



Standard Guide for Determination of Precision and Bias of Methods of Committee D-22¹

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^{€1} NOTE—Section 13 was added editorially in November 1996.

1. Scope

1.1 This standard provides guidance to task groups of Committee D-22 on Sampling and Analysis of Atmospheres in planning and conducting collaborative testing of candidate methods.

1.2 It is intended for use with other ASTM practices for the determination of precision and bias.

1.3 It is applicable to most manual and automated methods and to most components of monitoring systems. It is recognized that the evaluation of monitoring systems may provide special problems. Practice D 3249 should be considered for general guidance in this respect.

1.4 It is directly applicable to chemical methods and in principle to most physical methods, sampling methods, and calibration procedures.

1.5 The processes described are for the general validation of methods of test. A user has the obligation and responsibility to validate any method it uses for a specific application and to demonstrate its own competence in the use of validated methods.

2. Referenced Documents

2.1 ASTM Standards:

D 2777 Practice for Determination of Precision and Bias of Applicable Methods of Committee D-19 on Water²

D 3249 Practice for General Ambient Air Analyzer Procedures³

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods⁴

E 180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial Chemicals⁵

E 691 Practice for Conducting an Interlaboratory Study to

Determine the Precision of a Test Method⁴

3. Terminology

3.1 The terms used in this practice are consistent with those defined in Practices D 2777, E 177, E 180, and E 691.

3.2 Definitions:

3.2.1 *accuracy*—the degree of conformity of a value generated by a specific procedure to the assumed or accepted true value. It includes both precision and bias.

3.2.2 *bias*—a systematic (nonrandom) deviation of the method average value or the measured value from an accepted reference value.

3.2.3 *candidate method*—an analytical method or measurement process being considered for standardization. A method is a “candidate” until completion of all phases of the consensus process specified by ASTM regulations for a proposal, an emergency standard, or a standard.

3.2.4 *collaborative test*—an interlaboratory study of a test method wherein the participants analyze or make measurements on sub-samples of the same test material. If the test method includes the sampling of atmospheres, the participants should sample the same test atmosphere, as possible.

3.2.5 *laboratory bias*—systematic differences between the true value and a value reported by a laboratory due to errors of application such as losses, contamination, mis-calibration, and faulty manipulations, for example.

3.2.6 *method bias*—systematic departures of the limiting mean from the true value of the parameter measured, caused by physical or chemical phenomena inherent in the methodology.

3.2.7 *over-all precision*—a value including components of within-laboratory and between-user variability.

3.2.8 *precision*—the degree of mutual agreement between individual measurements using an analytical method or measurement process. In practice, the standard deviation of an entire array of reviewed and acceptable data is calculated to provide the value to be stated as the precision of the method.

3.2.9 *ruggedness test*—a factorial test designed to explore the sensitivity of the method to variations in the procedure (see

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² *Annual Book of ASTM Standards*, Vol 11.01.

³ *Annual Book of ASTM Standards*, Vol 11.03.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ *Annual Book of ASTM Standards*, Vol 15.05.