

Chapter 32

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

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Section 1

Overview

Effective date: February 2005 – September 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 to cause combustion with an internal balance thermally isolated from the furnace chamber accurate to 0.1 g (balance must be capable of weighing a 3500 g sample in addition to the sample baskets)
 - providing an audible alarm and indicator light when the sample reaches constant weight. (*NOTE:* The furnace door must automatically lock when the test procedure begins and must remain locked until the test procedure is completed.)
 - having the means to provide initial specimen weight, specimen weight loss, correction factor, corrected asphalt content (%), and test time.
- ◆ 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.)
- ◆ tempered stainless steel catch pan, to fit under the basket assembly
- ◆ oven, capable of maintaining $250 \pm 5^{\circ}\text{F}$ ($121 \pm 3^{\circ}\text{C}$)
- ◆ balance with a capacity of 17.6 lb. (8 kg) or greater, accurate to 0.1 g for weighing sample in baskets.

Section 3

Safety Equipment

Use the following 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 the 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 $250 \pm 5^\circ\text{F}$ ($121 \pm 3^\circ\text{C}$) for 30 minutes. Do not heat sample for more than 1 hr.

The nominal maximum aggregate size of the mixture controls the sample size 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 ¹	Sieve Size, mm	Minimum Weight of Sample, g (lb.)
No. 4	4.75	1200 (2.6)
3/8 in.	9.5	1200 (2.6)
1/2 in.	12.5	1500 (3.3)
3/4 in.	19.0	2000 (4.4)
1 in.	25.0	3000 (6.6)
1-1/2 in.	37.5	4000 (8.8)

¹Defined 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).

Verify that the mixture contains no more than 0.2% of moisture by weight. 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 RAP to accurately estimate the binder content and to have an adequate quantity in the mix calibration.

Estimate the binder content of the RAP from the average of 4 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.

Preparing and Igniting Test Sample	
Step	Action
1	<ul style="list-style-type: none"> ◆ Prepare 6 calibration specimens conforming to the mass requirements of the 'Sample Size' table. <ul style="list-style-type: none"> • 2 at the design asphalt content • 2 each at $\pm 0.5\%$ of the design asphalt content. ◆ Prepare a 'butter batch mix' must be prepared for the 'design asphalt content' specimen, mixed and discarded before mixing any of the calibration specimens to ensure an accurate asphalt content. <p><i>NOTE:</i> 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.</p> <ul style="list-style-type: none"> ◆ Sample aggregate used for the calibration specimens according to "Tex-221-F, Sampling Aggregate for Bituminous Mixtures, Surface Treatments and Limestone Rock Asphalt." ◆ Combine aggregate according to the procedure outlined in "Tex-204-F, Design of Bituminous Mixtures."
2	Weigh and record the weight of the basket assembly to the nearest 0.1 g.
3	<ul style="list-style-type: none"> ◆ 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.
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

Preparing and Igniting Test Sample	
Step	Action
	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 (total weight - the weight of the sample basket assembly).
8	<ul style="list-style-type: none"> ◆ Input the initial weight of the sample specimen into the ignition furnace controller. ◆ Verify that the correct weight has been entered.
9	Open the chamber door and place the sample and basket assembly in the furnace. <i>NOTE:</i> 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. <i>NOTE:</i> 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. <i>NOTE:</i> This should unlock the sample chamber door.
13	Open the chamber door, remove the sample and allow it to cool to room temperature (approximately 45 min.). <i>NOTE:</i> 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

Follow these steps to determine the aggregate and asphalt correction factors.

Determining Aggregate and Asphalt Correction Factors	
Step	Action
1	◆ 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."
2	Subtract the aggregate gradation for each sieve size from each corresponding sieve size in the combined aggregate gradation of the original mixture design.
3	Average the 6 measured differences for each sieve size to determine the aggregate correction factor for each sieve size.
4	Subtract the measured asphalt content from the actual asphalt content.
5	Average the 6 measured differences to determine the asphalt content correction factor.

Section 9 Procedure

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

Determining Asphalt Content from Asphalt Paving Mixtures by the Ignition Method	
Step	Action
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"> ◆ Input the initial weight of the sample specimen into the ignition furnace controller. ◆ Verify that the correct weight has been entered.
9	Open the chamber door and place the sample and basket assembly in the furnace. <i>NOTE:</i> 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.
10	Close the chamber door and start the test. <i>NOTE:</i> This should lock the furnace chamber for the duration of the test.
11	<ul style="list-style-type: none"> ◆ 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.)
12	Open the chamber door, remove the sample, and allow it to cool to room temperature (approximately 45 min.). <i>NOTE:</i> Do not use a fan to assist in cooling the specimen to room temperature due to the possibility of losing fines.

Section 10

Gradation

Follow these steps to determine the gradation.

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

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.
- ◆ Click on [236-1104](#) for the test procedure effective November 2004 through January 2005.