

Colorado Procedure – Laboratory 5150-15

Standard Method of Test for

Adjusting Moisture Requirement to Hydrate Lime in Asphalt Mixes

1. SCOPE

- 1.1 This method can be used to adjust the amount of moisture required to properly hydrate lime in asphalt mixes.

2. REFERENCED DOCUMENTS

2.1 *Colorado Procedures:*

- CP 30 Sampling of Aggregates
- CP 31 Sieve Analysis of Aggregates
- CP 41 Sampling Hot Mix Asphalt
- CP-L 5109 Resistance of Compacted Bituminous Mixture to Moisture Induced Damage
- CP-L 5115 Standard Method for Preparing and Determining the Density of Bituminous Mixture Test Specimens Compacted by the Superpave Gyrotory Compactor
- CP-L 5120 Determination of the Asphalt Binder Content of Bituminous Mixtures by the Ignition Method

3. SIGNIFICANCE AND USE

- 3.1 As noted in the Scope, this method is intended to adjust the amount of moisture necessary to properly hydrate the lime in asphalt mixes. The current requirements are to hydrate the aggregates 2% above Saturated Surface Dry (SSD) conditions. This amount of moisture may not necessarily be required for mixes to pass the Tensile Strength Retained (TSR) requirements of the contract documents.
- 3.2 Contractors may elect to use this procedure to reduce the amount of moisture required to hydrate the lime. The reduction of the amount of moisture in mixes lowers energy costs by reducing the amount of moisture that must be dried out of the aggregates prior to mixing with asphalt cement.

4. SUMMARY OF METHOD

- 4.1 Test specimens of laboratory produced material are mixed in accordance with CPL 5115 and tested per CPL 5109 at 2% moisture and 1% lime. Test specimens must have TSR \geq 90%. If TSR is \geq 90%, ½% lime is added to specimens with no moisture. If TSR is \geq 80% move to production verification phase.
- 4.2 Before project production commences, the Contractor shall produce at least 100 tons of mix with 1% lime and no additional moisture added to the aggregates. Cold feed and HMA samples will be obtained. If gradation, binder content and volumetric properties meet targets and if the TSR is \geq 80%, the Contractor may submit a written request to waive the contract moisture requirement.

5. APPARATUS

- 5.1 *SuperPave Gyrotory Compactor* - will be used for CP-L 5115.
- 5.2 *Vacuum container* - ASTM D 2041 and vacuum pump or water aspirator from CP 51 including manometer or vacuum gauge.
- 5.3 *Water bath*:
 - 5.3.1 *Water bath* - Capable of maintaining a temperature of $140^{\circ}\text{F} \pm 1.0^{\circ}$ ($60^{\circ}\text{C} \pm 0.5^{\circ}$).
 - 5.3.2 *Water bath* - Capable of maintaining a temperature of $77^{\circ}\text{F} \pm 1.0^{\circ}$ ($25^{\circ}\text{C} \pm 0.5$).
- 5.4 *Freezer* - Maintained at $-2.5^{\circ}\text{F} \pm 7.5^{\circ}$ ($-19^{\circ}\text{C} \pm 4^{\circ}$)
- 5.5 *Plastic film* for wrapping, heavy-duty leak proof *plastic bags* to enclose the saturated specimens, and *masking tape*.
- 5.6 *Aluminum or steel pans* - having a surface area of 40-100 square inches (250-640 cm^2) in the bottom and a depth of approximately 1 to 3 inches (25 mm to 75 mm).
- 5.7 *Forced air draft oven* - capable of maintaining a temperature of $140^{\circ}\text{F} \pm 1.8^{\circ}$ ($60^{\circ}\text{C} \pm 1^{\circ}$).
- 5.8 *Loading jack and ring dynamometer* -from AASHTO T 245, or a mechanical or hydraulic testing machine from AASHTO T 167 to provide a range of accurately controllable rates of vertical deformation including 0.2 and 2 in. per minute (5.1 and 50.8 mm per minute).
- 5.9 *Loading Strips* - Steel loading strips with a concave surface having a radius of curvature equal to the nominal radius of the test specimen. For specimens 4 inches (101.6 mm) in diameter the loading strips shall be 0.5 inches (12.7 mm) wide, and for specimens 6 inches (152.4 mm) in diameter the loading strips shall be 0.75 in. (19.05 mm) wide. The length of the loading strips shall exceed the thickness of the specimens. The edges of the loading strips shall be rounded by grinding.

6. PREPARATION OF LABORATORY MIXED TEST SPECIMENS DURING MIX DESIGN

- 6.1 During mix design, mix a sample according Subsection 6.2 of CP-L 5109. All specimens will contain 1% lime and 2% moisture.
- 6.2 Compact all specimens per Section 6 of CP-L 5109 and evaluate per Section 7 of CP-L 5109.
- 6.3 Condition, test and calculate per CP-L 5109 Sections 8, 9, 10, and 11.
- 6.4 If a test specimen TSR is calculated $\geq 90\%$, repeat Subsection 6.2 with a set of test specimens mixed at $\frac{1}{2}\%$ lime and no moisture added for hydration.
- 6.5 Repeat Subsection 6.3 of this procedure. If a test specimen TSR is calculated $\geq 80\%$, move to production verification phase.

7. PRODUCTION VERIFICATION

- 7.1 Before production begins mix at least 100 tons of material for sample collection with 1% lime and no moisture.
- 7.2 Obtain enough cold feed samples per CP 30 to perform testing according to CP 31.
- 7.3 Obtain Hot Mix Asphalt Sample in accordance with CP 41 to perform testing according to CP-L 5109, CP-L 5120, and CP-L 5115.
- 7.4 Perform all testing for procedures in Subsections 7.2 and 7.3 of this procedure.
- 7.5 If TSR on samples obtained from plant are $\geq 80\%$ and all test results for volumetric properties and gradations are within mix design target values, submit results to Engineer for consideration for lowering contract required moisture content amount.

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