



## Standard Test Method for Volatile Matter in the Analysis of Particulate Wood Fuels<sup>1</sup>

This standard is issued under the fixed designation E 872; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method determines the percentage of gaseous products, exclusive of moisture vapor, in the analysis sample of particulate wood fuel that is released under the specific conditions of the test. The particulate wood fuel may be sanderdust, sawdust, pellets, green tree chips, hogged fuel, or other type particulate wood fuel having a maximum particle volume of 16.39 cm<sup>3</sup> (1 in.<sup>3</sup>). Volatile matter, when determined as herein described, may be used to indicate yields on processes to provide the basis for purchasing and selling or to establish burning characteristics.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

D 346 Practice for Collection and Preparation of Coke Samples for Laboratory Analysis<sup>2</sup>

D 2013 Method of Preparing Coal Samples for Analysis<sup>2</sup>

E 871 Method for Moisture Analysis of Particulate Wood Fuels<sup>3</sup>

### 3. Summary of Test Method

3.1 Volatile matter is determined by establishing the loss in weight resulting from heating wood under rigidly controlled conditions. The measured weight loss, corrected for moisture as determined in Method E 871, establishes the volatile matter content.

### 4. Significance and Use

4.1 The test procedures described in this test method can be used to determine the percentage of gaseous products, exclusive of moisture vapor, of any particulate wood fuel meeting

the requirements specified in this test method.

### 5. Apparatus

5.1 *Platinum Crucible*, with closely fitting cover, or a nickel-chromium crucible, with closely fitting cover, pre-fired to oxidize and stabilize the weight. The crucible shall be of not less than 10 or more than 20-mL capacity, not less than 25 or more than 35 mm in diameter, and not less than 30 or more than 35 mm in height.

5.2 *Vertical Electric Tube Furnace*—The furnace may be of the form shown in Fig. 1. It shall be regulated to maintain a temperature of  $950 \pm 20^\circ\text{C}$  in the crucible, as measured by a thermocouple positioned in the furnace.

### 6. Procedure

#### 6.1 Sampling:

6.1.1 *Place of Sampling*—Take sample where wood is being loaded into or unloaded from means of transportation or when discharged from storage bins or conveyors.

NOTE 1—Samples collected from the surface of piles are, in general, unreliable because of the exposure to the environment. If necessary, collect nine increments from a foot or more below the surface at nine points covering the pile.

#### 6.1.2 Collection of Gross Sample:

6.1.2.1 Collect increments regularly, systematically, and with such frequency that the entire quantity of wood sampled will be represented proportionally in the gross sample.

6.1.2.2 The quantity of the sample shall be large enough to be representative but not less than 10 kg (22 lb).

6.1.2.3 Place samples in an airtight container immediately after collection. Maintain samples in the airtight container whenever possible to prevent gains or losses in moisture from the atmosphere.

6.1.3 Sample reduction may be done by two methods, a coning and dividing process, or by using a riffle. Mixing, coning, and quartering are described and illustrated in Practice D 346.

6.1.3.1 Coning and dividing reduction is accomplished by placing the gross sample on a sheet of rubber or oil cloth. Thoroughly mix it by raising first one corner of the cloth and then the other. After mixing, cone and quarter sample. Continue the operations until the sample is reduced sufficiently so that one quarter weighs about 50 g (0.11 lb). This shall constitute a laboratory sample.

6.1.3.2 Riffle reduction is accomplished by using a standard

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 05.05.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 11.05.

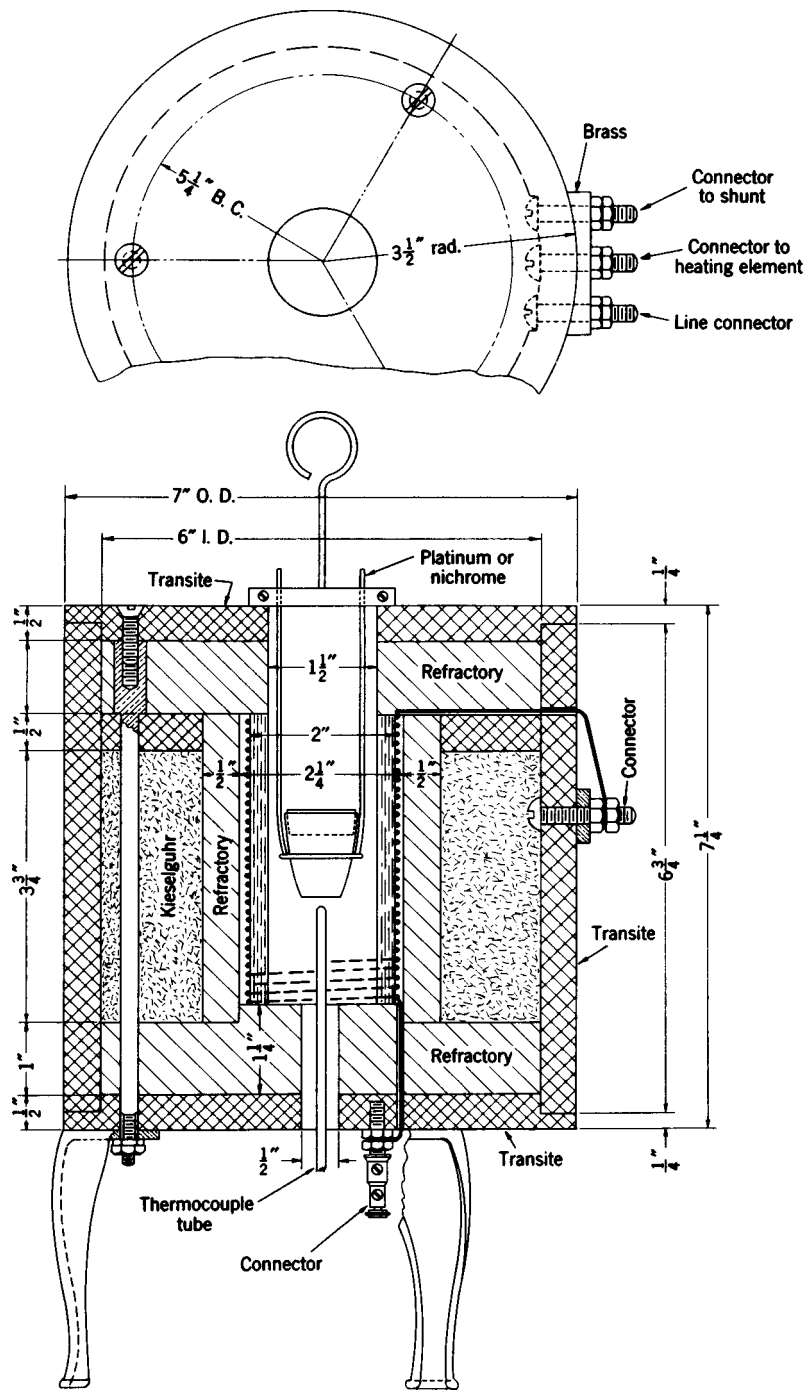


FIG. 1 Electric Furnace for Determining Volatile Matter

coal riffle. The gross sample is riffled repeatedly until one half of the riffle sample equals about 50 g (0.11 lb) which will constitute a laboratory sample. Riffles and procedures are described in Method D 2013.

6.2 Reduce the sample to a smaller particle size by use of cutting or shearing type laboratory mill. The final product should pass through a 1-mm or smaller screen. Depending on the specific product this step may involve more than one stage of reduction, that is, passing the sample through a mill with a larger size screen first and then milled to pass the final screen. Minimum atmospheric exposure is recommended and the

milling process should be conducted to avoid significant moisture means to ensure thorough intermix of heavy fines and milled fluff.

6.3 Weigh the crucible and cover to the nearest 0.01 g and record as crucible weight,  $W_c$ . Place approximately 1 g of sample in the crucible, cover, weigh the crucible, cover, and sample to the nearest 0.01 g, and record as initial weight,  $W_i$ .

6.4 Place the covered crucible with sample on platinum or nickel-chromium wire supports and insert directly into the furnace chamber, which shall be maintained at a temperature of  $950 \pm 20^\circ\text{C}$ , and lower immediately to the  $950^\circ\text{C}$  zone.

Regulation of the temperature to within the prescribed limits is critical. After the more rapid discharge of volatile matter has subsided as shown by the disappearance of the luminous flame, inspect the crucible (Note 2) to verify the lid is still properly seated. If necessary, reseal the lid to guard against the admission of air into the crucible. Do this as rapidly as possible by raising the crucible to the top of the furnace chamber, reposition the lid as described in Method D 2013 to more perfectly seal the crucible, then lower immediately back to the 950°C zone. After heating for a total of exactly 7 min, remove the crucible from the furnace and, without disturbing the cover, allow it to cool in a desiccator. Weigh the covered crucible with sample as soon as cold to the nearest 0.1 mg and record as final weight,  $W_f$ .

NOTE 2—Inspection of the crucible may be aided by the use of a mirror held above the furnace well.

## 7. Calculation

7.1 Calculate the weight loss percent as follows:

$$\text{Weight loss, \%} = 100 \times (W_i - W_f)/(W_i - W_c) = A \quad (1)$$

where:

$W_c$  = weight of crucible and cover, g,  
 $W_i$  = initial weight, g, and  
 $W_f$  = final weight, g.

7.2 Calculate the volatile matter percent in the analysis samples as follows:

$$\text{Volatile matter in analysis sample, \%} = A - B \quad (2)$$

where:

$A$  = weight loss %, and

$B$  = moisture, %, as determined using Method E 871.

## 8. Precision and Bias

8.1 The following criteria should be used for judging the acceptability of results:

8.1.1 *Repeatability*—Duplicate results by the same laboratory should not be considered suspect unless they differ by more than 0.3 %.

8.1.2 *Reproducibility*—The results submitted by two or more laboratories should not be considered suspect unless they differ by more than 1.0 %.

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