

# MATERIALS FINER THAN No. 200 (75 $\mu\text{m}$ ) SIEVE IN MINERAL AGGREGATES BY WASHING

## AASHTO T 11

### SCOPE

Aggregates are used in all phases of highway construction from bases, pavement mix, granular shoulders, and granular surfacing, as well as, erosion control. In order to ensure the aggregate performs as intended for the specific use, a variety of tests must be performed on the aggregate. One such test is determining materials finer than No. 200 (75  $\mu\text{m}$ ) sieve in mineral aggregates by washing. Fine materials such as clay particles or water soluble particles removed by washing, can cling to larger particles and do not dislodge readily. This test washes the fine particles through the No. 200 (75  $\mu\text{m}$ ) sieve to give an accurate determination of fine materials in the sample. The determination of minus No. 200 (75  $\mu\text{m}$ ) material is used to compare material performance with gradation specifications, and indirectly to gauge such properties as plasticity, permeability, and soils classifications. Such knowledge helps in determining whether a material is frost susceptible or not, and whether permeability (measurement of material capacity to allow water flow through the aggregate) will be affected.

### SUMMARY OF TEST

A known amount of material is placed in a wash container and covered with water, agitated to suspend the fine size particles in the water, and then poured through a No. 200 (75  $\mu\text{m}$ ) sieve (Figure 1). After thorough rinsing, the portion remaining on the No. 200 (75  $\mu\text{m}$ ) sieve is transferred to a pan, dried and weighed. The percentage passing through the No. 200 (75  $\mu\text{m}$ ) sieve is then calculated.



**Figure 1**

Fines suspended in the water are washed over a No. 8 (2.36 mm) and a No. 200 (75  $\mu\text{m}$ ) sieve

## Apparatus

Balance, general purpose G<sub>2</sub> (AASHTO M231).

Sieves, a No. 8 (2.36 mm) or No. 16 (1.18 mm) and a No. 200 (75 μm).

Container, of sufficient size to properly agitate the sample without losing material.

Oven, capable of maintaining a temperature of 230 ± 9°F (110 ± 5°C). When tests are performed in the field where ovens are not available, test samples may be dried in suitable containers over an open flame or electric hot plates with sufficient stirring to prevent overheating.

Wetting agent, dispersing material such as dish washing soap.

## Sample Preparation

Determine the proper dried sample weight from Table 1 based on the nominal maximum size of the sample to be tested. If the sample is to be tested for gradation in accordance with AASHTO T 27, the minimum weight of that test method shall apply. If the sample is not tested for gradation in accordance with AASHTO T 27 and the nominal maximum size of aggregate to be tested is not listed in Table 1, the next larger size shall be used to determine the sample size.

**Table 1-Sample Weight Requirements**

Nominal Maximum Size in. (mm)	Minimum Weight of Sample (gm)
No. 4 (4.75 mm)	300
3/8 in.(9.5 mm)	1000
3/4 in.(19.0 mm)	2500
1 1/2 (37.5 mm)	5000

## Procedure

1. Dry sample to a constant weight. Record this as the dry weight of the material to the nearest 0.1 g. Allow sample to air cool until cool to the touch.
2. Place sample into a wash container large enough to permit mixing the sample with water (Figure 2). Cover the sample with water (and optionally, at the discretion of the technician, add a small amount of wetting agent) and agitate the sample with sufficient movement so that the particles finer than the No. 200 (75  $\mu\text{m}$ ) sieve become suspended in the water. Stirring and agitating the sample may be necessary and may be accomplished with any stirring or agitating instrument. Care should be taken not to lose any portion of the sample or the fines suspended in the water.



**Figure 2**  
Washing Sample

3. Pour the water with the suspended fines through a No. 200 (75  $\mu\text{m}$ ) sieve (Figure 3). Occasionally inspect the No. 200 (75  $\mu\text{m}$ ) sieve for cracks along the seam or holes in the screen, as any imperfections will effect the final wash sieve results. Take care to pour only the water with suspended fines and not the sample itself, since samples with larger size aggregates might damage or clog the fine screen on the No. 200 (75  $\mu\text{m}$ ) sieve (Figure 3). Nesting sieves with larger openings a No. 8 (2.36 mm), or a No. 16 (1.18 mm) above the No. 200 (75  $\mu\text{m}$ ) sieve might help to prevent inadvertent clogging.



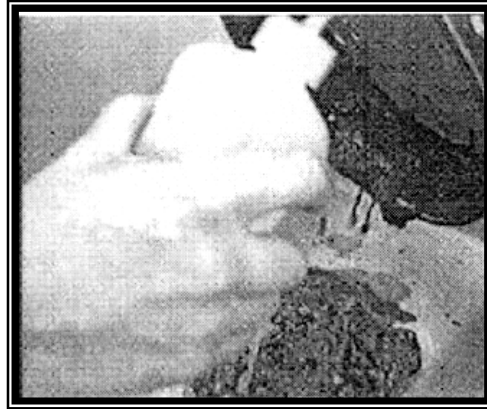
**Figure 3**  
Pouring Water through Sieves

4. Continue washing the sample with additional water and agitate until a majority of the fines suspended in the water have been washed through. When the washed sample is near completion, the water should be relatively clear compared with the initial water color of the wash sample. If you can see the sample beneath the water, then the sample is probably adequately washed.
5. Give the sample a final rinse, pouring as much of the remaining water as possible out of the sample and into the No. 200 (75  $\mu\text{m}$ ) sieve. Put the sample remaining in the washing bowl into a pan for oven drying.
6. Any suspended fines remaining on the No. 200 (75  $\mu\text{m}$ ) sieve must be included in the sample for drying. Rinsing any suspended fines to one side of the sieve (Figure 4) and then tapping those fines into the pan is one way of accomplishing this. Be sure to include all fines suspended on the No. 200 (75  $\mu\text{m}$ ) sieve in the final sample for drying.



**Figure 4**  
Material Retained on the No. 200 (75 $\mu\text{m}$ ) sieve

A rinsing bottle (Figure 5) may be used to remove the fines sticking to the No. 200 (75 µm) sieve once the sample has been washed.



**Figure 5**  
Rinsing Fines on No. 200 (75µm) Sieve

7. Place the washed sample into an oven set at  $230 \pm 9^{\circ}\text{F}$  ( $110 \pm 5^{\circ}\text{C}$ ), into an electric skillet, or onto an open flame and dry to a constant weight. Record the dry weight.

### Calculations

Calculate the total % passing the No. 200 (75 µm) sieve (A) by dividing the difference of the original dry sample weight (B) and the weight of sample after washing and drying (C) to a constant weight by the original dry sample weight (B) and multiplying by 100.

$$A = \frac{(B - C) \times 100}{B}$$

Where: A = Total % passing No. 200 (75 µm) sieve  
B = Original dry weight of sample (gms), and  
C = Dry weight of sample after washing and drying to constant weight (gms)

### Example

B = 532.2 gms

C = 521.6 gms

Formula:  $A = \frac{(B - C) \times 100}{B}$

$$A = \frac{(532.3 - 521.6) \times 100}{532.3}$$

A = 2.0%

Report the percentage of material finer than the No. 200 (75 µm) sieve to the nearest 0.1%.