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Standard Guide for
Using Existing Practices in Developing and Writing Test Methods[1]

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1. Scope

1.1 This guide is intended to assist task groups in the preparation of a test method. It can help the task group use existing statistically related ASTM practices more effectively during the development and writing of the test method.

1.2 Some of the essential activities that should occur during the development of a new test method are not in existing or proposed practices under the jurisdiction of ASTM Subcommittee D13.93 on Statistics. This guide includes a brief explanation of how such activities should be carried out.

1.3 This guide is applicable to properties that are evaluated by both parametric and nonparametric methods of estimation. The instructions on properties that are best evaluated by nonparametric methods are less complete than those for properties that are evaluated by parametric methods.

2. Referenced Documents

2.1 *ASTM Standards:*
D 123 Terminology Relating to Textiles[2]
D 2904 Practice for Interlaboratory Testing of a Textile Test Method That Produces Normally Distributed Data[2]
D 2905 Practice for Statements on Number of Specimens for Textiles[2]
D 2906 Practice for Statements on Precision and Bias for Textiles[2]
D 3777 Practice for Writing Specifications for Textiles[3]
D 4271 Practice for Writing Statements on Sampling in Test Methods for Textiles[3]
D 4356 Practice for Establishing Consistent Test Method Tolerances[4]
D 4467 Practice for Interlaboratory Testing of a Test Method That Produces Non-Normally Distributed Data[3]
D 4853 Guide for Reducing Test Variability[3]
D 4854 Guide for Estimating the Magnitude of Variability from Expected Sources in Sampling Plans[3]
D 4855 Practice for Comparing Test Methods[3]
E 456 Terminology Relating to Quality and Statistics[4]
E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method[4]
2.2 *ASTM Adjuncts:*[5]
TEX-PAC

NOTE 1—TEX-PAC is a group of PC programs on floppy disk.

3. Terminology

3.1 *Definitions:*

3.1.1 *moving range, MR, n*—the difference without regard to sign between two successive observations.

3.1.2 *nonparametric, adj*—in statistics, a term referring to a technique that is not based on assumptions about the nature of the underlying frequency distribution. (Compare to *parametric*.)

3.1.3 *parametric, adj*—in statistics, a term referring to a technique that assumes the nature of the underlying distribution is known. (Compare to *nonparametric*.)

3.1.4 *practice, n*—a definitive procedure for performing one or more specific operations or functions that does not produce a test result.

3.1.4.1 *Discussion*—A practice is not a down-graded test method. Examples of practices include procedures for conducting interlaboratory testing programs or other statistical procedures; for writing statements on sampling or precision and accuracy; and for selection, preparation, application, inspection, necessary precautions for use or disposal, installation, maintenance, and operation of testing equipment.

3.1.5 *test method, n*—a definitive procedure for the identification, measurement, or evaluation of one or more qualities, characteristics, or properties of a material, product, system, or service that produces a test result.

3.1.6 For the definitions of other terms that appear in this standard, refer to Terminology D 123 and Terminology E 456.

4. Summary of Guide

4.1 The guide is summarized in Fig. 1, which shows the steps in test method development, the sections of this guide which apply, and other references that may be used as aids in a specific step in the development of the test method. As Fig. 1 points out, the references should show to which of the previous steps the development should revert when the results

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[1] This guide is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.93 on Statistics.
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[2] *Annual Book of ASTM Standards*, Vol 07.01.
[3] *Annual Book of ASTM Standards*, Vol 07.02.
[4] *Annual Book of ASTM Standards*, Vol 14.02.

[5] PC programs on floppy disk are available through ASTM. For a 3½ in. disk request PCN: 12-429040; for a 5¼ in. disk request PCN: 12-429041-18.

When the results of a step are less than completely satisfactory, the reference practice(s) should show to which of the previous steps the development of the test method should revert.

Step in Development	Section(s)	Other References
Determining Need	6	none
Sources of Methods	7.1	none
Applicability of Potential Methods	7.2	none
Initial Test Method Tolerances	7.3	Practice D 4356
Reducing Variability	7.4	Practice D 4853
Statistical Control	7.5	none
Revised Test Method Tolerances	7.6	Practice D 4356
Initial Draft(s)	8.1	Blue Book
		D13.91 White Paper
Selecting Procedure to Use	8.2	Practice D 4855
Interlaboratory Testing	9	Practice D 2904
		Practice D 4467
		Practice E 691
Terminology	10.2	Terminology D 123
		Terminology E 456
Uses and Significance	10.3	Practice D 2906
Sampling	10.4	Practice D 2905
		Practice D 3777
		Practice D 4271
		Guide D 4854
Precision and Bias	10.5	Practice D 2906
		Blue Book
Review of Draft	11.1	none
Ballots	12.1	ASTM Regulations

FIG. 1 Suggested Steps in Test Method Development

of a specific step are less than satisfactory.

5. Significance and Use

5.1 There are enough existing practices related to the development of test methods or the preparation of one or more sections of new test methods so that even the experienced author may not use them as effectively as possible. This guide shows the person(s) preparing a new test method where and when the existing practices can best be used.

5.2 Using this standard as a guide, a task group should be able to prepare a draft of a new test in less time and with less effort than if this guide were not used. In addition, a well-prepared draft of a new test method is less likely to receive negative votes.

6. Determining Need for a Method

6.1 There is no simple answer to the question: "Is a new test method needed?" Generally, a new test method is needed if (*1*) no ASTM test method exists to identify, measure, or evaluate one or more significant qualities, characteristics, or properties of a material, product, system, or service and (*2*) need for such a method exists on an industry-wide basis. The responsible subcommittee needs to be convinced that a true need exists and be agreed upon the exact nature of the quality, characteristic, or property of interest to be evaluated. It is essential that a test method measure a quality, characteristic, or property that will predict the usefulness of a material, product, system, or service when it is put to its intended use.

7. Evaluating Potential Methods

7.1 *Sources of Potential Methods*—Potential procedures for a proposed new test method usually come from two sources: either one or more companies or laboratories have a method

that is being used by them, or someone has decided that a specific procedure is a reasonable one to use even though it has not been used in industry. Existing procedures may be modified by the task group in the light of a consensus of viewpoints.

7.2 *Applicability of Potential Methods*—The first job of the task group is to consider each of the potential methods and determine if the method really measures the property of interest or whether it measures some related property instead. A specific procedure can usually be investigated within a single laboratory. In the light of these findings, a judgment should be made whether each of the potential methods is worthy of further work. In addition, if the method is supposed to predict performance in a later stage in the life of a material or product, the task group needs to verify that the method will really do so. At this point, the task group should eliminate any potential test procedure that does not meet these requirements. If all of the potential procedures are eliminated, the task group should make every reasonable attempt to discover or invent a procedure that does meet these requirements. Failure to do so will mean that the selected test method will not be as good as the users have a right to expect.

7.3 *Initial Test Method Tolerances*—Practice D 4356 discusses the fact that the tolerances specified for each of the measurements of some characteristic of a test specimen determine the exactness with which a test result can realistically be reported. For example, a procedure for determining mass per unit area of a fabric specimen should require that the length and width of the specimen be measured to within some tolerance and the mass to within another tolerance. If these tolerances are broad, it will not be realistic to require reporting the mass per unit area quite exactly. Before starting work on the one or more potential procedures that are still under consideration, the task group should select consistent test method tolerances.

7.4 *Reducing Variability*—It is quite likely that the results for each of the potential test methods include variability that might be eliminated or reduced by changes in the procedure. Guide D 4853 discusses how to locate the sources of such unnecessary variability and how to eliminate them by (*1*) using ruggedness tests, (*2*) evaluating and using components of variance, (*3*) averaging results from more than one specimen, (*4*) compositing samples prior to testing, and (*5*) using physical standards to reduce time related changes in the method or equipment. A brief description of ruggedness testing and a set of references are given in Practice D 2904. The task group should contact a person with statistical experience for help with the methods of eliminating unnecessary variability listed above.

7.5 *Statistical Control*—Useful testing procedures should be in a state of statistical control; that is, the long-term variability should be no greater than is predicted from the short-term variability. Guidance is given in 7.4 for detecting and eliminating assignable causes of increased long-term variability. The existence of a state of statistical control can be demonstrated by control charts prepared as directed in STP 15D.[6]

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[6] *Manual on Presentation of Data and Control Chart Analysis, ASTM STP 15D*, ASTM 1976.