



Designation: D 3980 - 88

Standard Practice for Interlaboratory Testing of Paint and Related Materials¹

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1. Scope

1.1 This practice covers the interlaboratory testing of paint and related materials. The information presented is intended to assist task groups in the effective planning of round-robin test programs.

1.2 The various parts appear in the following order:

	Sections
Part A—Definitions	3
Part B—Planning	4 to 11
Part C—Statistical Analysis	12 to 16
Part D—Analysis Presentation	17 to 20

1.3 This practice, in spite of its length, is not intended to cover all aspects of statistical design and analysis. For example, the analysis of variance used in the practice as the basis for estimating the precision is abridged in comparison to that normally used for establishing the significance of experimental factors. The publications listed in the appendix should be consulted for further information or explanations. For convenience, comparable practices developed by other ASTM technical committees are also shown.

2. Referenced Documents

2.1 ASTM Standards:

- D 968 Test Methods for Abrasion Resistance of Organic Coatings by the Falling Abrasive Tester²
- D 3793 Test Method for Low-Temperature Coalescence of Latex Paint Films²
- E 180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial Chemicals³

PART A—TERMINOLOGY

3. Definitions

3.1 The statistical terms used in this practice are defined, as nearly as possible, in every day language. For convenience, the terms are listed in order of use in this practice.

3.2 *experimental design*—the complete plan for conducting an investigation or an interlaboratory study of materials, processes, or test methods. It is conveniently set forth in the form of a single comprehensive table showing number of laboratories, materials to be tested, test methods, number of operators, testing conditions, time of testing, and

degree of replication and repetition. The experimental design should provide the basis for an efficient statistical analysis of the results (see Part B, Planning).

3.3 *replication*—the execution of multiple chemical or physical determinations on the same specimen or physical measurements on the same panel at the same time, as closely as possible. Two replicates are called duplicates, three are called triplicates, etc. The individual results are not suitable for estimating precision but are used only to ensure by comparison with similar measurements that there is not a gross error among them (see 15.1.3.3).

3.4 *repetition*—The execution of multiple physical measurements on the same panel or chemical determinations at different times, or physical measurements on different panels, areas of large structures, or specimens of a liquid sample within a short time interval, to establish the precision of a method. In most cases the measurements are the mean of replicates as defined in 3.3.

3.5 *population*—the totality of observations on or determinations of a certain property or component obtained by the same procedure; theoretically, an infinite collection of measurements on a given item of interest but, practically, a large number of measurements of the item. Thus, when statistical procedures are used to determine whether or not two (or more) materials or test methods differ significantly with respect to some measurable property, in effect, the determination is whether these materials belong to the same or to different populations.

3.6 *sample*—a randomly selected subset of a population intended to be representative of it so as to enable obtaining an estimate of the property or composition of the entire population. The reliability of such an estimate can be expressed in terms of confidence limits (see 3.19). Through tests of significance (see 3.21), it is possible to state, with a specified degree of confidence, whether two or more samples are drawn from the same or from different populations.

3.7 *average*—a typical numerical value that attempts to summarize or reflect the location of a group of observations by a single number. While it is a measure of central tendency, it does not provide information on the variability of the individual observations. The following are different types of averages: arithmetic mean, weighted mean, algebraic mean, geometric mean, harmonic mean, median, and mode.

3.7.1 *mean (arithmetic)*—the value obtained by dividing the sum of a set of observations or results by their number. This value is an estimate of the mean of the parent population. Although the arithmetic mean is affected by extreme values and therefore may not be typical, it is amenable to statistical treatment and is the most commonly used average.

¹ This practice is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings and Materials and is the direct responsibility of Subcommittee D01.20 on Sampling, Statistics, etc.

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² Annual Book of ASTM Standards, Vol 06.01.

³ Annual Book of ASTM Standards, Vol 15.05.