

## Colorado Procedure 21-23

*Standard Method of Test for*

### Sieve Analysis of Soils

#### 1. SCOPE

- 1.1 This method describes the procedure for the quantitative determination of the distribution of particle size in soils and soil aggregate mixtures.

#### 2. REFERENCED DOCUMENTS

2.1 *AASHTO Procedures:*

- M 92 (ASTM E 11)
- M 145 Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
- T11 Materials Finer Than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
- T27 Sieve Analysis of Fine and Coarse Aggregates

2.2 *Colorado Procedures:*

- CP 20 Dry Preparation of Disturbed Soil Samples for Test
- CP 31 Sieve Analysis of Aggregates

#### 3. APPARATUS

- 3.1 *Balance* – A balance sensitive to within 0.1 gram (0.003 pound)
- 3.2 *Container* – A pan or vessel with sufficient capacity to contain the specimen when covered with water.
- 3.3 *Washing Device* (Optional) – Any approved device designed to facilitate the removal of material finer than the No. 200 sieve from the test specimen.
- 3.4 *Sieves* – A series of sieves of the following sizes conforming to AASHTO M 92: 3-in. (75 mm), 1-in. (25.0 mm), 3/4-in. (19.0 mm), No. 4, No. 10, No. 40, and No. 200.
- 3.5 *Drying Equipment* – Hot plate, stove, or oven.

#### 4. TEST SPECIMEN

- 4.1 The test specimen shall be prepared per CP 20, Subsections 5.1 and 5.2.

## 5. PROCEDURE

5.1 Sieve Analysis of Plus No. 4 Material – The total fraction of the sample retained on the No. 4 sieve as prepared in CP 20, Subsection 5.1, shall be used to determine the sieve analysis on the sample using AASHTO T 27.

5.1.1 If the plus No. 4 aggregate has nominal maximum size smaller than 1/2 inch, or contains appreciable material finer than No. 4, or has highly absorptive aggregate, a split moisture sample may be used to accelerate the test procedure using section 3.1.3 of CP 31.

5.1.2 Weigh and record the portion of the specimen retained on each sieve per AASHTO T27. It is permissible to record the accumulated weights (masses) as the contents of each successive sieve are added to the fractions previously deposited on the scale pan (Cumulative weighing).

**Note 1:** For soil classification per AASHTO M 145, material retained on the 3 in. (75 mm) sieve shall not be included in the total weight (mass) of the specimen. The approximate maximum size shall be noted and reported on CDOT Form #219. When there is an appreciable amount of plus 3 in. (75 mm) material the percentage should be estimated and included in the notes on CDOT Form # 219.

5.2 Sieve Analysis of Minus, No. 4 Material – The minus No. 4 specimen for moisture determination, as prepared by CP 20, Subsection 5.2, shall, after weighing be dried to a constant weight (mass) at 230°F ± 9° (110°C ± 5°). When cool (room temperature), weigh, calculate, and record the percent moisture.

5.2.1 The minus No. 4 specimen for the washed sieve analysis as prepared by CP 20, Subsection 5.2, shall, after weighing, be analyzed per AASHTO T11 and T27.,

5.2.2 (Deleted)

## 6. CALCULATIONS

6.1 Using the percent moisture as determined in Subsection 5.2, correct the original wet weight (mass) of the total minus No. 4 material and the moist wet weight (mass) of the minus No. 4 specimen selected for the washed sieve analysis to dry weight (mass) and, if needed, using the moisture content determined in Subsection 5.1.1 to determine the dry weight of the plus No. 4 material as follows:

$$\text{Dry Weight (Mass)} = \frac{\text{wet weight (mass)}}{100 + \% \text{moisture in specimen}} \times 100$$

- 6.2 After correcting the total wet weight (mass) of the minus No. 4 fraction to dry weight (mass), calculate the percentage of material retained on each sieve larger than the No. 4 sieve and the total percentage of material passing the No. 4 sieve by dividing the weight of the material retained on each sieve by the total combined dry weight (mass) of both the plus and minus No. 4 fractions. Convert percent retained to percent passing each sieve and total percent passing the No. 4 sieve. (See Note 1)
- 6.3 Calculate the percentages retained on the No. 10, No. 40, and No. 200 sieves from the washed sieve analysis specimen by dividing the weight (mass) retained on each sieve by the total dry weight (mass) of the minus No. 4 sieve analysis specimen before washing. Convert percent retained to percent passing each sieve.
- 6.4 Calculate the percent passing each sieve on a total sample basis by multiplying the percent passing each sieve of the washed sieve analysis specimen by the percent passing the No. 4 sieve of the total sample divided by 100.

## **7. RECORD**

- 7.1 CDOT Form 564, Soils and Aggregates Sieve Analysis When Splitting on the No. 4 Sieve.
- 7.2 CDOT Form 219, Soil Survey of the Completed Roadbed.

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