

## Tex-213-F, Determining Hydrocarbon-Volatile Content of Bituminous Mixtures

### Overview

Effective date: August 1999 to October 2004

This method, a modification of ASTM D 1461, covers determining hydrocarbon volatile content of a bituminous mixture.

### Apparatus

The following apparatus is required:

- ◆ 'Metal Still,' consisting of a vertical cylindrical container, approximately 127 mm (5 in.) in diameter and 152 mm (6 in.) in depth with removable lid, heavy fiber gasket or O-ring, and a clamping system. There should be two holes in the lid, each approximately 25 mm (1 in.) in diameter to provide entry of the water trap-condenser assembly and a safety valve.
- ◆ volatile trap, 5 mL (0.2 oz.) capacity, graduated in 0.1 mL (0.0034 oz.) divisions, and equipped with cork or rubber stoppers
- ◆ condenser, Liebig glass-tube type, with a condenser jacket approximately 400 mm (16 in.) long
- ◆ tubing
- ◆ loose, clean cotton
- ◆ balance, readable to 0.1 g and accurate to 0.5 g
- ◆ hot plate
- ◆ ring stand with base and clamp
- ◆ bucket, 4 L (1 gal.) with airtight lid, or plastic bag.

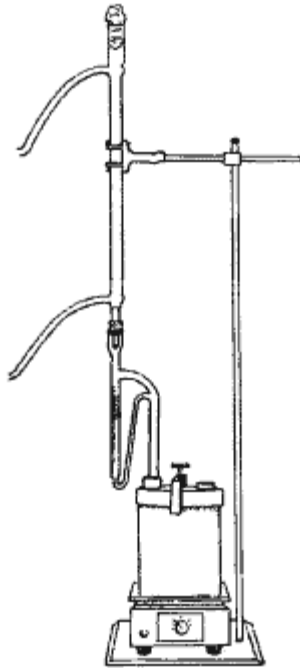


Figure -1. Metal Still (No. 2).

### Materials

The following material is needed:

- ◆ clean tap water free of dissolved salts or minerals.

### Test Record Form

Record test data on the "Hydrocarbon Volatiles Worksheet" ([Hydro](#)).

### Precautions

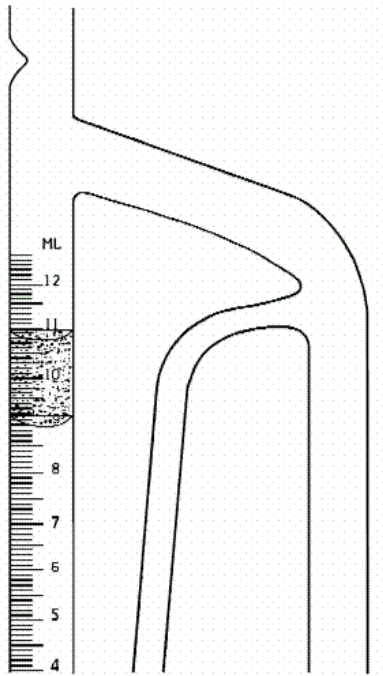
All connections and the lid must fit tightly to avoid vapor loss which will skew readings and create an unsafe condition.

### Procedure

Follow these steps for determining hydrocarbon-volatile content of bituminous mixtures.

Determining Hydrocarbon-Volatile Content of Bituminous Mixtures	
Step	Action

<b>Determining Hydrocarbon-Volatile Content of Bituminous Mixtures</b>	
<b>Step</b>	<b>Action</b>
1	Obtain a representative sample of the bituminous mixture according to Test Method "Tex-222-F, Sampling Bituminous Mixtures."
2	Thoroughly mix the sample, breaking up large lumps.
3	Reduce the mixture to laboratory test size by quartering, or thoroughly blending, the material and taking small portions from several places in the pan.
4	Weigh a 500 to 600 g sample and record to the nearest 0.1 g as X under 'Calculations' and on the 'Hydrocarbon Volatiles Worksheet' ( <a href="#">Hydro</a> ). NOTE: Keep samples in moisture-tight containers at all times.
5	<ul style="list-style-type: none"> <li>◆ Immediately pour the weighed sample into the still.</li> <li>◆ Add water until the sample is covered to a depth of about 25 mm (1 in.).</li> </ul>
6	Place gasket or O-ring on rim of metal still and firmly fasten the lid by means of the clamping system.
7	Insert the volatile trap in the still lid making sure the lower end of trap extends away from the source of heat, and assemble the condenser as shown in 'Metal Still.'
8	<ul style="list-style-type: none"> <li>◆ Place a cork or rubber stopper in the other hole to serve as a safety valve.</li> <li>◆ Minimize evaporation loss by inserting a loose cotton plug in the top of the glass condenser.</li> <li>◆ Inspect all stoppers regularly to be certain they do not leak.</li> </ul>
9	Circulate plenty of cool water continuously through the condenser.
10	<ul style="list-style-type: none"> <li>◆ Apply heat so that refluxing will start within 5 to 10 minutes after application and water will drip from the condenser at a rate of 85 to 95 drops per minute.</li> <li>◆ Check the temperature of the water passing from the condenser and control the flow so that its temperature does not exceed 43 °C (110 °F).</li> </ul>
11	Continue distillation until three consecutive readings of the upper and lower volatiles, at 15 minute intervals, show no increase in the amount of volatiles being condensed.
12	Cool the hydrocarbon volatile trap and contents to room temperature and permit the volatiles to separate from the water.
13	<p>Read the two meniscus.</p> <ul style="list-style-type: none"> <li>◆ 'Meniscus Readings' shows an example of a test in which the top meniscus reads 11.0 and the bottom meniscus, between the solvent and water, reads 9.0.</li> <li>◆ The difference, or volume of volatiles, is 2 mL (0.07 oz.).</li> </ul>
14	<p>Determine the specific gravity of the hydrocarbon volatiles at the temperature the distillate was measured.</p> <p>NOTE: When the specific gravity is not available, use a specific gravity of 0.8.</p>



### Meniscus Readings

Figure -2. Meniscus Readings.

### Calculations

Calculate the percent of hydrocarbon volatiles based on the weight of the bituminous mixture:

$$\text{Percent Hydrocarbon Volatiles} = \frac{100 VG}{X}$$

Where:

- ◆ X = Weight (grams) of total sample
- ◆ V = Volume of volatiles (milliliters)
- ◆ G = Specific gravity of volatiles.