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**Test Procedure for****LABORATORY METHOD OF MIXING BITUMINOUS MIXTURES****TxDOT Designation: Tex-205-F****Effective Date: August 2016**

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**1. SCOPE**

- 1.1 Use this test method to combine various sizes of aggregates and blend them with asphalt to obtain uniform bituminous mixtures.
  - 1.2 The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.
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**2. APPARATUS**

- 2.1 *Balance*, Class G2 in accordance with Tex-901-K, with a minimum capacity of 10,000 g and electronic tare feature.
  - 2.2 *Heating oven*, capable of attaining a temperature of at least  $325 \pm 5^\circ\text{F}$  ( $163 \pm 3^\circ\text{C}$ ).
  - 2.3 *Hot plate*.
  - 2.4 *Mechanical mixer and bowl or round pans*, 8 in. (200 mm) in diameter and 3 in. (80 mm) deep.
  - 2.5 *Small, pointed masonry trowels*.
  - 2.6 *Small bowl or round pan*, less than 8 in. (200 mm) in diameter.
  - 2.7 *Mercury thermometer*, marked in  $5^\circ\text{F}$  ( $3^\circ\text{C}$ ) divisions or less, or digital thermometer, capable of measuring the temperature specified in the test procedure.
  - 2.8 *Angled pliers*.
  - 2.9 *Insulating gloves*.
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**3. MATERIALS**

- 3.1 *Asphalt cement*.
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- 3.2            *Graded aggregate.*
- 3.3            *Additives, if applicable.*
- 3.4            *Recycled materials, such as Reclaimed Asphalt Pavement (RAP) or Recycled Asphalt Shingles (RAS), if applicable.*
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#### 4.            **PROCEDURE**

- 4.1            Design the bituminous mixture as described in Tex-204-F. Use the calculated amounts of aggregate and asphalt, (including additives and recycled materials, when applicable,) to satisfy the requirements of the specifications.
- 4.2            Separate the material retained on the No.8 (2.36 mm) sieve for each stockpile into individual sieve sizes as required by the specification.  
**Note 1**—Do not divide the material passing the No.8 (2.36 mm) sieve into smaller sieve sizes unless segregation is apparent or absolute control is necessary, since a minimum amount of segregation occurs in this material.
- 4.3            Place the pan, with or without a trowel, or small bowl on the balance and tare the balance.  
**Note 2**—It is recommended, but not mandatory, to use a trowel or small bowl. Use the trowel to separate the aggregate sizes as they are added. This aids in the removal of excess material if too much is accidentally added.
- 4.4            Use the individual or cumulative weight for each sieve size calculated.  
**Note 3**—Weigh the fine aggregate passing the No.8 (2.36 mm) sieve last. Adjust the weight of the aggregate batch by adding or removing very small amounts of fines to equal the total weight if necessary.
- 4.5            Add the calculated amount of aggregate for the largest sieve size from the first stockpile into the pan. Place the blade of the trowel or the small bowl in a flat position on top of this layer as noted in Section 4.3, if desired, and add the calculated amount of the aggregate for the next smaller sieve size on the trowel or to the side of the previous aggregate added. Add all the aggregate sizes for all the stockpiles, mineral filler, and hydrated lime to the pan by repeating this process.  
**Note 4**—The blade of the trowel or the small bowl momentarily separates the aggregate being weighed from the portion that was previously placed in the pan or bowl. Use the trowel to retrieve any excess aggregate.
- 4.6            Mix the dry aggregate weighed in Section 4.5 until all sizes and materials are blended thoroughly.  
**Note 5**—It is important to blend the dry aggregate thoroughly when adding hydrated lime as an anti-stripping additive.
- 4.7            Select a mixing temperature from Table 1 based on the asphalt binder specified on the plans. When adding warm mix asphalt (WMA) additives or using WMA processes in the laboratory, select the mixing temperature based on the asphalt binder specified on the plans.
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**Note 6**—If using RAP or RAS and a substitute PG binder in lieu of the PG binder originally specified on the plans, defer to the originally specified binder grade when selecting the mixing temperature.

- 4.8 Place a thermometer into the aggregate and set the aggregate in an oven maintained at or slightly above the mixing temperature selected in Section 4.7.

**Note 7**—Do not leave the trowel in the pan when heating materials.

- 4.9 Place the calculated quantity of asphalt and any required liquid additives into a small can to facilitate handling. Heat this material in an oven slowly to the temperature selected in Section 4.7.

**Note 8**—Do not allow the asphalt to heat to a temperature above the maximum temperature allowed for storage in the Department's *Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges*, Item 300, or the recommended temperature obtained from the Construction Division's Materials and Pavements Section (CST/M&P), Flexible Pavements Branch.

**Note 9**—Incorporate and mix WMA additives into the laboratory mixture or use WMA processes according to the WMA supplier's recommendations, when applicable.

- 4.10 Place the calculated quantity of RAP or RAS in a separate pan, when applicable. Heat the material in an oven at the mixing temperature selected in Section 4.7.

**Note 10**—Keep heating time for recycled materials to a minimum to avoid further hardening of the recycled material asphalt binder.

- 4.11 Remove the aggregate from the oven after the aggregate has reached the required mixing temperatures. Remove the thermometer.

- 4.12 Slowly place the heated aggregate into a mixing bowl. When applicable, add the heated recycled materials to the heated aggregate and thoroughly blend the materials.

- 4.13 Make a small depression in the center of the aggregate using a trowel, without exposing the bottom of the mixing bowl, to receive the asphalt material.

- 4.14 Place the mixing bowl with the heated aggregate on the scale and tare. Add the required amount of preheated asphalt material.

**Note 11**—Use gloves or a pair of side angle pliers to avoid burning hands. Remove excess asphalt, if necessary.

- 4.15 Thoroughly mix to blend the asphalt material and the aggregate, either by hand or with a mechanical mixer. Use a trowel to blend the aggregate around the side of the pan when mixing by hand. Take care to prevent free asphalt material from coming in contact with the side or bottom of the mixing pan.

- 4.16 Mix the aggregate and asphalt material continuously until the materials are coated thoroughly.

**Note 12**—It may be necessary to adjust the mixing time or temperature for some mixtures to coat the aggregate particles thoroughly. Carefully consider and calculate the speed and time of mixing and the clearance between the mixing device and the bowl to prevent abnormal degradation of the aggregate, when using a mechanical mixer.

- 4.17 Split the mixture into the appropriate size, as need it, and place the samples in the oven.
- 4.18 Identify each mixture with a laboratory number and indicate the percentage of asphalt.

**5. MIXING TEMPERATURE**

- 5.1 Mixtures containing asphalt materials not listed in Table 1, or those containing viscosity-modifying additives, may require considerably varied mixing temperatures from those listed. For guidance, consult the binder supplier or the Flexible Pavements Branch of the Materials and Pavements Section of the Construction Division.
- 5.2 The Engineer must approve the use of asphalt material and mixing temperatures different from those listed in Table 1.

**Table 1—Asphaltic Material Mixing Temperatures by Grade and Type**

Type-Grade <sup>1</sup>	Asphalt Material Temp. °F (°C)	Mixing Temp. °F (°C) <sup>2</sup>
PG 70-28, PG 76-22	325 (163)	325 (163)
PG 64-28, PG 70-22	300 (149)	300 (149)
PG 64-22, PG 64-16	290 (143)	290 (143)
AC-3,5,10; PG 58-28, PG 58-22	275 (135)	275 (135)
RC-250	100 (38)	165 (74)
MC-250	100 (38)	165 (74)
MC-800	140 (60)	190 (88)
CMS-2	140 (60)	235 (113)
AES-300	140 (60)	235 (113)
Asphalt-Rubber (A-R) Binder	325 (163)	325 (163)

- 1. If using RAP or RAS and a substitute PG binder in lieu of the PG binder originally specified on the plans, defer to the originally specified binder grade when selecting the mixing temperature.
- 2. When using RAP or RAS, mixing temperature may be increased up to 325°F to achieve adequate coating.

**6. ARCHIVED VERSIONS**

- 6.1 Archived versions are available.