



Standard Test Method for Clay Lumps and Friable Particles in Aggregates¹

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1. Scope

1.1 This test method covers the approximate determination of clay lumps and friable particles in aggregates.

1.2 The values given in SI units are to be regarded as the standard. The values given in parentheses are provided for information purposes only.

1.3 *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 33 Specification for Concrete Aggregates²

C 117 Test Method for Materials Finer Than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing²

C 125 Terminology Relating to Concrete and Concrete Aggregates²

C 1005 Specification for Reference Masses and Devices for Determining Mass for Use in the Physical Testing of Hydraulic Cements³

E 11 Specification for Wire-Cloth Sieves for Testing Purposes⁴

3. Significance and Use

3.1 This test method is of primary significance in determining the acceptability of aggregate with respect to the requirements of Specification C 33.

4. Apparatus

4.1 *Balance*—A balance or scale accurate to within 0.1 % of the mass of the test sample at any point within the range of use. Balances shall conform to the accuracy of the applicable sections of Specification C 1005.

4.2 *Containers*—Rust-resistant containers of a size and shape that will permit the spreading of the sample on the bottom in a thin layer.

¹ This test method is under the jurisdiction of ASTM Committee C-9 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.20 on Normal Weight Aggregates.

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² *Annual Book of ASTM Standards*, Vol 04.02.

³ *Annual Book of ASTM Standards*, Vol 04.01.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

4.3 *Sieves*—Sieves conforming to Specification E 11.

4.4 *Drying Oven*—An oven providing free circulation of air and capable of maintaining a temperature of $110 \pm 5^\circ\text{C}$ ($230 \pm 9^\circ\text{F}$).

5. Samples

5.1 Aggregate for this test method shall consist of the material remaining after completion of testing in accordance with Test Method C 117. To provide the quantities designated in 5.3 and 5.4 it may be necessary to combine material from more than one test by Test Method C 117.

5.2 Dry the aggregate to substantially constant mass at a temperature of $110 \pm 5^\circ\text{C}$ ($230 \pm 9^\circ\text{F}$).

5.3 Test samples of fine aggregate shall consist of the particles coarser than a 1.18-mm (No. 16) sieve and shall have a mass not less than 25 g.

5.4 Separate the test samples of coarse aggregate into different sizes, using the following sieves: 4.75-mm (No. 4), 9.5-mm ($\frac{3}{8}$ -in.), 19.0-mm ($\frac{3}{4}$ -in.), and 37.5-mm ($1\frac{1}{2}$ -in.). The test sample shall have a mass not less than indicated in the following table:

Size of Particles Making Up Test Sample	Mass of Test Sample, min, g
4.75 to 9.5-mm (No. 4 to $\frac{3}{8}$ -in.)	1000
9.5 to 19.0-mm ($\frac{3}{8}$ to $\frac{3}{4}$ -in.)	2000
19.0 to 37.5-mm ($\frac{3}{4}$ to $1\frac{1}{2}$ -in.)	3000
Over 37.5-mm ($1\frac{1}{2}$ -in.)	5000

5.5 In the case of mixtures of fine and coarse aggregates, separate the material on the 4.75-mm (No. 4) sieve, and prepare the samples of fine and coarse aggregates in accordance with 5.3 and 5.4.

6. Procedure

6.1 Determine the mass of the test sample to the accuracy specified in 4.1 and spread it in a thin layer on the bottom of the container, cover it with distilled water, and soak it for a period of 24 ± 4 h. Roll and squeeze particles individually between the thumb and forefinger to attempt to break the particle into smaller sizes. Do not use the fingernails to break up particles, or press particles against a hard surface or each other. Classify any particles that can be broken with the fingers into fines removable by wet sieving as clay lumps or friable particles. After all discernible clay lumps and friable particles have been broken, separate the detritus from the remainder of the sample by wet sieving over the sieve prescribed in the following table:

Size of Particles Making Up Sample	Size of Sieve for Removing Residue of Clay Lumps and Friable Particles
Fine aggregate (retained on 1.18-mm (No. 16) sieve)	850- μ m (No. 20)
4.75 to 9.5-mm (No. 4 to 3/8-in.)	2.36-mm (No. 8)
9.5 to 19.0-mm (3/8 to 3/4-in.)	4.75-mm (No. 4)
19.0 to 37.5-mm (3/4 to 1 1/2-in.)	4.75-mm (No. 4)
Over 37.5-mm (1 1/2-in.)	4.75-mm (No. 4)

Perform the wet sieving by passing water over the sample through the sieve while manually agitating the sieve, until all undersize material has been removed.

6.2 Remove the retained particles carefully from the sieve, dry to substantially constant mass at a temperature of $110 \pm 5^\circ\text{C}$ ($230 \pm 9^\circ\text{F}$), allow to cool, and determine the mass to the nearest 0.1 % of the mass of the test sample as defined in 5.3 or 5.4.

7. Calculation

7.1 Calculate the percent of clay lumps and friable particles in fine aggregate or individual sizes of coarse aggregate as follows:

$$P = [(M - R)/M] \times 100 \quad (1)$$

where:

P = percent of clay lumps and friable particles,

M = mass of test sample (for fine aggregate the mass of the portion coarser than the 1.18-mm (No. 16) sieve as described in 5.3), and

R = mass of particles retained on designated sieve as determined in accordance with 6.2.

7.2 For coarse aggregates, the percent of clay lumps and friable particles shall be an average based on the percent of clay lumps and friable particles in each sieve size fraction weighted in accordance with the grading of the original sample before separation or, preferably, the average grading of the supply represented by the sample. Should the aggregate contain less than 5 % of any of the sizes specified in 6.1, that size shall not be tested but, for the purpose of calculating the weighted average, shall be considered to contain the same percent of clay lumps and friable particles as the next larger or next smaller size, whichever is present.

8. Precision and Bias

8.1 *Precision*⁵—The estimate of the precision of this test method is provisional and is based on samples of one fine aggregate which was tested by ten different operators at nine different laboratories. For that sample, the average “percent of clay lumps and friable particles” in the aggregate was 1.2 %, and the standard deviation was 0.6 %. Based on this standard deviation, the acceptable range of two test results on samples from the same aggregate sent to different laboratories is 1.7 %.

8.2 *Bias*—Since there is no acceptable reference material for determining the bias for the procedure in this test method, no statement is being made.

9. Keywords

9.1 aggregates; clay lumps; friable particles

⁵ A research report is on file at ASTM Headquarters. Request RR:C09-1016.

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