



Standard Practice for Estimating and Monitoring the Uncertainty of Test Results of a Test Method Using Control Chart Techniques¹

This standard is issued under the fixed designation E2554; 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 practice describes techniques for a laboratory to estimate the uncertainty of a test result using data from test results on a control sample. This standard provides one method for a laboratory to estimate Measurement Uncertainty in accordance with Section A22.3 in *Form and Style of ASTM Standards*.

1.2 Uncertainty as defined by this practice applies to the capabilities of a single laboratory. Any estimate of uncertainty determined through the use of this practice applies only to the individual laboratory for which the data are presented.

1.3 The laboratory uses a well defined and established test method in determining a series of test results. The uncertainty estimated using this practice only applies when the same test method is followed. The uncertainty only applies for the material types represented by the control samples, and multiple control samples may be needed, especially if the method has different precision for different sample types or response levels.

1.4 The uncertainty estimate determined by this practice represents the intermediate precision of test results. This estimate seeks to quantify the total variation expected within a single laboratory using a single established test method while incorporating as many known sources of variation as possible.

1.5 This practice does not establish error estimates (error budget) attributed to individual factors that could influence uncertainty.

1.6 This practice describes the use of control charts to evaluate the data obtained and presents a special type of control chart to monitor the estimate of uncertainty.

1.7 The system of units for this standard is not specified. Dimensional quantities in the standard are presented only as illustrations of calculation methods. The examples are not binding on products or test methods treated.

1.8 *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:²

D5184 Test Methods for Determination of Aluminum and Silicon in Fuel Oils by Ashing, Fusion, Inductively Coupled Plasma Atomic Emission Spectrometry, and Atomic Absorption Spectrometry

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E456 Terminology Relating to Quality and Statistics

E2282 Guide for Defining the Test Result of a Test Method

E2587 Practice for Use of Control Charts in Statistical Process Control

ISO/ASTM 51707 Guide for Estimating Uncertainties in Dosimetry for Radiation Processing

2.2 ASTM Publications:²

Form and Style for ASTM Standards

Manual on Presentation of Data and Control Chart Analysis 7th Edition

2.3 ISO Standard:³

ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories

3. Terminology

3.1 **Definitions**—The terminology of Terminology **E456** applies to this practice except as modified herein.

3.1.1 **control sample, n**—sample taken from a stable, homogeneous material for the purposes of monitoring the performance of a test method in a laboratory.

3.1.1.1 **Discussion**—The control sample material is representative of the product typically tested in the laboratory by the

¹ This practice is under the jurisdiction of ASTM Committee **D05** on Coal and Coke and is the direct responsibility of Subcommittee **D05.07** on Physical Characteristics of Coal.

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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.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.