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## Test Procedure for

# DETERMINING ASPHALT CONTENT FROM ASPHALT PAVING MIXTURES BY THE IGNITION METHOD



## TxDOT Designation: Tex-236-F

**Effective Dates: October 2005–July 2008.**

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### 1. SCOPE

- 1.1 Use this test method to determine the asphalt content of hot mixed paving mixtures by ignition of the asphalt cement.
  - 1.2 Use the remaining aggregate for sieve analysis in accordance with Tex-200-F.
  - 1.3 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 *Ignition furnace*, capable of:
    - 2.1.1 Maintaining a temperature to cause combustion with an internal balance thermally isolated from the furnace chamber accurate to 0.1 g. The balance must be capable of weighing a 3500 g sample in addition to the sample baskets.
    - 2.1.2 Providing an audible alarm and indicator light when the sample reaches constant weight.  
**Note 1**—The furnace door must automatically lock when the test procedure begins and must remain locked until the test procedure is completed.
    - 2.1.3 Providing initial specimen weight, specimen weight loss, correction factor, corrected asphalt content (percent), and test time.
  - 2.2 *Tempered stainless steel No. 8 (2.36 mm) mesh basket*, otherwise perforated basket, or combination of baskets capable of handling at least a 1500 g sample. The basket must incorporate a design that confines the sample during testing.
  - 2.3 *Tempered stainless steel catch pan*, to fit under the basket assembly.
  - 2.4 *Oven*, capable of maintaining  $250 \pm 5^{\circ}\text{F}$  ( $121 \pm 3^{\circ}\text{C}$ ).
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- 2.5 *Balance, with a capacity of 17.6 lb. (8 kg) or greater, accurate to 0.1 g for weighing sample in baskets.*
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### **3. SAFETY EQUIPMENT**

- 3.1 *Safety glasses or face shield.*
- 3.2 *High temperature gloves.*
- 3.3 *Long sleeve jacket.*
- 3.4 *Heat-resistant surface, capable of withstanding heat from the sample baskets.*
- 3.5 *Protective cage, capable of surrounding the sample baskets.*
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### **4. MISCELLANEOUS EQUIPMENT**

- 4.1 *Pan for transferring samples after ignition, spatulas, bowls, and wire brushes.*
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### **5. REPORT FORMAT**

- 5.1 QC/QA worksheets for the ['Ignition Oven Method'](#), used in conjunction with the Hot Mix specification. Refer to the 'Help' tab for detailed instructions on how to use this program.
- 5.2 ['Correction Factor Calculation Worksheet Asphalt Content and Combined Aggregate Gradation.'](#)
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### **6. PREPARING SAMPLES**

- 6.1 Quarter a test sample out of a larger sample taken in accordance with Tex-222-F.
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### **7. PREPARING TEST SPECIMENS**

- 7.1 If the mixture is not sufficiently workable to separate with a spatula or trowel, place it in a large flat pan and warm to  $250 \pm 5^{\circ}\text{F}$  ( $121 \pm 3^{\circ}\text{C}$ ) for 30 min. Do not heat sample for more than one hour.
- 7.2 The nominal maximum aggregate size of the mixture controls the sample size and must conform to the mass requirement shown in Table 1 (See note<sup>1</sup>).

<b>Table 1—Sample Size</b>	
<b>Nominal Max Aggregate Size<sup>1</sup></b>	<b>Min Weight of Sample, g</b>
No. 4	1200
3/8 in.	1200
1/2 in.	1500
3/4 in.	2000
1 in.	3000
1-1/2 in.	4000
1. defined as the largest sieve that retains 10% or more of the total aggregate mixture	

- 7.3 Sample sizes should not be more than 400 g greater than the minimum recommended sample mass. Large samples of fine mixes tend to result in incomplete ignition of the asphalt. When the mass of the test specimen exceeds the recommended maximum capacity of the equipment used, the test specimen may be divided into suitable increments, tested, and the results appropriately combined for calculation of the asphalt content (weighted average).
- 7.4 Verify that the mixture contains no more than 0.2% of moisture by weight. Do not use the same specimen used for moisture determination as used for asphalt content determination.

## 8. CORRECTION FACTORS

### 8.1 *Asphalt Content:*

- 8.1.1 Determine an asphalt content correction factor for each mixture.
- 8.1.2 For mixtures containing recycled asphalt pavement (RAP), sample enough RAP to estimate the binder content accurately and to have an adequate quantity in the mix calibration.
- 8.1.3 Estimate the binder content of the RAP from the average of four samples (RAP only) burned in the furnace. The RAP must be heated at 140°F (60°C), broken apart until friable, and quartered to obtain a representative sample.

### 8.2 *Aggregate Gradation:*

- 8.2.1 The type of aggregate in the mixture may affect the ignition procedure. Accordingly, to optimize accuracy, establish correction factors by testing a set of samples for each mix type. Determine correction factors before the start of production.

8.3 *Calibrating Mixture Quantities:*

8.3.1 Prepare six calibration specimens conforming to the mass requirements of Table 1.

- two at the design asphalt content
- two each at  $\pm 0.5\%$  of the design asphalt content.

8.3.1.1 Prepare a 'butter batch mix' for the 'design asphalt content' specimen, mixed and discarded before mixing any of the calibration specimens to ensure an accurate asphalt content.

**Note 2**—A 'butter batch mix' is a trial batch of asphalt and aggregate design mixture used to coat the mixing bowl and whips with asphalt. This helps prevent a loss of asphalt due to adhesion on the bare walls of the bowl or in the mixing whips.

8.3.1.2 Sample aggregate used for the calibration specimens in accordance with Tex-221-F.

8.3.1.3 Combine aggregate in accordance with Tex-204-F.

8.3.2 Weigh and record the weight of the basket assembly to the nearest 0.1 g.

8.3.3 Place the freshly mixed specimens directly into the sample baskets. Reheat the specimens in a 250°F (121°C) oven for 30 min., if they cool. Do not preheat the sample baskets.

8.3.4 Enter an asphalt correction factor of 0.00 in the ignition furnace.

8.3.5 Evenly distribute the calibration specimen in the basket assembly taking care to keep the material away from the edges of the basket.

8.3.6 Weigh and record the sample and basket assembly to the nearest 0.1 g.

8.3.7 Calculate and record the initial weight of the sample (total weight - the weight of the sample basket assembly).

8.3.8 Input the initial weight of the sample specimen into the ignition furnace controller. Verify entry of the correct weight.

8.3.9 Open the chamber door and place the sample and basket assembly in the furnace.

**Note 3**—Failure of the furnace scale to stabilize may indicate that the sample basket assembly is contacting the furnace wall. If this occurs, adjust the sample basket inside the furnace.

8.3.10 Close the chamber door and start the test.

**Note 4**—This should lock the furnace chamber for the duration of the test.

8.3.11 Allow the test to continue until the stable light and audible stable indicator indicate the test is complete.

8.3.12 Press the start/stop button.

**Note 5**—This should unlock the sample chamber door.

- 8.3.13 Open the chamber door, remove the sample, and allow it to cool to room temperature (approximately 45 min.).  
**Note 6**—Do not use a fan to assist in cooling the specimen to room temperature due to the possibility of losing fines.
- 8.4 *Determining Aggregate and Asphalt Correction Factors:*
- 8.4.1 Perform a gradation analysis on the residual aggregate in accordance with Tex-200-F, Part I.  
**Note 7**—Determine correction factors for aggregate gradation reported in percent passing.
- 8.4.2 Subtract the aggregate gradation for each sieve size from each corresponding sieve size in the combined aggregate gradation of the original mixture design.
- 8.4.3 Average the six measured differences for each sieve size to determine the aggregate correction factor for each sieve size.
- 8.4.4 Subtract the measured asphalt content from the actual asphalt content.
- 8.4.5 Average the six measured differences to determine the asphalt content correction factor.
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## 9. PROCEDURE

- 9.1 Turn ignition oven on.
- 9.2 Enter the correction factor for the specific mix to be tested, as determined in Section 8.3.
- 9.3 Weigh and record the weight of the sample basket assembly.
- 9.4 Prepare the sample as described under Section 7.
- 9.5 Evenly distribute the specimen in the basket assembly taking care to keep the material away from the edges of the basket.
- 9.6 Weigh and record the sample and basket assembly to the nearest 0.1 g.
- 9.7 Calculate and record the initial weight of the sample specimen (total weight minus the weight of the sample basket assembly).
- 9.8 Input the initial weight of the sample specimen into the ignition furnace controller. Verify that the correct weight has been entered.
- 9.9 Open the chamber door and place the sample and basket assembly in the furnace.  
**Note 8**—Failure of the furnace scale to stabilize may indicate that the sample basket assembly is contacting the furnace wall. Adjust the sample basket inside the furnace if this occurs.
- 9.10 Close the chamber door and start the test.

**Note 9**—This should lock the furnace chamber for the duration of the test.

9.11 Allow the test to continue until the stable light and audible stable indicator indicate the test is complete. Press the start/stop button. This should unlock the furnace chamber.

9.12 Open the chamber door, remove the sample, and allow it to cool to room temperature (approximately 45 min.).

**Note 10**—Do not use a fan to assist in cooling the specimen to room temperature due to the possibility of losing fines.

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## 10. GRADATION

10.1 Empty the contents of the baskets into a flat pan.

10.2 Use a small wire sieve brush to ensure to remove any residual fines from the basket. Add those fines to the contents in the flat pan.

10.3 Perform the gradation analysis in accordance with Tex-200-F, part I.

10.4 Apply the gradation correction factor for each sieve size as determined in Section 8.4.

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## 11. ARCHIVED VERSIONS

11.1 Archived versions are available.