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Standard Practice for Bias Testing a Mechanical Coal Sampling System¹

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1. Scope

1.1 This practice presents sample collection and statistical evaluation procedures for testing mechanical sampling systems, subsystems, and individual system components for bias. It is the responsibility of the user of this practice to select the appropriate procedure for a specific sampling situation.

1.2 This practice does not purport to define an absolute bias. Bias defined by this practice is the difference between the population mean of the mechanical sampler test results and the accepted reference value.

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 121 Terminology of Coal and Coke²
- D 2013 Practice for Preparing Coal Samples for Analysis²
- D 2234 Practice for Collection of a Gross Sample of Coal²
- D 4621 Guide for Quality Management in an Organization that Samples or Tests Coal and Coke²
- D 4702 Guide for Inspecting Crosscut, Sweep-Arm, and Auger Mechanical Coal Sampling Systems for Conformance with Current ASTM Standards²
- E 105 Practice for Probability Sampling of Materials³
- E 122 Practice for Calculating Sample Size to Estimate, with a Specified Tolerable Error, the Average for a Characteristic of a Lot or Process³
- E 456 Terminology Relating to Quality and Statistics³
- E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method³

3. Terminology

3.1 *Definitions*—For additional definitions of terms used in this practice refer to Terminologies D 121 and E 456.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *bias, n*—the difference between the population mean of the mechanical sampler test results and the accepted reference value.

3.2.2 *confidence interval, n*—a numeric interval with a lower limit and a higher limit within which the true parameter value is estimated to fall. The confidence interval percentage indicates the percentage of time the true value will fall within the interval if the procedure is continuously repeated.

3.2.3 *correlation, n*—a measure of the linear dependence between paired system and reference measurements. Correlation frequently is expressed by the correlation coefficient, which can take a value from minus one (perfect negative linear relationship) to plus one (perfect positive linear relationship).

3.2.4 *delimitation error, n*—a material error that occurs when all the elements in a cross section of a coal stream do not have an equal probability of being intercepted (captured) by the sampler cutter during increment collection.

3.2.5 *ellipsoidal region, n*—an area that is formed by plane sections of ellipses that are defined by the values selected for the largest tolerable bias of each coal characteristic used in the bias test. The region will be used to determine if the system is biased.

3.2.6 *Hotelling's T^2 test, n*—a statistical test that is used to evaluate multivariate data. It is the multivariate equivalent of the Student's *t*-test.

3.2.7 *largest tolerable bias (LTB), n*—an interval whose upper and lower bounds represent the limits of an acceptable bias.

3.2.8 *mechanical sampling system, n*—a single machine or series of interconnected machines whose purpose is to extract mechanically, or process (divide and reduce), or a combination thereof, a sample of coal.

3.2.9 *paired data set, n*—system and reference values observed on samples collected and compared from the same batch of material.

3.2.10 *reference sample, n*—a sample used in testing of a mechanical sampling system which is comprised of one or more increments collected from the test batch or lot of coal by the stopped belt method as described in Practice D 2234.

3.2.11 *reject stream, n*—the coal flow within a mechanical sampling system, which occurs at each stage of division, before and after reduction, and is not included in the system sample.

3.2.12 *save stream, n*—the coal flow within a mechanical sampling system which occurs at each stage of division, before

¹ This practice is under the jurisdiction of ASTM Committee D05 on Coal and Coke and is the direct responsibility of Subcommittee D05.23 on Sampling.

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² *Annual Book of ASTM Standards*, Vol 05.06.

³ *Annual Book of ASTM Standards*, Vol 14.02.