

## Colorado Procedure 20-08

*Standard Practice for*

### Dry Preparation of Disturbed Soil Samples for Test

**1. SCOPE**

1.1 This procedure describes the dry preparation of soil and soil aggregate samples for mechanical analysis, liquid and plastic limits, and moisture density relations test.

**2. REFERENCED DOCUMENTS**

- 2.1 *AASHTO Procedures:*  
 T 89 Determining the Liquid Limit of Soil  
 T 90 Determining the Plastic Limit and Plasticity Index of Soil  
 T 99 Moisture-Density Relations of Soils Using a 2.5-kg Rammer and a 305-mm Drop  
 T 180 Moisture-Density Relations of Soils Using a 4.54-kg Rammer and a 457-mm Drop  
 M 92 (ASTM E 11)  
 M 145 Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
- 2.2 *ASTM Procedures:*  
 E 11 Standard Specifications for Wire Cloth and Sieves for Testing Purposes
- 2.3 *Colorado Procedures:*  
 CP 21 Mechanical Analysis of Soils  
 CP 32 Reducing Field Samples of Soils and Aggregate to Testing Size

**3. APPARATUS**

- 3.1 *Scales* – Scale of suitable capacity and sensitive to .01 lb (.01 kg).
- 3.2 *Balance* – Balance of suitable capacity and sensitive to 0.1 g.
- 3.3 *Sieves* – Series of sieves conforming to AASHTO M 92 of the following sizes: No. 4, No. 10, and No. 40.

3.4 *Drying Apparatus* – Oven or other suitable device.

3.5 *Sample Splitter* – Riffle type sample splitter to reduce sample to test portion size in accordance with CP 32.

3.6 *Pulverizing Apparatus* – Either a mortar and rubber covered pestle, or a mechanical device consisting of a power driven rubber covered mauler and a mortar suitable for breaking up the aggregations of soil particles without reducing the size of the individual grains.

**4. SAMPLE SIZE**

4.1 The amounts of material required to perform the individual tests are as follows:

4.1.1 Mechanical Analysis of Soils (CP 21) – For the mechanical analysis, material passing the No. 4 is required in the amount of approximately 500 g. The total portion of the sample retained on the No. 4 shall be used for gradation.

**NOTE 1:** When the mechanical analysis is to be used to determine the soil classification in accordance with AASHTO M 145, material retained on the 3-in. (75 mm) sieve shall not be included in the gradation of the material retained on the No. 4 sieve.

4.1.2 Liquid Limit (AASHTO T 89) and Plastic Limit (AASHTO T 90) – For the liquid and plastic limit tests, material passing the No. 40 sieve is required in total amounts of 100 to 300 g.

4.1.3 For Moisture Density Relations (AASHTO T 99 and T 180) test the following minimum amounts of material as required.

<u>Method</u>	<u>Passing Sieve</u>	<u>Minimum Quantity</u>
A	No. 4	10 lb. (4.5 kg)
B	No. 4	16 lb. (7.3 kg)
C	3/4 in. (19.0 mm)	12 lb. (5.4 kg)
D	3/4 in. (19.0 mm)	25 lb. (11.3 kg)

## 5. PREPARATION OF TEST SAMPLES

5.1 The sample shall be dried in air or by use of a drying apparatus that does not exceed 140°F (60°C). When sufficiently dry, break up the aggregations and separate the material into two fractions using a No. 4 sieve. Care shall be taken when processing the material through the No. 4 sieve to avoid reducing the natural size of the individual particles. Material retained on the No. 4 sieve shall be thoroughly cleaned using the apparatus described in Subsection 3.6 and a wire brush when necessary. The minus No. 4 material removed shall be combined with the material previously processed through the No. 4 sieve, and added to the total weight (mass) of the material passing the No. 4 sieve, uncorrected for hygroscopic moisture. (See NOTE 1).

5.2 Test Specimen for Mechanical Analysis – The total fraction of the sample retained on the No. 4 sieve as prepared in Subsection 5.1 shall be set aside for use in the sieve analysis of the plus No. 4 material in CP 21. Immediately after weighing the total amount of material passing the No. 4 sieve as prepared in Subsection 5.1, select by use of a sample splitter, a representative specimen weighing (with a mass of) approximately 500g for the washed sieve analysis in CP 21 and another representative specimen weighing (with a mass of) approximately 250g for a moisture specimen to correct the total weight (mass) of the minus No. 4 fraction and to correct the weight (mass) of the specimen selected for the washed sieve analysis to oven dry weight (mass).

5.3 Test Specimen for Liquid and Plastic Limits Tests (T 89, T 90) – By use of a sample splitter, select a representative portion of minus No. 4 material as prepared in Subsection 5.1 which will provide approximately 100g to 300g of minus No. 40 material when processed as follows:

5.3.1 The aggregations of soil particles shall be mauled using a rubber covered pestle or a power driven rubber covered mauler and mortar. Separate the specimen on the No. 10 sieve and alternately grind and sieve the material until the plus No. 10 particles appear clean. Discard the material retained on the No. 10 sieve. Alternately maul and sieve the material retained on the No. 40 sieve until only a small quantity passes the sieve and the retained particles appear clean. Discard the material retained on the No. 40 sieve. The thoroughly mixed minus No. 40 material shall be used for the liquid and plastic limits tests.

**NOTE 2:** When mauling material with a pulverizing apparatus it shall be done in such a manner as to break up the aggregations without fracturing the individual grains.

5.4 Moisture Density Relations Test - By use of a sample splitter select a representative portion of minus No. 4 material as prepared in Subsection 5.1. Prepare the plus No. 4 material according to the procedure described in AASHTO T 99 or T 180 Method C or D. The minimum weight (mass) requirement shall be as shown for the applicable method in Subsection 4.1.3.