

**STATE OF OHIO  
DEPARTMENT OF HIGHWAYS  
SUPPLEMENT 1005  
METHOD OF TEST  
FOR  
SIEVE ANALYSIS OF ALL MATERIALS FOR USE IN ITEMS  
304, 411, 603 Type 1 & 2, and 617  
April 12, 2002**

**1005.1 Scope**

**1005.2 Sample Preparation**

**1005.3 Dry Sieve Analysis**

**1005.4 Wet Sieve Analysis**

**1005.5. Calculations**

**1005.1 Scope.** This test method conforms to AASHTO Designation T 11, "Amount of Material Finer Than No. 200 (75µm) Sieve in Aggregate" and AASHTO Designation T 27, "Sieve Analysis of Fine and Coarse Aggregates" and establishes procedures for determining particle size distribution of aggregate materials, Items 304, 411 , 603 Type 1 & 2 , and 617, using sieves with square openings.

**1005.2 Sample Preparation.** Thoroughly mix the sample which contains sufficient moisture to prevent segregation. Obtain a representative portion for test using a sample splitter conforming with the following table:

Soil Aggregate Designation	*Nominal Maximum Sieve Size of Particle	Minimum Weight of Sample, lbs	No. of Splits to Obtain Portion for Test
304	1"(25mm)	70 (32kg)	1
411	1"(25mm)	70 (32kg)	1
603 Type 1 & 2	1"(25mm)	70 (32kg)	1
617	1"(25mm)	70 (32kg)	1

\*The nominal maximum sieve size is the largest of the specified sieves on which more than 10 percent of the sample is retained.

The selection of a portion for test of an exact predetermined weight will not be attempted.

**1005.3 Dry Sieve Analysis.**

A. The dry sieve analysis consists of:

1. Perform a Dry sieve analysis to determine the amount of each fraction retained on the No. 4 (4.75mm) sieve and the total amount passing the No. 4 (4.75mm) sieve.

2. Determine the amount passing the No. 200 (75 $\mu$ m) sieve clinging to the particles coarser than the No. 4 (4.75mm) sieve.

3. Obtain portions for the plasticity tests.

#### B. Coarse Grading

1. After splitting sample to proper sample size, dry the entire portion for test to a constant weight at 230 $\pm$ 9 $^{\circ}$  F. Allow to cool to room temperature and then weigh the entire portion (Sample weight) and record the weight on the Work Sheet. Where visual observation indicates that the dried sample contains considerable silt and/or clay particles, place the sample in a mortar or large flat pan and break up the soil particles with a rubber/covered pestle.

2. Place the entire portion for testing in a mechanical shaker (Gilson type) and shake for ten minutes. Use sieve sizes in the shaker necessary to determine compliance with the specifications for the material under test and any intermediate sieves necessary to prevent overloaded sieves.

3. Examine each fraction after sieving, and where silt and/or clay balls are present, grind the fraction in a mortar with a rubber/covered pestle to reduce the soil particles to their individual sizes. After grinding, re-sieve the ground material and place the separated sizes with the previously sieved material of the same sieve size. Weigh the material retained on each sieve and the material in the pan or tray to the nearest 10 grams and record the weights on the Work Sheet. Brush the material on the bottom of the shaker into the pan or tray before weighing that portion.

4. The balance or scale used will be capable of weighing to within 0.1 percent of the weight of the sample to be tested. Add the weights of the material retained on each sieve and the pan or tray. The total weight should be within 1 percent of the original dried weight. If the difference exceeds 1 percent, repeat the test on the unused portion of material remaining after the initial split. Calculations for the coarse fractions are described under Section 1005.5.

#### C. Material Finer Than the No. 200 (75 $\mu$ m) Sieve in Coarse Aggregate

1. Recombine and thoroughly mix all fractions retained on the No. 4 (4.75mm) sieve. Use all of the recombined aggregate retained on the No. 4 (4.75mm) sieve to determine the amount passing the No. 200 (75 $\mu$ m) sieve thereon where the weight is 7500 grams or less. Where the weight exceeds 7500 grams, split it once with a sample splitter to provide a representative portion for test.

2. Place the portion for test, obtained in the manner described in 1005.3.C.1, in a 5 quart (4.7L) porcelain pan or other suitable container and cover it with a water. Note: When clay balls are present or excessive amounts of silt then use a stock solution of a

dispersing agent such as sodium hexametaphosphate 757 grams to 5 gallons (19L) of water or a liquid dishwashing detergent solution mixed with water producing a small amount of suds. Stir the contents of the container thoroughly with a large spoon or similar tool and let it soak for not less than 30 minutes. Take care to avoid loss of the aggregate or the water/dispersing agent solution while agitating the sample.

If using the sodium hexametaphosphate as a dispersing agent store the powder in the sack in which it is delivered or in a plastic container. Store sodium hexametaphosphate solution in plastic or glass containers. Do not use metal containers for making or storing the solution.

3. When using a dispersing agent allow to soak for 30 minutes, stir or agitate vigorously using a large spoon or similar tool the contents of the container. The use of a water spray bar will help the agitation; however, care must be exercised to avoid loss of material. Decant the excess solution through nested No. 16 (1.18 mm) and No. 200 (75 $\mu$ m) sieves. Use full height 12 inch round sieves for this operation. Use dispersing agent on first wash only, add water thereafter.

4. Pour the excess solution from the container through the nested sieves and wash with a spray of water. For large size samples, it may be necessary to wash small portions until the total sample is washed. Continue washing until the water coming through the sieves is clear. Transfer the material retained on the No. 16 (1.18mm) and No. 200 (75 $\mu$ m) sieves to a pan.

5. Dry the aggregate to a constant weight at 230 +/- 90 F. Weigh the dried material to the nearest 0.1 percent and record the weight on the Work Sheet. Calculate the percent passing the No. 200 (75 $\mu$ m) sieve as described under Section 1005.5.B.

#### **1005.4 Wet Sieve Analysis.**

A. After the material in the pan or tray passing the No. 4 (4.75mm) sieve has been weighed and the weight recorded on the Work Sheet, obtain a representative portion weighing 500 (+/-25) grams by use of a sand splitter. Use this portion of the sample for the wet sieve analysis. Use the remaining split portion to obtain material for the plasticity test. (AASHTO T 90).

B. Place the material passing the No. 4 (4.75mm) sieve obtained under Section 1005.4.A in a wide mouth 2 quart glass or 2000 ml erlenmeyer plastic flask or other suitable container and cover it with water. If using a dispersing agent agitate and allow to soak for 30 minutes.

C. Before the sieves are used, clean them thoroughly and examine them to make certain there are no breaks in the sieve cloth.

D. After soaking for 30 minutes, place a rubber stopper or lid on the container and vigorously shake the portion for test to bring the fine material into suspension. Decant the

wash water immediately over nested No. 16 (1.18mm) and No. 200 (75 $\mu$ m) sieves. When decanting, exercise care to prevent spilling the wash water and particles not in suspension.

E. Pour the excess water from the jar or plastic container through the nested sieves and wash with a spray of water. A spray head or bar on the sink will facilitate this operation. Continue washing until the water coming through the sieves is clear. After washing, dry the material in an oven at 230 $\pm$ 9 $^{\circ}$  F to a constant weight. When dry, weigh the material retained on each sieve to the nearest 0.1 gram and record these weights on the Work Sheet. Calculate the percentages as described in Section 1005.5.C.

### **1005.5. Calculations.**

A. Determine the gradation of the dry sieve analysis of the material retained on and passing the No. 4 sieve (4.75mm), Section 1005.3.B, as follows:

1. The sum of the weights of the material retained on each sieve and the weight of the material in the pan or tray is the total weight of the sample.

2. To obtain the percent retained on each sieve, divide the weight retained on each sieve by the total weight and multiply by 100.

3. To obtain the percent passing the No. 4 (4.75mm) sieve, divide the weight passing the No. 4 (4.75mm) sieve by the total weight of the sample and multiply by 100. Record percentages to the nearest whole percent on the Work Sheet. The sum of correctly calculated percentages will be 100.

B. Determine the amount passing the No. 200 (75 $\mu$ m) sieve in the aggregate retained on the No. 4 (4.75mm) sieve, Section 1005.3.C, as follows:

1. To obtain the weight of the material passing the No. 200 (75 $\mu$ m) sieve, subtract the weight of the oven dried washed portion (Section 1005.3.C.5) from the original total dry weight of the portion for test, (Section 1005.3.C.1). Record on the Work Sheet.

2. To obtain the percent passing the No. 200 (75 $\mu$ m) sieve, divide the weight of the material passing the No. 200 (75 $\mu$ m) sieve (Section 1005.5.B.1 ) by the weight of the portion for test (Section 1005.3.C.1 ) and multiply by 100. Record to the nearest 0.1 percent on the Work Sheet.

3. To obtain the percent passing the No. 200 (75 $\mu$ m) sieve of the total sample, multiply the percent obtained in Section 1005.5.B.2 by the percent of material retained on the No. 4 (4.75mm) sieve (Section 1005.5.A) and divide by 100.

C. Determine the gradation of the wet sieve analysis of the material passing the No. 4 (4.75mm) sieve, including the amount passing the No. 200 (75 $\mu$ m) sieve, Section 1005.4, as follows:

1. To obtain the weight of the dry material passing the No. 200 (75 $\mu$ m) sieve, subtract the sum of the weights of the material retained on each sieve from the dry weight of the portion for test used for the wet sieve analysis as shown on the Work Sheet.

2. To obtain the percent retained on each sieve, divide the weight retained on each sieve by the weight of the portion for test and multiply by 100. Calculate the percentages retained on each sieve to the nearest whole percent. To obtain the percent passing the No. 200 (75 $\mu$ m) sieve, divide the weight passing the No. 200 (75 $\mu$ m) sieve by the weight of the portion for test and multiply by 100. Calculate the percent passing the No. 200 (75 $\mu$ m) sieve to the nearest 0.1 percent as shown on the Work Sheet, Column 1.

3. Since the material used for the wet sieve analysis is only a part of the total amount passing the No. 4 (4.75mm) sieve, multiply the percentages calculated for the wet sieve analysis by the percent passing the No. 4 (4.75mm) sieve and divide by 100. Calculate these percentages, except for the percent passing the No. 200 (75 $\mu$ m) sieve, to the nearest whole percent. Calculate the percent passing the No. 200 (75 $\mu$ m) sieve to the nearest 0.1 percent as shown on the Work Sheet, Column 2.

D. The total percent passing the No. 200 (75 $\mu$ m) sieve shown on the Work Sheet is the sum of the percent passing the No. 200 (75 $\mu$ m) sieve in the portion retained on the No. 4 (4.75mm) sieve, 1005.5.B.3, and that in the portion passing the No. 4 (4.75mm) sieve, Section 1005.5.C.3.

E. Transfer the percentages for the various sieves from the dry sieve analysis, wet sieve analysis and the total amount passing the No. 200 (75 $\mu$ m) sieve to Construction Management System "CMS".