

## Colorado Procedure – Laboratory 5145-15

*Standard Method of Test for*

### Contractor Asphalt Mix Design Approval Procedures Utilizing RAP Millings from the Same Project

#### 1. SCOPE

1.1 This practice describes Reclaimed Asphalt Pavement (RAP) sampling and testing requirements for HMA mixture designs that will incorporate RAP millings from the same project.

#### 2. REFERENCED DOCUMENTS

2.1 Colorado Procedures:

- CP 31 Sieve Analysis of Aggregates
- CP 32 Reducing Field Samples of Soil and Aggregate to Testing Size
- CP 51 Determining the Maximum Specific Gravity of HMA
- CP 52 Contractor Asphalt Mix Design Approval Procedures
- CP-L 5120 Determination of the Asphalt Binder Content of Bituminous Mixtures by the Ignition Method

2.2 AASHTO Procedures:

- T 164 Quantitative Extraction of Asphalt Binder from Hot Mix Asphalt (HMA)

#### 3. SAMPLING RAP FROM THE EXISTING HMA MAT

3.1 Determine the percentage of RAP and the associated tonnage that can/will be utilized in the HMA for the project. Determine the amount of milling (tons) to be generated from the project. If there is no allowance for the Contractor to retain RAP from the project and it is desired to do so, the Contractor shall submit a Value Engineering Change Proposal (VECP) detailing cost savings to the project that can be achieved if it is desired to incorporate RAP from the project into the HMA mix. If successful in obtaining a percentage of the RAP from a project through the use of a VECP, the Contractor will be allowed to choose the area of the roadway from which the RAP will be taken.

3.2 At a minimum, samples of the HMA mat to be processed and incorporated into the mix design shall be taken every half mile in each lane for that portion of the roadway where RAP is to be obtained. Samples should also be taken in the shoulder if RAP from the shoulder areas are to be incorporated into the HMA for the project as well. Samples shall be taken using a mill type device similar to that which will be utilized on the project, and the mill depth shall be set to the depth equal to that specified for the milling in the contract documents. RAP millings shall be collected and marked as to where the millings were obtained.

or

Full-depth 6" diameter (or larger) cores shall be taken every half-mile of each lane. Cores should also be taken in the shoulder, if the shoulder millings will be incorporated into the project HMA mix design.

Milled areas and core holes shall be patched immediately by the Contractor after sampling is completed.

A sufficient amount of millings, or number of cores shall be taken at each test location to ensure an adequate amount of RAP is obtained to perform a full HMA mix design. It is required that at a minimum, a total of 80 pounds of RAP material be obtained for initial testing purposes as well as for inclusion into the mix design.

3.3 Samples, either millings or cores, shall be taken if visual observations show significant variations in the existing mat along the project length. If the project is designated as a mill and fill (same day) type project, sufficient material shall be obtained from each mile of the project to perform additional testing of the RAP materials as detailed in Subsection 5.2 of this procedure.

#### 4. PREPARATION OF SAMPLES

#### 4.1 Processing/Crushing:

##### A. Pavement Cores

1. Trim samples so only that portion designated for milling remains.
2. Crush the material proposed for milling to minus 1-1/4 inch.

##### B. Milled Pavement

1. Crush oversized material using a jaw crusher so that the sample is 100% passing the 1-1/4 inch.

4.2 Combining Samples: Processed and crushed pavement samples shall be combined to form a minimum of five (5) composite RAP samples representing various locations of the milled surface. The locations to be composited are at the discretion of the mix designer and may vary from project to project, and should be determined based on differences in material characteristics. Composite RAP samples shall be tested as described in the Subsection 5.1 of this procedure.

### 5. TESTING OF RAP SAMPLES

5.1 The following testing shall be performed on the combined, composite samples of RAP. At a minimum, five (5) composite samples of RAP from areas of the project that will incorporate RAP millings shall be tested for asphalt cement (AC) content and gradation, as outlined below. The test samples shall be split out and reduced to the appropriate sample size using CP 32. Testing to be performed on the composite samples shall include the following:

- AC Content, determined in accordance with AASHTO T 164, Method A or B, and CP-L 5120 in order to develop a RAP AC content correction factor. Alternately, the Contractor may propose a RAP asphalt content correction factor to be used in conjunction with CP-L 5120 per the Reclaimed Asphalt Pavement Standard Special Provision 401.02(b)1C.
- Gradation, determined in accordance with CP 31.
- The remaining composite sample shall be combined and used to test the effective Specific Gravity, determined through CP 51.

5.2 For a mill and fill type project, additional testing for AC content, gradation, and effective

specific gravity, as outlined in 5.1, shall be required for each mile of roadway and/or shoulder that will be milled. This information shall be used to determine whether adjustments to the mix design will be required as the project proceeds, since a composite sample may not be representative of the RAP properties at project startup, or at various locations along the project length. The Contractor will be required to pave with a virgin mix design until a sufficient amount of processed RAP (minimum of 3,000 tons with 3 tests for AC content and gradation) has been stockpiled and tested to allow full production of a RAP HMA mix.

### 6. ASPHALT MIX DESIGN

6.1 The test results obtained in Section 5 shall be used to develop an asphalt mix design for the project. The asphalt mix design shall be developed in conformance with CP 52. The AC content of the RAP utilized in the Contractor RAP mix design shall be the average AC content of the samples tested in accordance with Section 5 of this procedure, or the remaining RAP shall be recombined and tested, to establish the average AC content, gradation and effective specific gravity for the mix design. The remaining RAP from the combined composite samples should be combined into one sample. A representative sample (minimum of 45 lbs.) shall then be split in accordance with CP 32 and provided to the CDOT Central Laboratory, Flexible Pavement Unit for testing, along with the RAP AC correction factor determined by Subsection 5.1.

The RAP shall be tested for: Asphalt Binder Content (uncorrected), Gradation (uncorrected) (CP-L 5120), and Effective Specific Gravity (CP 51, Method B).

### 7. RAP PROCESSING TESTING

7.1 The RAP millings shall be tested per the Contract requirements. The test results obtained during RAP processing shall be compared to the RAP test results used to develop the mix design. Adjustments shall be made to the mix design, if needed, prior to beginning paving operations so that the required volumetric properties can be produced. Any changes made to the mix design and the subsequent volumetric test results shall be reported to the Region Materials Engineer so

that the mix design can be re-evaluated, and a new Form #43 issued if acceptable.

7.2 The uniformity requirements contained in the project contract shall apply to the processed RAP used in the mix design.

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