

## Chapter 32

# Tex-236-F, Determining Asphalt Content from Asphalt Paving Mixtures by the Ignition Method

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## **Section 1**

### **Overview**

Effective dates: November 2004 – January 2005.

Use this test method to determine the asphalt content of hot mixed paving mixtures by ignition of the asphalt cement.

The remaining aggregate can be used for sieve analysis according to "Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates."

### **Units of Measurement**

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.

## Section 2

### Apparatus

Use the following apparatus:

- ◆ ignition furnace, capable of maintaining a temperature of 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. The furnace must have the means for providing the following information:
  - initial specimen weight
  - specimen weight loss
  - correction factor
  - corrected asphalt content (%)
  - test time.
- ◆ The furnace must provide an audible alarm and indicator light when the sample reaches constant weight. The furnace door must automatically lock when the test procedure begins and must remain locked until the test procedure is completed.
- ◆ a tempered stainless steel No. 8 (2.36 mm) mesh or otherwise perforated basket, or combination of baskets capable of handling at least a 1500 g sample. The basket must incorporate a design which confines the sample during testing.
- ◆ a tempered stainless steel catch pan, to fit under the basket assembly.
- ◆ oven capable of maintaining  $250 \pm 5$  °F ( $121 \pm 3$  °C)
- ◆ balance, 17.6 lbs. (8 kg) or greater capacity, accurate to 0.1 g for weighing sample in baskets.

### **Section 3**

## **Safety Equipment**

List of safety equipment:

- ◆ safety glasses or face shield
- ◆ high temperature gloves
- ◆ long sleeve jacket
- ◆ heat resistant surface capable of withstanding heat from the sample baskets
- ◆ protective cage capable of surrounding the sample baskets.

**Section 4**  
**Miscellaneous Equipment**

Pan for transferring samples after ignition, spatulas, bowls and wire brushes.

## Section 5

### Report Format

Use the following Microsoft Excel programs for reporting purposes.

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

## **Section 6**

### **Preparing Samples**

Quarter a test sample out of a larger sample taken according to "Tex-222-F, Sampling Bituminous Mixtures."

## Section 7

### Preparing Test Specimens

If the mixture is not sufficiently workable to separate with a spatula or trowel, place it in a large flat pan and warm to  $250 \pm 5$  °F ( $121 \pm 3$  °C) for 30 minutes. Do not heat sample for more than 1 hour.

The size of the sample is controlled by the nominal maximum aggregate size of the mixture and must conform to the mass requirement shown in the 'Sample Size' table (see NOTE 1).

Use this table to gauge size of sample.

Sample Size		
Nominal Maximum Aggregate Size, mm	Sieve Size	Minimum Weight of Sample, g (lb.)
4.75	No. 4	1200 (2.6)
9.5	3/8 in.	1200 (2.6)
12.5	1/2 in.	1500 (3.3)
19.0	3/4 in.	2000 (4.4)
25.0	1 in.	3000 (6.6)
37.5	1-1/2 in.	4000 (8.8)

NOTE 1: Define 'Nominal Maximum Aggregate Size' as the largest sieve that retains 10% or more of the total aggregate mixture.

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).

Make a test specimen for moisture determination as is necessary. The specimen used for moisture determination must not be used for asphalt content determination.



## Section 8

### Mixture Calibration

#### Asphalt Content

Determine an asphalt content calibration factor for each mixture.

For mixtures containing RAP, sample enough to accurately estimate the binder content, and to provide that the RAP is used in the mix calibration.

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.

#### Aggregate Gradation

The type of aggregate in the mixture may affect the ignition procedure. Accordingly, to optimize accuracy, establish a calibration factor by testing a set of samples for each mix type. Perform the mixture calibration during the mixture design process.

- ◆ Calibrating mixture quantities

Follow these steps to calibrate mixture quantities of asphalt content and aggregate gradation.

<b>Preparation and Ignition of Test Sample</b>	
<b>Step</b>	<b>Action</b>
1	<ul style="list-style-type: none"> <li>◆ Prepare six calibration specimens conforming to the mass requirements of the 'Sample Size' table.                             <ul style="list-style-type: none"> <li>• two at the design asphalt content</li> <li>• two each at <math>\pm 0.5\%</math> of the design asphalt content.</li> </ul> </li> <li>◆ A 'butter batch mix' must be prepared for the 'design asphalt content' specimen, mixed and discarded prior to mixing any of the calibration specimens to ensure an accurate asphalt content. A 'butter batch mix' is a trial batch of asphalt and aggregate design mixture that is used to coat the mixing bowl and whips with asphalt. This helps to prevent a loss of asphalt due to adhesion on the bare walls of the bowl or in the mixing whips.</li> <li>◆ Sample aggregate used for the calibration specimens according to "Tex-221-F, Sampling Aggregate for Bituminous Mixtures, Surface Treatments and Limestone Rock Asphalt."</li> <li>◆ Aggregate must be combined according to the procedure outlined in "Tex-204-F, Design of Bituminous Mixtures."</li> </ul>
2	Weigh and record the weight of the basket assembly to the nearest 0.1 g.
3	Place the freshly mixed specimens directly into the sample baskets. <ul style="list-style-type: none"> <li>◆ If specimens cool, reheat in a 250 °F (121 °C) oven for 30 minutes.</li> <li>◆ Do not preheat the sample baskets.</li> </ul>
4	Enter an asphalt correction factor of 0.00 in. the ignition furnace.
5	Evenly distribute the calibration specimen in the basket assembly taking care to keep the material away from the edges of the basket.

<b>Preparation and Ignition of Test Sample</b>	
<b>Step</b>	<b>Action</b>
6	Weigh and record the sample and basket assembly to the nearest 0.1 g.
7	Calculate and record the initial weight of the sample (total weight - the weight of the sample basket assembly).
8	Input the initial weight of the sample specimen into the ignition furnace controller. NOTE: Verify that the correct weight has been entered.
9	Open the chamber door and place the sample and basket assembly in the furnace. NOTE: 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.
10	Close the chamber door and start the test. NOTE: This should lock the furnace chamber for the duration of the test.
11	Allow the test to continue until the stable light and audible stable indicator indicate the test is complete.
12	Press the start/stop button. NOTE: This should unlock the sample chamber door.
13	Open the chamber door, remove the sample and allow it to cool to room temperature (approx. 45 minutes). NOTE: Do not use a fan to assist in cooling the specimen to room temperature due to the possibility of losing fines.

◆ Determining Aggregate and Asphalt Correction Factors

<b>Determining Aggregate and Asphalt Correction Factors</b>	
<b>Step</b>	<b>Action</b>
1	<ul style="list-style-type: none"> <li>◆ Perform a gradation analysis on the residual aggregate according to 'Part I, Dry Sieve Analysis (Based on Weight)' of "Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates."</li> <li>◆ The aggregate gradation for each sieve size must be subtracted from each corresponding sieve size in the combined aggregate gradation of the original mixture design to determine each individual sieve correction factor.</li> <li>◆ Each gradation correction factor is the average of the six measured differences.</li> </ul>
2	<p>Once all six of the calibration specimens have been burned, determine the difference between the actual and measured asphalt contents for each sample.</p> <ul style="list-style-type: none"> <li>◆ The asphalt content correction factor is the average of the six measured differences.</li> </ul>

## Section 9 Procedure

Follow these steps to determine asphalt content from asphalt paving mixtures by the ignition method.

<b>Determining Asphalt Content from Asphalt Paving Mixtures by the Ignition Method</b>	
<b>Step</b>	<b>Action</b>
1	Turn ignition oven on.
2	Enter the correction factor for the specific mix to be tested as determined in the 'Calibration' section of this procedure.
3	Weigh and record the weight of the sample basket assembly.
4	Prepare the sample as described under 'Preparing Test Specimens.'
5	Evenly distribute the specimen in the basket assembly taking care to keep the material away from the edges of the basket.
6	Weigh and record the sample and basket assembly to the nearest 0.1 g.
7	Calculate and record the initial weight of the sample specimen (total weight minus the weight of the sample basket assembly).
8	<ul style="list-style-type: none"> <li>◆ Input the initial weight of the sample specimen into the ignition furnace controller.</li> <li>◆ Verify that the correct weight has been entered.</li> </ul>
9	Open the chamber door and place the sample and basket assembly in the furnace. <ul style="list-style-type: none"> <li>◆ Failure of the furnace scale to stabilize may indicate that the sample basket assembly is contacting the furnace wall.</li> <li>◆ If this occurs, adjust the sample basket inside the furnace.</li> </ul>
10	Close the chamber door and start the test. <ul style="list-style-type: none"> <li>◆ This should lock the furnace chamber for the duration of the test.</li> </ul>
11	<ul style="list-style-type: none"> <li>◆ Allow the test to continue until the stable light and audible stable indicator indicate the test is complete.</li> <li>◆ Press the start/stop button. (This should unlock the furnace chamber.)</li> </ul>
12	<ul style="list-style-type: none"> <li>◆ Open the chamber door, remove the sample and allow it to cool to room temperature (approx. 45 minutes).</li> <li>◆ Do not use a fan to assist in cooling the specimen to room temperature due to the possibility of losing fines.</li> </ul>

## Section 10

### Gradation

Follow these steps to determine the gradation.

<b>Determining Gradation</b>	
<b>Step</b>	<b>Action</b>
1	Empty the contents of the baskets into a flat pan.
2	<ul style="list-style-type: none"><li>◆ Use a small wire sieve brush to ensure that any residual fines are removed from the basket.</li><li>◆ Add those fines to the contents in the flat pan.</li></ul>
3	Perform the gradation analysis according to 'Part I, Dry Sieve Analysis' of "Tex-200-F, Sieve Analysis of Fine and Coarse Aggregates."
4	<ul style="list-style-type: none"><li>◆ Apply the gradation correction factor for each sieve size as determined in the 'Calibration' section of this procedure.</li><li>◆ The gradation must fall within the JMF (mix design) tolerances.</li></ul>

## **Section 11**

### **Archived Versions**

Archived versions of "Tex-236-F, Determining Asphalt Content from Asphalt Paving Mixtures by the Ignition Method" are available through the following links:

- ◆ Click on [236-0899](#) for the test procedure effective August 1999 through October 2004.