

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

STANDARD METHOD OF TEST FOR FRIABLE PARTICLES IN AGGREGATES

1. PURPOSE

- 1.1 To provide a standard method for obtaining the approximate percent by weight of clay lumps and friable particles in aggregates. Although this test method is performed on a dry, prewashed sample, it is not intended to alter the intent of ASTM C 142.
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2. SCOPE

- 2.1 This method of test is applicable to all coarse and fine aggregates when a test for friable particles is required.
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3. EQUIPMENT

- 3.1 *Balance*—The balance shall have sufficient capacity, be readable to 0.1 percent of the sample mass, or better, and conform to the requirements of M 231.
- 3.2 *Oven*—An oven capable of maintaining a temperature of $230^{\circ}\text{F} \pm 9^{\circ}\text{F}$ ($110^{\circ}\text{C} \pm 5^{\circ}\text{C}$).
- 3.3 *Pans*—Large flat pans for spreading the aggregate in a single layer.
- 3.4 *Sieves*—The following sieve sizes conforming to AASHTO M-92; 4.75 mm (No. 4), 2.36 mm (No. 8), 1.18 mm (No. 16), and 850 μm (No. 20).
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4. DEFINITIONS

- 4.1 Friable Particle - Any piece of aggregate that can be broken into smaller particles with the thumb and forefinger, excluding the use of the fingernails.
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5. TEST PORTION PREPARATION

- 5.1 In order to provide a clean, workable test portion, it is necessary that the aggregate sample be washed, oven dried and sieved over the proper sieve described below in sections 5.1.1 and 5.1.2.
- 5.1.1 *COARSE AGGREGATE* - Sieve a sufficient quantity of the coarse aggregate over a 4.75 mm (No. 4) sieve so as to yield a test portion of no less than 5000 g retained on the 4.75 mm (No. 4) sieve.
- 5.1.1.1 Record the mass of the test portion to the nearest whole gram.
- 5.1.2 *FINE AGGREGATE* - Sieve a sufficient quantity of the fine aggregate sample over a 1.18 mm (No. 16) sieve so as to yield a test portion of approximately 200 g retained on the 1.18 mm (No. 16) sieve.

- 5.1.2.1 Record the mass of the test portion to the nearest whole gram on the WVDOH Forms 702-Q and 703-Q (see attached sample forms). The live forms are available on the WVDOH MCS&T [Webpage Toolbox](#).¹

6. TEST PROCEDURE

- 6.1 Spread the sieved sample in a thin layer on the bottom of a large flat pan.
- 6.2 Examine the sample for possible friable particles and squeeze or roll the pieces between the thumb and forefinger attempting to break them into smaller particles.
- 6.3 After all discernible friable particles have been broken, remove the smaller particles from the remainder of the sample by use of the sieves listed in the following table.

Standard size of sieve upon which test portion is retained	Standard size of sieve through which friable particles are permitted to pass
COARSE AGGREGATES: 4.75 mm (No. 4)	2.36 mm (No. 8)
FINE AGGREGATES: 1.18 mm (No. 16)	850 µm (No. 20)

7. CALCULATIONS

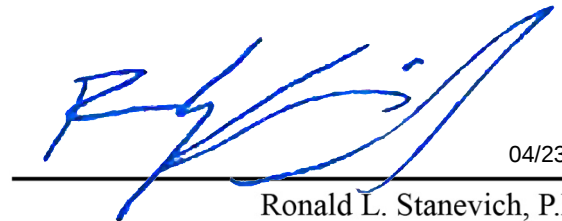
- 7.1 Percentages of friable particles are determined by the following formula:

$$F_p = \frac{M_f}{M} \times 100$$

where:

F_p = Percentage of friable particles
M_f = Mass of the friable particles removed after second sieving.
M = Mass of the test sample retained on the first sieving.

- 7.2 Report results to the nearest 0.01%.


04/23/2020
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Materials Control, Soils and Testing Division

RLS: Ms

Attachments

¹ <https://transportation.wv.gov/highways/mcst/Pages/tbox.aspx>

Deleterious Substances for Coarse Aggregates - Section 703.1.2

Lab Ref No.: _____	Source: _____
Date Logged : _____	Technician : _____

Thin or Elongated pieces: 5% by weight max.
$W_i (0.1g):$ _____ g
$W_{t/e} (0.1g):$ _____ g
$W_p (0.1\%) = (W_{t/e} / W_i) \times 100 =$ _____ %

Shale / Shale-like Material: 1% by weight max.
$W_i (0.1g):$ _____ g
$W_s (0.1g):$ _____ g
$W_p (0.1\%) = (W_s / W_i) \times 100 =$ _____ %

Friable Particles: 0.25% by weight max.
$W_i (0.1g):$ _____ g
$W_{fri} (0.1g):$ _____ g
$W_p (0.01\%) = (W_{fri} / W_i) \times 100 =$ _____ %

Coal & Lightweight Materials: 1.5% by weight max.
$W_i (0.1g)$ _____ g
$W_{c/L} (0.1g)$ _____ g
$W_p (0.1\%) = (W_{c/L} / W_i) \times 100 =$ _____ %

Form 702-Q

Deleterious Substances for Fine Aggregate: Section 702.1.2

Lab Ref No.:	_____	Source:	_____
Date Logged :	_____	Technician :	_____

Coal & Lightweight: 2% by weight max.	
W_i (0.1g):	_____ g
$W_{c/L}$ (0.1g):	_____ g
W_p (0.1%) = $(W_{c/L} / W_i) \times 100 =$ _____ %	

Friables: 1% by weight max.	
W_i (0.1g):	_____ g
W_{fri} (0.1g):	_____ g
W_p (0.1%) = $(W_{fri} / W_i) \times 100$ _____ %	

Organic Impurities - result of 4 or 5, send to lab for mortar strength	
Color reading after 24 hours _____	Time start/end: _____
Send Sample for Mortar Strength Test?	Jar #: _____
no _____ yes _____	Date Sent (if yes) _____