



Designation: ~~D2961/D2961M – 18~~ D2961/D2961M – 18a

## Standard Test Method Practice for Single-Stage Total Moisture Less than 15 % in Coal Reduced to 2.36 mm [No. 8 Sieve] Topsize<sup>1</sup>

This standard is issued under the fixed designation D2961/D2961M; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

### 1. Scope\*

1.1 This test method covers a single-stage procedure for the determination of total moisture less than 15 % in coal reduced to 2.36 mm [No. 8 sieve] topsize. This test method is for determination of total moisture only. Materials subjected to this test shall not be used in the determination of other test parameters. It is recognized that the conditions of the test can increase the potential for significant oxidation effects on some coals. If the oxidation potential is of concern, the use of this single-stage method shall involve prior agreement between the parties involved. This test method shall not be construed as the referee standard test method for total moisture. For referee purposes, users of this test method are referred to Test Method ~~D3302/D3302M~~ for moisture determination methods which are not as susceptible to oxidation effects.

1.2 Statistical analysis of data from several sources indicates that at a 95 % confidence level, there is statistically no significant difference between the mean value of the results obtained by ~~D2961/D2961M~~ and ~~D3302/D3302M~~ (that is, no bias is detected between the two methods at the 95 % confidence level) for moisture levels between 1.4 % and 15.8 %. These two test methods were not compared in this study for some ranks of coal including lignite and anthracite. (See ~~11.2.~~)

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

<https://standards.iteh.ai/catalog/standards/sist/f0ccacf0-8bbd-43c4-959f-e05a0c73cb5c/astm-d2961-d2961m-18a>

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

~~D121 Terminology of Coal and Coke~~

~~D2013/D2013M Practice for Preparing Coal Samples for Analysis~~

~~D3302/D3302M Test Method for Total Moisture in Coal~~

### 3. Terminology

3.1 *Definitions*—For additional definitions of terms used in this test method, refer to Terminology ~~D121.~~

### 4. Summary of Test Method

4.1 Moisture is determined by establishing the mass loss of the coal sample by drying in an oven with forced-air circulation.

<sup>1</sup> This test method practice is under the jurisdiction of ASTM Committee D05 on Coal and Coke and is the direct responsibility of Subcommittee D05.21 on Methods of Analysis.

Current edition approved Sept. 1, 2018/Dec. 1, 2018. Published November 2018/January 2019. Originally approved in 1971. Last previous edition approved in 2017/2018 as ~~D2961/D2961M – 17~~/D2961/D2961M – 18. DOI: ~~10.1520/D2961\_D2961M-18~~/10.1520/D2961\_D2961M-18A.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

\*A Summary of Changes section appears at the end of this standard

## 5. Significance and Use

5.1 The measurement of total moisture is required to determine whether coal meets commercial or environmental specifications, or both. Within the limitations prescribed in the scope, this test method describes a procedure for determination of total moisture that requires less time than the procedures described in Test Method [D3302/D3302M](#).

## 6. Apparatus

6.1 *Drying Pans*, noncorrodible, stable at the temperature used, and of such size that the sample can be spread to a depth of not more than 25 mm [1 in.].

6.1.1 The pan size may be varied to suit the size of the sample and the oven. The height of the sides shall be no more than 40 mm [1½ in.] so that air is not restricted in passing over the coal.

6.2 *Drying Oven*, forced air type capable of maintaining a temperature of  $107^{\circ}\text{C} \pm 3^{\circ}\text{C}$  and constructed to provide for a continuous air flow to all parts of the oven. Air changes shall be at the rate of two to four volumes per minute.

## 7. Sampling<sup>3</sup>

7.1 The sample shall be prepared to 2.36 mm [No. 8] according to Test Method [D2013/D2013M](#). Divide from the 2.36 mm [No. 8] sieve size subsample (Test Method [D2013/D2013M](#)) a portion not less than 125 g.

7.2 That portion of the sample used for the moisture determination shall have a minimum mass of 125 g.

## 8. Procedure

8.1 Weigh the empty drying pan. Record the mass in grams as  $W_1$ . Transfer the sample from the sample container to the drying pan. Distribute the sample uniformly over the pan. Do not exceed a depth of 25 mm [1 in.]. Place the empty sample container in the drying pan. Weigh the drying pan, coal sample, and empty sample container. Record the mass in grams as  $W_3$ .

8.2 Place the pan, sample, and empty sample container in the oven at a temperature of  $107^{\circ}\text{C} \pm 3^{\circ}\text{C}$ . Maintain the air flow to provide continuous introduction of air while ensuring that fine particles are not elutriated. Dry for 90 min, remove from the oven, and weigh immediately. Record the mass.

8.3 Return to the oven for an additional 30 min, remove, and weigh. Record the mass. Repeat the drying at 30 min intervals until the change in mass for the 30 min period is less than 0.05 % of the original mass of the coal sample.

$$\text{Change in mass \%} = \frac{(\text{Loss in mass during the 30 min interval}) \times 100}{\text{Original sample mass}} \quad (1)$$

8.4 Remove any residual coal from the dried sample container and weigh the empty container. Record the mass as  $W_2$ .

NOTE 1—If the moisture determination is to be made in the immediate vicinity of sample preparation, the sample need not be placed in a container, but can be weighed directly in a tared drying pan.

## 9. Calculation

9.1 Calculate the moisture content of the sample as follows:

$$M = [(W_3 - W_4)/(W_3 - W_1 - W_2)] \times 100 \quad (2)$$

where:

- $M$  = total moisture in the coal as analyzed, %;
- $W_1$  = mass of empty pan;
- $W_2$  = mass of empty sample container;
- $W_3$  = mass of coal plus pan plus sample container wet, and
- $W_4$  = mass of coal plus pan plus sample container after drying.

## 10. Report

10.1 Report the following information:

10.1.1  $M$ , the total moisture in the coal as analyzed, %, to the nearest 0.01 percentage point.

## 11. Precision and Bias

11.1 The precision of this test method for the determination of Single-Stage Total Moisture in coal are shown in [Table 1](#).

11.1.1 *Repeatability Limit (r)*—the value below which the absolute difference between two test results of separate and consecutive test determinations, carried out on the same sample in the same laboratory by the same operator using the same apparatus on samples taken at random from a single quantity of homogeneous material, may be expected to occur with a probability of approximately 95 %.

<sup>3</sup> A study was conducted between 1989 and 1993 confirming the minimum 125 g analysis sample size and the 2.36 mm [No. 8] topsize. Eleven labs participated in the study. Supporting data are available from ASTM Headquarters. Request Report RR:D05-1052. Contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org).