



Standard Recommended Practice for RUBBER—STATISTICAL DESIGN OF INTERLABORATORY TESTS¹

This Standard is issued under the fixed designation D 1421; 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.

1. Scope

1.1 The purpose of an interlaboratory study is to determine the variability in results caused by different personnel, equipment, and environment in following a prescribed method of test, and the consistency from material to material of this variability. The study may also include a comparative study of two or more alternative methods of test. In order to achieve these objectives satisfactorily and efficiently, it is essential that sound statistical designs be employed in the planning of interlaboratory studies.

1.2 This recommended practice is intended to define the statistical concepts that are likely to be involved in the design of an interlaboratory study and in the analysis of interlaboratory test data; to give the basic principles involved in the planning of such a study; and to present a general method for analyzing data resulting from it.

2. Definitions

2.1 *population*—the hypothetical collection of experimental values that would be obtained if a given test were repeated an unlimited number of times, under essentially the same conditions, on a material or on materials having the same true value. From this definition it follows that a given set of data can be considered to belong to many different populations. The choice of the population is determined by the specification of the "conditions" under which the repetitive measuring process is conducted (see 2.6).

2.2 *sample*—(1) In a statistical sense, the limited sequence of values actually obtained by repeating the test a finite number of times.

(2) In a material sense, the object or group of objects selected for test.

2.3 *population parameter*—a fixed value characterizing a certain aspect of a statistical population. The location of the mean of a population, its spread, its skewness (lack of symmetry)—all these are expressed by appropriate population parameters. An estimate of the value of a population parameter, derived from a sample, is called a "sample estimate" or "statistic."

2.4 *sample size*—the number of experimental values in a sample.

2.5 *average, or mean value*—the arithmetic average of a set of values. The population average, or true average, is a fixed number associated with the population. The sample average is considered as an estimate (sample estimate) of the population average and varies from one sample to another.

2.6 *random error*—the deviation of a measured value from the corresponding population average.

NOTE 1—A given measurement can have different random errors, depending on the choice of the population. An example is provided by a result obtained by a given laboratory in an interlaboratory study. The population can be defined as the totality of results that would be obtained in this laboratory through unending repetition of the measuring process. Another population is obtained by considering the collection of values resulting from tests made by *all* the laboratories involved in the study.

¹ This recommended practice is under the jurisdiction of ASTM Committee D-11 on Rubber and Rubber-Like Materials and is the direct responsibility of Subcommittee D11.16 on Statistical Quality Control.

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