

## Colorado Procedure 53-09

*Standard Method of Test for*

### Determining Maximum Density of Cold In-Place Recycled Pavement

(This procedure modifies AASHTO T 180. The current AASHTO T 180 is to be used in conjunction with this procedure.)

#### 1. SCOPE

1.1 This test is intended for determining the maximum density of cold in-place recycled pavement using AASHTO T 180. Two alternate procedures are recommended as follows:

Method C - 4-inch (101.60 mm) mold, material passing a 3/4 in. (19.0 mm) sieve.

Method D - 6-inch (152.60 mm) mold, material passing a 3/4 in. (19.0 mm) sieve.

#### 2. REFERENCED DOCUMENTS

- 2.1 *AASHTO Standards:*  
 T 119 Bulk Density ("Unit Weight") & Voids in Aggregate  
 T 180 Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

- 2.2 *Colorado Procedures:*  
 CP 41 Sampling Hot Mix Asphalt

#### 2A. SAMPLING

2A.1 Obtain a sample from the windrow or roadway, after rolling in the finished roadway. For cationic emulsions, sample after rolling in the finished roadway. Follow CP 41, Method C. Prepare and compact the sample as described in Method C or Method D below.

#### METHOD C

#### 8. SAMPLE

8.1 (Disregard - Drying of the sample.)

8.2 (Follow as modified.) Coarse material, which is retained on the 3/4 in. (19.0 mm) sieve, if

any, may be discarded and replaced. (NOTE 8 from AASHTO T 180.)

**NOTE 1:** If it is advisable to maintain the same percentage of coarse material in the lab sample as in the original field sample, the material retained on the 3/4 in. (19.0 mm) sieve shall be replaced as follows: Sieve an adequate quantity of the representative material over the 2 in. (50 mm) and 3/4 in. (19.0 mm) sieves. Discard the coarse material retained on the 2 in. (50 mm) sieve. Remove the material passing the 2 in. (50 mm) sieve and retained on the 3/4 in. (19.0 mm) sieve and replace it with an equal mass of material passing the 3/4 in. (19.0 mm) sieve and retained on the No. 4 sieve. Take the material for replacement from the remaining portion of the sample.

8.3 (Follow as modified.) Select a representative sample, weighing (with mass of) approximately 6 lb. (2.7 kg) or more, of the material prepared as described in Subsection 8.2.

#### 9. PROCEDURE

9.1 (Disregard - Addition of water to sample.)

9.2 (Follow per AASHTO T 180.) Form a specimen by compacting the prepared material in the 4 in. (101.60 mm) mold (with collar attached) in five approximately equal layers to give a total compacted depth of about 5 in. (125 mm). Compact each layer by applying 25 uniformly distributed blows from a rammer dropping free from a height of 18 in. (457 mm) above the elevation of the material when a sleeve-type rammer is used, or from 18 in. (457 mm) above the approximate elevation of each finally compacted layer when a stationary mounted type of rammer is used. During compaction, the mold shall rest firmly on a dense, uniform, rigid and stable foundation. (See NOTE 2).

**NOTE 2:** Each of the following has been found to be a satisfactory base on which to rest the mold during compaction of the material: A block of concrete, weighing not less than 200 lb. (91 kg), supported by a relatively stable foundation; a sound concrete floor; and for field application, such surfaces as found in concrete box culverts, bridges, and pavements.

9.2.1 (Follow per AASHTO T 180.) Following compaction, remove the extension collar, carefully trim the compacted material even with the top of the mold by means of the straight edge, and weigh the mold and material to the nearest 0.01 lb (5g). For molds conforming to the tolerances given in Subsection 3.1 and masses recorded in pounds, multiply the mass of the compacted specimen and the mold, minus the mass of the mold, by 30, and record the result as the wet density,  $W$ , in pounds per cubic foot, of compacted material. For molds conforming to tolerances given in Subsection 3.1 and masses recorded in kilograms, multiply the mass of the compacted specimen and the mold, minus the mass of the mold, by 1060, and record the result as the wet density,  $W$ , in kilograms per cubic meter, of compacted material. For used molds out of tolerance by not more than 50 percent (Subsection 3.1), use the factor for the mold as determined in accordance with Section 8 (Calibration of Measure), AASHTO T 19.

9.3 (Follow as modified.) Remove the material from the mold and slice vertically through the center. Take a representative sample of the material from one of the cut faces, weigh immediately, and dry in an oven at 230°F (110°C) for at least 12 hours, or to a constant mass, to determine the moisture content. The moisture content sample shall weigh no less than 500g. Since this is for informational purposes, a microwave drying method may be used.

9.4 (Disregard - Addition of water to sample.)

## METHOD D

### 10. SAMPLE

10.1 (Follow as modified.) Select the representative sample in accordance with Subsection 8.3, except that it shall weigh (have a mass of) approximately 12 lb. (5 kg).

### 11. PROCEDURE

11.1 (Follow per AASHTO T 180.) Follow the same procedure as described for Method C in

Section 9, except for the following: Form a specimen by compacting the prepared sample in the 6 in. (152.40 mm) mold (with collar attached) in five approximately equal layers, to give a total compacted depth of about 5 in. (127 mm), each layer being compacted by applying 56 uniformly distributed blows from the rammer. For molds conforming to tolerances in Subsection 3.1, and masses recorded in pounds, multiply the mass of the compacted specimen and the mold, minus the mass of the mold, by 13.33, and record the result as the wet density,  $W$ , in lb/ft<sup>3</sup> of the compacted material. For molds conforming to tolerances in Subsection 3.1, and masses recorded in kilograms, multiply the mass of the compacted specimen and the mold, minus the mass of the mold, by 471, and record the result as the wet density,  $W$ , in kilograms per cubic meter, of compacted material. For used molds out of tolerance by not more than 50 percent (Subsection 3.1), use the factor for the mold, as determined in accordance with Section 8 (Calibration of Measure) AASHTO T 19.

### 12. CALCULATIONS

12.1 (Follow as modified.) The wet density, which was calculated in Subsections 9.2.1 or 11.1, will be the maximum density used for determining the percent relative compaction.

### 14. RECORD

14.1 No CDOT Form is used, record on your own worksheet.