



Designation: D2961/D2961M – 17

Standard Test Method for Single-Stage Total Moisture Less than 15 % in Coal Reduced to 2.36-mm (No. 8 Sieve) Topsize¹

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 reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

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 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 and D3302 (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 and health practices and determine the applicability of regulatory limitations prior to use.*

¹ This test method 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 Feb. 1, 2017. Published February 2017. Originally approved in 1971. Last previous edition approved in 2011 as D2961 – 11. DOI: 10.1520/D2961_D2961M-17.

2. Referenced Documents

2.1 *ASTM Standards:*²

D121 Terminology of Coal and Coke

D2013 Practice for Preparing Coal Samples for Analysis

D3302 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 weight loss of the coal sample by drying in an oven with forced-air circulation.

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.

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 $107 \pm 3^\circ\text{C}$ 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.

² 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



7. Sampling

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

7.2 That portion of the sample used for the moisture determination shall have a minimum weight 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 $107 \pm 3^\circ\text{C}$. Maintain the air flow to provide continuous introduction of air while ensuring that fine particles are not elutriated. Dry for $1\frac{1}{2}$ h, remove from the oven, and weigh immediately. Record the mass.

8.3 Return to the oven for an additional $\frac{1}{2}$ h, remove, and weigh. Record the mass. Repeat the drying at $\frac{1}{2}$ -h intervals until the change in mass for the $\frac{1}{2}$ -h period is less than 0.05 % of the original mass of the coal sample.

$$\text{Change in mass \%} = \frac{\left(\text{Loss in mass during the } \frac{1}{2} \text{ hour interval} \right) * 100}{(\text{Original sample mass})} \quad (1)$$

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:

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

TABLE 1 Concentrations Range and Limits for Repeatability and Reproducibility for Single-Stage Total Moisture

Repeatability Limit	Reproducibility Limit
r	R
0.30%	0.50%

where:

M = total moisture in the coal as analyzed, %,

W_1 = weight of empty pan,

W_2 = weight of empty sample container,

W_3 = weight of coal plus pan plus sample container wet, and

W_4 = weight 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%.

11.1.2 *Reproducibility Limit (R)*—the value below which the absolute difference between two test results carried out in different laboratories using samples taken at random from a single quantity of material that is as homogeneous as possible, may be expected to occur with a probability of approximately 95%.

11.2 *Bias*—Bias of this test method has not been determined.³

³ Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D05-1024.

SUMMARY OF CHANGES

Committee D05 has identified the location of selected changes to this standard since the last issue (D2961–11) that may impact the use of this standard.

(1) Report section (10) added.

(2) Designation corrected to D2961/D2961M-17.



ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, Tel: (978) 646-2600; <http://www.copyright.com/>