieving too large a specimen, or portion of a specimen, at any one time.

7.3 Method B:

7.3.1 As an alternative, particularly for very cohesive soils; after preparing the specimen in accordance with 7.1, place the specimen in a container, cover with water containing a deflocculating agent, and soak for a minimum of 2 h (preferably overnight) (Note 5). The specimen should be periodically agitated manually or by mechanical means to facilitate the complete separation of the particles.

NOTE 5—It will also be easier to separate the particles if the specimen is not dried prior to soaking. The moist mass can be adjusted to a dry mass by using the water content determination procedure from 7.1.2.

7.3.2 After the soaking period is completed, agitate the contents of the container vigorously and immediately pour into the nested sieves. Wash any remaining material into the sieve(s) to make sure all of the material is transferred. Then finish the washing procedure as specified in 7.2.

7.4 When the washing by Method A or B is completed, the material retained on the 75- μm (No. 200) sieve can be dried either in the sieve, or by flushing (transferring) the contents of the sieve into another container. If the soil is transferred, excess water can be removed by decanting or suctioning to speed drying time. Take care not to lose any particles by removing only clear water.