

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

MATERIALS PROCEDURE

STANDARD METHOD OF TEST FOR PERCENT CRUSHED PARTICLES

1. PURPOSE

- 1.1 To set forth a standard method of test for determining the percent of crushed particles in coarse aggregate.
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2. SCOPE

- 2.1 This method of test is applicable to that portion of crushed aggregate which is retained on the 4.75 mm (No. 4) sieve when that material is being used for applications where the standard specifications places a requirement on the percent of crushed particles.
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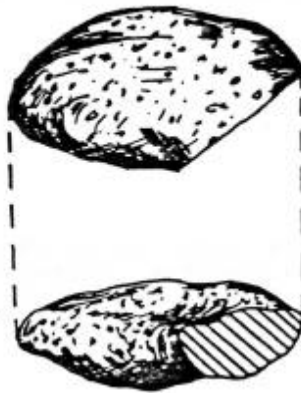
3. EQUIPMENT

- 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 ASSHTO 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 *Sieve*—4.75 mm (No. 4), conforming to AASHTO M 92
- 3.4 *Pans*—Large flat pans for spreading the aggregate in a single layer, and suitable for containing the pieces of aggregate as they are separated.
- 3.5 *AASHTO Compliant Splitter* – Compliant with AASHTO M 92
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4. DEFINITIONS

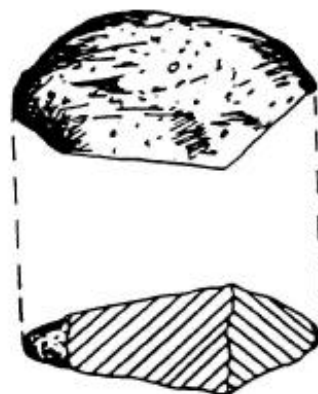
- 4.1 Crushed Particle - A particle of aggregate which has at least one face fracture as defined in Section 4.1.1.
- 4.1.1 Face Fracture - A face fracture is defined as a break that has resulted from the production process (crushing operation) which constitutes an area of at least 25 % of the largest two-dimensional area of the particle.
- 4.1.2 Single Face Fracture - A particle which has only one exposed break in a single plane meeting the requirements set forth in Section 4.1.1. An example of a single face fracture is shown in Figure 1.

FIGURE 1



- 4.1.3 Multi-Face or Two Face Fracture - A particle which has at least two exposed breaks in two or more planes meeting the requirements set forth in Section 4.1.1. An example of a multi-face fracture is shown in Figure 2.

FIGURE 2



5. TEST PORTION PREPARATION

- 5.1 Obtain enough aggregate from the field sample to yield a test portion of the appropriate size by use of a sample splitter. (*see NOTE*)
- 5.2 Sieve the aggregate over a 4.75 mm (No. 4) sieve and discard the minus 4.75 mm (No. 4) material.
- 5.3 Gently wash the aggregate retained on the 4.75 mm (No. 4) sieve to remove any dust or coatings.
- 5.4 Dry the clean, sieved aggregate to a constant mass in an oven maintained at $230^{\circ}\text{F} \pm 9^{\circ}\text{F}$ ($110^{\circ}\text{C} \pm 5^{\circ}\text{C}$).

NOTE: Approximate mass of the test portion of crushed aggregate after sieving.

NOMINAL MAXIMUM SIZE OF PARTICLES	MINIMUM MASS OF TEST PORTION
9.5 mm (3/8-in.)	500 g
19 mm (3/4-in.)	1500 g
37.5 mm (1-1/2-in.)	3000 g
Over 37.5 mm (1-1/2-in.+)	5000 g

6. TEST PROCEDURE

- 6.1 Weigh the test portion and record the mass to the nearest gram on the WVDOH Form T 302 (see attached sample form). The live form is available on the WVDOH MCS&T [Webpage Toolbox](#).¹ See NOTE in Section 5. for the required test portion mass.
- 6.2 Place the test portion in a large, flat pan or on another suitable workspace. Arrange and label three pans for separating the test portion into single-face, multi-face, and no-face fractures.
- 6.3 Pick up and inspect each particle to determine the number of face fractures and place them in the appropriate pan or container.
- 6.4 After the entire test portion has been separated, weigh each fraction and record the masses on the T302 form to the nearest whole gram.
- 6.5 The entire test portion is to be re-combined and the test is to be conducted by a second technician. The second technician is to follow the steps described in Sections 6.1 through 6.4.
- 6.6 Use form T302 for comparison of the two Technician's results. When the results obtained by two technicians vary more than two percent, it is necessary for both technicians to review the test procedure and re-conduct the test, beginning at Section 6.1.

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

7. CALCULATIONS

7.1 Let M_2 = the mass of all particles which have two or more face fractures.

M_1 = the mass of all particles which have only one fractured face.

M_0 = the mass of all particles which have no fractured faces.

$M_3 = M_1 + M_2$ = Total mass of crushed particles (Single-Face or more)

M_4 = Total test portion mass

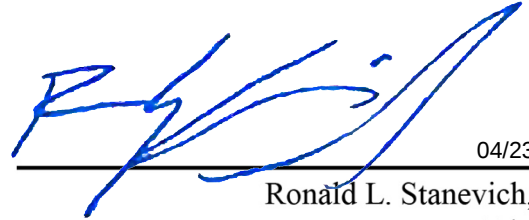
7.2 Total Percent Crushed Particles (Single-Face or more) =

$$(M_3 / M_4) \times 100$$

7.3 Percent Multi-face Fractures =

$$(M_2 / M_4) \times 100$$

7.4 When the final two results have been obtained, they shall be averaged, and the average reported is to be to the nearest 1.0%.



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Attachment

WEST VIRGINIA DIVISION OF HIGHWAYS
MATERIALS SECTION
FACE FRACTURE
MP 703.00.21

Lab Location:	_____	Producer/Supplier Name:	_____
Lab Reference Number:	_____	Producer/Supplier Code:	_____
Date Sampled:	_____	Material Code:	_____
Contract ID:	_____	Project Number:	_____

Technician 1: _____ Technician 2: _____

Source _____ Date _____ Field Sample # _____

Technician 1:	Initial Mass	Mass (Nearest 1g)	Percent of Sample (Nearest 0.1%)
	0 Face	_____	_____
	1 Face	_____	_____
	2 or More Face	_____	_____
	Final Mass	_____	_____
	Total Crushed Particles	_____	_____

Technician 2:	Initial Mass	Mass (Nearest 1g)	Percent of Sample (Nearest 0.1 %)
	0 Face	_____	_____
	1 Face	_____	_____
	2 or More Face	_____	_____
	Final Mass	_____	_____
	Total Crushed Particles	_____	_____

Final Results

	Tech 1	Tech 2	Difference (Must be less than 2%)	Average to Nearest 1%
0 Facee	_____	_____	_____	_____
1 Face	_____	_____	_____	_____
2 or More Face	_____	_____	_____	_____
Total Crushed Particles	_____	_____	_____	_____