



Standard Practice for Writing Committee D 13 Standards¹

This standard is issued under the fixed designation D 6718; 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. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

The position of Committee D13 is that the current issue of the publication entitled *Form and Style for ASTM Standards*, is controlling in all instances of document preparation within subcommittees. While much of its content allows for some optional choices in document format, there are several sections that are mandatory in respect to being included in all standards. These mandatory sections are: *Title, Designation, Scope, Significance and Use, Procedure, Precision and Bias, and Keywords*, which must be included in all documents, with precision and bias specifically required in test methods that generate data in the form of values, counts, or ratings that can be analyzed to yield statistical parameters for stating precision and bias. ASTM documents include test methods, specifications, and other types, such as practices and guides, classifications, terminology, tables, and charts.

Under the ASTM consensus process, ASTM policies about document formats are not implemented uniformly in all committees, nor even in subcommittees within a committee. If a document lacking a required section goes through the ballot steps without receiving a negative vote as to a mandatory section being missing, publication results routinely. Consequently, some standards appear in the Book of Standards with missing mandatory sections, or with other recommended sections that have been omitted. By implementing this practice within Committee D13, a practice which is based firmly on guidance found in *Form and Style for ASTM Standards*, Committee D13 writers will have a reference for producing documents that fulfill ASTM policies.

There are four parts to this practice. The main body describes sections usually contained in standards, and a brief statement of content for each, following a test method example. Next follows an annex that shows more detail and fuller statements of content for each section, again with emphasis on test methods. Then follows an appendix that provides a check-off list for three standards for the use of document writers in seeing that all mandatory and other recommended sections are included. Finally, there follows an annex that provides a synopsis of SI units and usage.

1. Scope

1.1 This practice gives information to Committee D13 document writers that agrees with guidance of the ASTM publication *Form and Style for ASTM Standards*² (hereinafter *Form and Style*) and fits the particular needs of Committee D13.

1.2 With guidance from this practice and from *Form and Style*, Committee D13 document writers will have answers to most questions regarding form and style.

1.3 Writers may prepare documents, with pertinent requirements in hand, at the time of writing, to meet all ASTM policies.

2. Referenced Documents

2.1 *ASTM Standards*:

D 123 Terminology Relating to Textiles³

IEEE/ASTM S10 - Use of the International System of Units (SI): The modern Metric System⁴

2.2 *Other ASTM Documents*:

Tex-Pac Adjunct²

3. Terminology

3.1 *Definitions*:

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

3.1.2 *specification, n*—a precise statement of a set of requirements to be satisfied by a material, product, system, or

¹ This practice is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.91 on Editorial Review and Policy. Current edition approved Nov. 10, 2002. Published January 2003.

² Available, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

³ *Annual Book of ASTM Standards*, Vol. 07.01.

⁴ *Annual Book of ASTM Standards*, Vol. 14.04.

service that indicates the procedures for determining whether or not each of the requirements is satisfied.

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

3.1.4 For definitions of other textile terms contained in this practice, refer to Terminology D 123.

4. Summary of Practice

4.1 This practice gives Committee D13 document writers information needed to produce standards that are within ASTM policies regarding form and style.

4.2 The most usual sequence of document sections for Committee D13 standards is shown for test methods, specifications, and practices.

4.3 Information regarding test methods is highlighted in this practice, with a brief statement of content for each section heading.

5. Significance and Use

5.1 The practice shows sections most frequently included in Committee D13 standards, highlighting those sections designated as mandatory.

5.2 Use this practice in conjunction with the most current issue of *Form and Style*.

5.3 Sections designated as mandatory in *Form and Style* must be included in Committee D13 standards.

5.4 In addition to sections designated as mandatory in *Form and Style*, Committee D13 has designated the terminology section to be mandatory in its standards.

5.4.1 Subcommittees are responsible for maintaining standards, including terminology. Defined terms must be kept current in standards from which they derive, and in Terminology D 123.

5.5 Statements on precision and bias are necessary for test methods that generate data in the form of values, counts, or ratings that can be analyzed to yield statistical parameters for determining precision and bias.

6. Procedure

6.1 Of the types of standards allowed by ASTM policies, test methods, specifications, and practices are most often required within Committee D13. This practice is directed primarily to these three types, but the other types not cited are very similar to practice requirements.

6.2 Sections usually contained in Committee D13 standards. Writers should follow the sequence in drafting new documents, or in revising current documents.

6.3 When following the sequence for test methods as noted above, include information pertaining to each section as indicated in the example that follows.

6.3.1 Example of test method sections and content, numbered as usually contained in a test method.

Designation (Mandatory)

(Use assigned test method number and year.)

Title (Mandatory)

(A title should be concise, but identify the use of a test method.)

1. Scope (Mandatory)

(The scope should contain information relating to the purpose of a test method, including any limitations.)

2. Referenced Documents

(List titles of documents cited in the standard, and give sources for documents. Do not list related documents, if not cited within the standard.)

3. Terminology (D13 Mandatory)

(Significant terms with meanings more specialized than common dictionary meanings should be defined within a standard or reference made to a terminology standard under the subcommittee's jurisdiction.)

4. Summary of Test Method

(Include a brief outline of the test method, giving essential features, without the details necessary to the complete statement of procedure.)

5. Significance and Use (Mandatory)

(Include information that explains the relevance and meaning of the test method. Avoid repetition of the scope. State the suitability of the test method for acceptance testing.)

TABLE 1 Sequence for Drafting New Documents

Test Method	Specification	Practice
Designation (Mandatory)	Designation (Mandatory)	Designation (Mandatory)
Title (Mandatory)	Title (Mandatory)	Title (Mandatory)
Scope (Mandatory)	Scope (Mandatory)	Scope (Mandatory)
Referenced Documents	Referenced Documents	Referenced Documents
Terminology (D13 Mandatory)	Terminology (D13 Mandatory)	Terminology (D13 Mandatory)
Summary of Test Method	Classification	Summary of Practice
Significance and Use (Mandatory)	Ordering Information	Significance and Use (Mandatory)
Apparatus	Materials and Manufacture	Reagents
Reagents and Materials	Physical properties	Procedure (Mandatory)
Hazards	Performance Requirements	Test Methods
Sampling, Test Specimens, and Test Units	Sampling	Report
Calibration and Standardization	Number of Tests and Retests	Keywords (Mandatory)
Conditioning	Test Methods	(Additional Sections may be contained:)
Procedure (Mandatory)	Inspection	Annex (Mandatory Information)
Calculation (or Interpretation of Results)	Product Marking	Appendix (Nonmandatory Information)
Report	Packaging and Marking	
Precision and Bias (Mandatory)	Rejection and Rehearing	
Keywords (Mandatory)	Quality Assurance	
(Additional Sections may be contained:)	Keywords (Mandatory)	
Annex (Mandatory Information)	(Additional Sections may be contained:)	
Appendix (Nonmandatory Information)	Annex (Mandatory Information)	
References (5 or more)	Appendix (Nonmandatory Information)	
Adjunct	References (5 or more)	
	Adjunct	

- 6. Apparatus**
(Include a brief description of the essential features of equipment required.)
 - 7. Reagents and Materials**
(List reagents and materials needed for the procedure.)
 - 8. Hazards**
(Include statements relating to safety hazards, precautions, remedial measures, and technical hazards.)
 - 9. Sampling, Test Specimens, and Test Units**
(Give directions for obtaining sample test units.)
 - 10. Calibration and Standardization**
(Give detailed instructions for calibration and adjustment of any apparatus, for standardization and use of reference standards, for preparation and use of calibration curves or tables.)
 - 11. Conditioning**
(Specify time and atmosphere for conditioning test materials.)
 - 12. Procedure (Mandatory)**
(Following the sequence of the procedure, give detailed directions for performing the test.)
 - 13. Calculation (or Interpretation of Results)**
(Give directions for calculating the test result, along with the number of significant figures. If the test result is of descriptive, relative, or abstract form, give a basis for interpreting the test result, such as by classification or rating.)
 - 14. Report**
(State the detailed information required in reporting the results of the test.)
 - 15. Precision and Bias (Mandatory)**
(Determine precision by initiating an interlaboratory study, determining components of variance from the data set, and calculating useful precision parameters. Determine the bias shown by a test method in comparison to an accepted referee method, or to standardized materials; but, if this is not possible, state the test method has no known bias.)
 - 16. Keywords (Mandatory)**
(Identify terms or phrases that represent the technical information presented in the standard.)
- (Additional Sections that May Be Contained:)
- References** (5 or more that pertain to the test method)

- (Include references providing needed supplementary information. If only a few references are included, use footnotes.)
- Annex (Mandatory Information)**
(Include additional information considered too lengthy for the main text.)
- Appendix (Nonmandatory Information)**
(Include additional information that is not a mandatory part of the test method.)
- Adjunct**
(Include material that is lengthy but required for use of the standard. Adjunct material must be available at the time of publication of the standard.)
(End of example for test method sections and content)

6.4 When following the sequence for specifications, practices, or other documents, refer to *Form and Style* for descriptions of information to be included in sections. In many instances, this necessary information is similar to that in a test method, and is not repeated here.

6.5 Follow the sequence in writing the document to ensure mandatory and other pertinent sections are included.

6.5.1 Use one of the check-off lists contained in Appendix X1 as a final check to see that all necessary sections have been included.

6.6 For a more detailed discussion of section contents, refer to Annex A1.

7. Keywords

7.1 ASTM documents; form; format; mandatory sections; style; writing standards

ANNEX

(Mandatory Information)

A1. MORE DETAILED DISCUSSION OF PREPARING A D13 STANDARD TEST METHOD

A1.1 This annex gives further guidance to writers of new and revised D13 standards by giving more details regarding section content and by citing certain examples of standardized language that may be inserted into documents.

A1.2 Though more extensive, this annex is not all inclusive. The preparer of a draft standard should use it in conjunction with *Form and Style*, applying both as they fit the needs of the intended document.

A1.3 Sections shown as “Mandatory” must appear in all test methods.

A1.4 Whenever possible, the author should give directions in the imperative voice.

A1.5 In the following test method example, italicized text contained in parentheses relates to instructions for the particular section in which they appear.

A1.6 The example contained below is directed primarily to test methods, but much of the information applies to the other types of standards.

A1.6.1 Example of test method sections and content are as follows:

(Beginning of test method example:)

This document is not an ASTM standard; it is under consideration within an ASTM technical committee but has not received all approvals required to become an ASTM standard. It shall not be reproduced or circulated or quoted, in whole or in part, outside of ASTM committee activities except with the approval of the Chairman of the Committee having jurisdiction and the President of the Society. Copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. All Rights Reserved.

(Caveat above, designation and title below are Mandatory)

Draft _____

New Standard: D _____

Standard Test Method for _____ of _____¹

(Modify title from test method to specification, practice, etc., as needed)

- 1. Scope (Mandatory)**
 - 1.1 This test method covers the measurement of _____
 - 1.2 This test method applies to _____

1.3 (Use For Solely SI Standards) The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

or

1.3 (Use for combined SI and inch-pound standards, not specifying one system of units) The values stated in either SI units or inch-pound units are to be regarded separately as the standard. Within the text, the inch-pound units are shown in parentheses. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with a specification.

or

1.3 (Use for combined SI and inch-pound standards, specifying one system of units) The values stated in SI units (Use inch-pound units, if applicable) are to be regarded as the standard. The values given in parentheses are provided for information only.

1.4 (Mandatory caveat) 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. (If there are other specific warning or precautionary statements in the text, cite the appropriate section(s) at the end of the generic hazards caveat.)

2. Referenced Documents

(List in alphanumeric order the designation and complete title of the documents referenced in the standard, such as ASTM Standards, proposals, and adjuncts.)

2.1 ASTM Standards: (Use colon, if there is no text following the headings.)

D 123 Terminology Relating to Textiles³

D 1776 Practice for Conditioning Textiles for Testing³

2.2 ASTM Adjuncts:

Tex-Pac²

2.x (List other standard source(s) assigning consecutive section numbers.)

(Use footnote(s) as shown above and placed on the Section 2 page to indicate source of documents. When later citing ASTM standards in the text, cite only the type, designation letter and number. For example: Test Method D 2256.)

3. Terminology (Review definitions with terminology subcommittee chairman.)

3.1 Definitions:

3.1.1 (term), part-of-speech (for example n) — (insert delimiting phrase when applicable) the (definition)

3.1.1.1 Discussion—(Add when applicable)

3.1.x For definitions of other textile terms used in this method, refer to Terminology D 123.

4. Summary of Test Method

4.1 The _____ .

(Generally state what happens to the specimen and how the information is used to calculate the value of the property.)

5. Significance and Use (MANDATORY)

(State whether or not the test method is recommended for use in acceptance testing. If the test method is recommended for such use, give a basis for the statement. When precision of the test method is known and is reasonable, this provides a basis for a recommendation. If the precision statement indicates test results to be unreasonably variable, the test method should not be recommended for use in acceptance testing. If precision is not known, there is little basis for recommending use of the test method in acceptance testing. If precision of a test method is not known, but industry uses it for acceptance testing, a statement to this effect may be included, but it is incumbent upon the responsible subcommittee to establish such general use. If this condition persists over time, and precision is not determined, the recommendation should not be carried over succeeding reapprovals of the test method.)

(Examples of statements that can be used are:)

5.1 This test method is considered satisfactory for acceptance testing of commercial shipments because current estimates of between-laboratory precision are acceptable, and the method is used extensively in the trade for acceptance testing.

or

5.1 This test method is not recommended for acceptance testing of commercial shipments in the absence of reliable information on between-laboratory precision.

or

5.1 (Some other statement that fits the test method and its known usage and precision.)

5.1.1 If there are differences of practical significance between reported test results for two laboratories (or more), comparative tests should be performed to determine if there is a statistical bias between them, using competent statistical assistance. As a minimum, use test samples for such comparative tests that are as homogeneous as possible, that are drawn from the same lot of material as the samples that resulted in disparate results during initial testing, and that are randomly assigned in equal numbers to each laboratory for testing. The test results from the laboratories involved should be compared using a statistical test for unpaired data, at a probability level chosen prior to the testing series. If a bias is found, either its cause must be found and corrected, or future test results for that material must be adjusted in consideration of the known bias.

5.2 (Cite any additional information relative to the use and significance of the standard.)

6. Apparatus

(No need to list ordinary laboratory items, such as, rulers, beakers, marking pens, etc.)

6.1 _____ Testing Apparatus consisting of the following:

6.1.1 _____ .

(Use footnote 4 below as it applies to a single source of specialized equipment, or when more than one source is available. DO NOT list any sources, if more than one equipment supplier is available.)

6.2 Hazards—Refer to the manufacturer's Material Safety Data Sheets (MSDS) for information on handling, use, storage, and disposal of material and reagents used with this standard.

(In some cases, a like hazard statement may be included in the apparatus section. In any event, when required, it should appear directly after the section to which it applies.)

⁴ Apparatus is commercially available. (Or, if only one known supplier use:) The only source of supply at this time is (name and address of the supplier). If you are aware of alternate suppliers, please provide this information to ASTM International headquarters. Your comments will receive careful consideration of the responsible technical committee, which you may attend.

7. Sampling and Test Specimens

(ASTM specifically advises in the *Form and Style* for ASTM Standards Manual that test methods and specification are to be separate documents. Statements, such as "agreement between purchaser and supplier", "subject to an existing specification", "revision of the test method requirement of the two parties", "lot sample for acceptance testing" are kinds of statements that cannot be contained in Specifications. Descriptions and examples of lot sampling can be referenced or discussed in an appendix (References: *Form and Style for ASTM Standards* sections A14.2 and B1.2). An example of a sampling and test specimens section for fabric follows:)

7.1 Primary Sampling Unit—Consider material as put-up for shipment to be the primary sampling unit, such as rolls, bolts or pieces of fabric, or cartons of garments or flat goods, as applicable. (See Appendix X1)

7.2 Laboratory Sampling Unit—As a laboratory sampling unit take from rolls at least one full-width piece of fabric that is 1 m (1 yd) in length along the selvage (machine direction), after removing a first 1 m (1 yd) length. For fabric components of fabricated systems use the entire system.

7.3 Test Specimens—From each laboratory sampling unit, cut 8 warp-wise (lengthwise) and 8 filling-wise (widthwise) test specimens 45 mm (1-7/8 in.) by 230 mm (9 in.). For woven fabrics, the long dimensions are cut parallel to the warp yarns for length-wise abrasion and parallel to the filling yarns for widthwise abrasion. Take lengthwise specimens from different positions across the width of the fabric. Take widthwise specimens from different positions along the length of the fabric. Consider the long direction as the direction of test. Abrade the specimens on the face of the material. Specimens preparation need not be carried out in the standard atmosphere for testing. Label to maintain specimen identity.

7.3.1 For fabric widths 125-mm (5-in.) or more, take no specimen closer than 25-mm (1-in.) from the selvage edge, and not within 0.5-m (0.5-yd) from the end of the roll or piece.

7.3.2 For fabric widths less than 125-mm (5-in.), use the entire width for specimens but take no specimen within 0.5-m (0.5-yd) from the end of the roll or piece.

7.3.3 Cut specimens representing a broad distribution diagonally across the width of the laboratory sampling unit. Ensure specimens are free of folds, creases, or wrinkles. Avoid getting oil, water, grease, etc. on the specimens when handling.

7.3.4 If the fabric has a pattern, ensure that the specimens are a representative sampling of the pattern.

7.3.5 When test specimens must be taken from an end-use item, for example from a shirt, select specimens from the front, back, sleeves, in both upper and lower portions, to achieve good representation.

8. Conditioning

8.1 Precondition the specimens by bringing them to approximate moisture equilibrium in the standard atmosphere for preconditioning textiles as directed in Practice D 1776.

8.2 After preconditioning, bring the test specimens to moisture equilibrium for testing in the standard atmosphere for testing textiles as directed in Practice D 1776 or, if applicable, in the specified atmosphere in which the testing is to be performed.

9. Preparation of Test Apparatus and Calibration

9.1 Set-up procedures for machines from different manufacturers may vary. Prepare and verify calibration of the _____ tester as directed in the manufacturer's instructions.

9.2 When using microprocessor automatic data gathering systems, set the appropriate parameters as defined in the manufacturer's instructions.

10. Procedure (Mandatory)

10.1 Test the test specimens in the standard atmosphere for testing textiles, as described in Practice D 1776 (For some test methods preconditioning and, or conditioning may not be required; adapt statement accordingly.)

10.2 Handle the test specimens carefully to avoid altering the natural state of the material.

10.3 Place a test specimen _____ and perform the test until the specimen _____. (Indicate what determines the end of the test. For example, until the specimen breaks, or until the specimen reaches a maximum unit.)

10.4 Read and record the individual test results in SI units as _____ and in U. S. Customary units (inch-pound) as _____ rounded to three significant digits. (Use only units that are specified in scope.)

10.5 Remove the tested specimens, in turn, and continue as directed in Section _____ until _____ specimens have been tested for each laboratory sampling unit.

11. Calculation

(Even though calculations may be made by a computer program, show the equations used.)

11.1 (Property Name) , Individual Specimens – Calculate the _____ of individual specimens to the nearest _____ using Eq. 1.

$$X = Y/Z \tag{1}$$

where:
X = _____
Y = _____
Z = _____

11.1.1 When data are computer processed, calculations are generally contained in the associated software. It is recommended that computer processed data be verified against known property values, and the software used be described in the report.

11.2 (Property Name) , Average – Calculate the average _____ for the laboratory sample.

11.3 Standard Deviation, Coefficient of Variation – Calculate when requested.

12. Report

12.1 Report that the _____ was determined as directed in Test Method D _____. Describe the material or product tested.

12.2 Report the following information for the laboratory sampling unit.

12.2.1 _____. (State the property(s) name(s).)
12.2.2 When calculated, the standard deviation, or the coefficient of variation.
12.2.3 Manufacturer and model of test instrument.

13. Precision and Bias (Mandatory)

(Refer to Practice D 2904 and Practice D 2906. Review interlaboratory testing program and results with Statistics Subcommittee Chairman.) (Typical precision and bias statements are shown that can be modified as needed.)

13.1 Interlaboratory Study⁵—An interlaboratory study was run (Date) in which randomly-drawn samples of (Number) materials were tested in each of (Number) laboratories. (Number) operators in each laboratory tested (Number) specimens of each material using Test Method D _____. The precision statement is based upon a testing plan described in Practice D 2904 and Practice D 2906. Analysis of the data was conducted using the Tex-Pac Adjunct (or list any other procedure used for the analysis). The components of variance for (Name), expressed both as variances and standard deviations, were calculated to be the values listed in Table _____. The material types were: (List material used.)

13.1.2 In comparing two averages within a laboratory, the differences should not exceed the single-operator precision values shown in Table _____ for the respective number of tests in 95 out of 100 cases when all the observations are taken by the same well-trained operator using the same piece of equipment and specimens randomly drawn from the sample of material. Larger differences are likely to occur under all other circumstances.

(If day comparisons were made, note whether or not a component of variance for days was determined, or the data sets for days were combined, so that this effect was reflected in error variance.)

13.2 Precision—For the components of variance reported in Table _____, two averages of observed values should be considered significantly different at the 95 % probability level if the difference equals or exceeds the critical differences listed in Table _____.

(If analysis suggests wide differences related to material type and structure, add the following statement.)

There were sufficient differences related to the material type and structure to warrant listing the components of variance and the critical differences separately. Consequently no multi-material comparisons were made. (See later examples of tables.)

(If there is a need to highlight differences between test results of two specific laboratories, use Note 1:)

NOTE 1—(or proper number for document) The tabulated values of the critical differences should be considered to be a general statement, particularly with respect to between-laboratory precision. Before a meaningful statement can be made about two specific laboratories, the amount of statistical bias, if any, between them must be established, with each comparison being based on recent data obtained on specimens taken from a lot of material of the type being evaluated so as to be as homogeneous as possible and then randomly assigned in equal numbers to each of the laboratories for testing.

(If less than five laboratories were used in the interlaboratory study, use Note 2:)

NOTE 2—(or proper number for document) Because the interlaboratory study for _____ included only _____ laboratories, estimates of between laboratory precision may be either underestimated or overestimated to a considerable extent and should be used with special caution.

13.3 Bias—(If bias cannot be determined, state the following:) The procedure of this test method produces a test value that can be defined only in terms of a test method. There is no independent, referee method, nor any standard reference materials, by which bias may be determined. This test method has no known bias.

⁵ ASTM Research Report No. D-13-XXXX. A copy is available from ASTM International Headquarters, 100 Barr Harbor Drive, West Conshohocken PA 19428-2959

14. Keywords (Mandatory)

(List in alphabetical order; no caps unless a proper noun; use semicolon between keywords; no period at end.)

14.1 _____

Tables—(Reference all tables in the text. Number tables in the order which they are cited in the text. Ensure tables are titled. Any footnote applying to a table is shown immediately below it.)

(Examples of tables that can be used for Components of Variance and Critical Differences tables are shown below.)

(Table examples:)

TABLE ____ Components of Variance ^A			
Component	Symbol	Variance	Standard Deviation
Fabric	VF	X.XXX	Y.YYY
Laboratory	VL	X.XXX	Y.YYY
FxL Interaction	VFL	X.XXX	Y.YYY
Operators within Laboratories	VO.L	X.XXX	Y.YYY
FxO.L Interaction	VFO.L	X.XXX	Y.YYY
Residual	V	X.XXX	Y.YYY

^AComponents derived with multiple operators per laboratory.

TABLE ____ Components of Variance ^A			
Component	Symbol	Variance	Standard Deviation

Fabric	VF	X.XXX	Y.YYY
Laboratory	VL	X.XXX	Y.YYY
FxL Interaction	VFL	X.XXX	Y.YYY
Residual	V	X.XXX	Y.YYY

^AComponents derived with single operator per laboratory.

TABLE ____ Standard Errors and Critical Differences for (Name of Property)
95 % Confidence Level (using t = 1.96 for infinite degrees of freedom)

N	Single Operator Precision		Within-Laboratory Precision		Between-Laboratory Precision	
	SE	CD	SE	CD	SE	CD
1	X.XXX	Y.YYY	X.XXX	Y.YYY	X.XXX	Y.YYY
2	X.XXX	Y.YYY	X.XXX	Y.YYY	X.XXX	Y.YYY
X	X.XXX	Y.YYY	X.XXX	Y.YYY	X.XXX	Y.YYY

N = number of determinations per average; SE = Standard Error; CD = Critical Difference

At 95 % Level, CD = 2.8 SE; SE and CD may be shown for single and multiple fabrics comparisons

(For single operators per laboratory, it is obvious that VO.L = 0, meaning that within-laboratory precision and single operator precision have the same calculated value. This occurs with multiple operators, as well, when VO.L = 0.)

(For multiple operators per laboratory, when VO.L > 0, within-laboratory precision and single operator precision will calculate to different values.)

(End table examples.)

Figures (Reference all Figures in the text. Number Figures in the order which they are cited in the text. Ensure titles appear below figures.)

FIG. 1 _____ (Title of Figure) _____

(Additional information that may be included:)

**ANNEXES
(Mandatory Information)**

(Include detailed information on apparatus, materials, etc., that is too lengthy to include in the text but is essential to conducting the test correctly. Number with respect to Annex number as follows:)

A1. (Title) _____
 A1.1 (Text) _____
 TABLE A1.1 _____ (Title of Table) _____
 FIG. A1.1 _____ (Title of Figure) _____

**APPENDICES
(Non-Mandatory Information)**

(Include information such as development of equations or statement of rationale, but is not part of the standard and is not essential to completing the test. Number with respect to Appendix number as follows:)

X1. (Title) _____
 X1.1 (Text) _____
 TABLE X1.1 _____ (Title of Table) _____
 FIG. X1.1 _____ (Title of Figure) _____

An example of an appendix relating to a sampling section might be:

**Appendix
(Nonmandatory Information)**

X1. Check-off Lists

- X1.1 Test Method check-off list.
 - X1.1.1 See Sheet X1.1, Test Method Check-off List.
 - X1.1.2 Check document sections against the list, making certain that all mandatory sections are contained, and that other needed sections are included.

X1.2 Specification check-off list

- X1.2.1 See Sheet X1.2, Specification Check-off List.
- X1.2.2 Check document sections against the list, making certain that all mandatory sections are contained, and that other needed sections are included.

X1.3 Practice check-off list.

- X1.3.1 See Sheet X1.3, Practice Check-off List.
- X1.3.2 Check document sections against the list, making certain that all mandatory sections are contained, and that other needed sections are included.

Sheet X1.1

Test Method Check-Off List

- _____ Designation (Mandatory)
- _____ Title (Mandatory)
- _____ Scope (Mandatory)
- _____ Referenced Documents
- _____ Terminology (D13 Mandatory)
- _____ Summary of Test Method
- _____ Significance and Use (Mandatory)
- _____ Apparatus
- _____ Reagents and Materials
- _____ Hazards
- _____ Sampling, Test Specimens, and Test Units
- _____ Calibration and Standardization
- _____ Conditioning
- _____ Procedure (Mandatory)
- _____ Calculation (or Interpretation of Results)
- _____ Report
- _____ Precision and Bias (Mandatory)
- _____ Keywords (Mandatory)

(Additional Sections may be contained:)

- _____ Annex (Mandatory Information)
- _____ Appendix (Nonmandatory Information)
- _____ References (5 or more)
- _____ Adjunct

Sheet X1.2

Specification Check-off List

- _____ Designation (Mandatory)
- _____ Title (Mandatory)
- _____ Scope (Mandatory)
- _____ Referenced Documents
- _____ Terminology (D13 Mandatory)
- _____ Classification
- _____ Ordering Information
- _____ Materials and Manufacture
- _____ Physical Properties
- _____ Performance Requirements
- _____ Sampling
- _____ Number of Tests and Retests
- _____ Test Methods
- _____ Inspection
- _____ Product Marking
- _____ Packaging and Marking
- _____ Rejection and Rehearing
- _____ Quality Assurance
- _____ Keywords (Mandatory)

(Additional Sections may be contained:)

- _____ Annex (Mandatory Information)
- _____ Appendix (Nonmandatory Information)
- _____ References (5 or more)
- _____ Adjunct

Sheet X1.3

Practice Check-off List

- _____ Designation (Mandatory)
- _____ Title (Mandatory)
- _____ Scope (Mandatory)
- _____ Referenced Documents
- _____ Terminology (D13 Mandatory)
- _____ Summary of Practice
- _____ Significance and Use (Mandatory)
- _____ Reagents
- _____ Procedure (Mandatory)
- _____ Test Methods
- _____ Report
- _____ Keywords (Mandatory)

(Additional Sections may be contained:)

- _____ Annex (Mandatory Information)
- _____ Appendix (Nonmandatory Information)

X2. SI Units and Usage

X2.1 Synopsis of IEEE/ASTM SI 10 - 1997, Standard for Use of the International System of Units (SI): The Modern Metric System.

X2.1.1 This synopsis concentrates on the things that must be done to put SI to proper and general technical use. Any reader is referred directly to the document for a definitive discussion of correct SI usage, and a most thorough treatise of things not to do.

X2.1.2 SI is still the same basic metric system, albeit now rationalized and coherent (some explanation to follow), and adopted by agreement of the participating nations, USA included.

X2.1.3 The crux of successful SI application lies in memorizing the SI seven base units, and the SI twenty prefixes and symbols (both later described). With use of these two fundamental building blocks, proper application of SI begins immediately.

X2.1.4 This abbreviated guide is just that. To seriously implement SI usage, one must obtain the cited reference, and become adeptly familiar with its content.

X2.2 Development of SI Units

X2.2.1 Long history beginning with 1790 French National Assembly request to French Academy of Sciences to devise a system of units suitable for adoption by the entire world.

X2.2.2 Many conferences and agreements by participating nations over next 160 years.

X2.2.3 SI was established by the 11th General Conference on Weights and Measures (CGPM) in 1960. Three classes of units: base units, derived units, and supplementary units.

CGPM - Conference Generale des Poids et Mesures
(underline indicates acute e)

X2.2.4 SI revised by the 20th CGPM in 1995 to include only two classes of units: base units and derived units.

X2.2.5 Member nations numbered 48 in 1995, including USA.

X2.3 Quotes from SI 10 Annex C (Informative) Regarding the SI System.

X2.3.1 SI is a rationalized selection of units from the metric systems developed before 1960.

X2.3.2 SI is a coherent system with seven base units for which names, symbols, and precise definitions have been established.

X2.3.3 From the seven SI base units, units for all other physical quantities are derived.

X2.3.4 A great advantage of SI is that there is one and only one SI unit for each physical quantity.

X2.3.5 Another advantage of SI is its retention of the decimal relation between multiples and submultiples of the unit for each physical quantity.

X2.3.6 Equations between units of a coherent system contain as numerical factors only the number 1.

X2.4 Table of Seven Base Units (commit this to memory).

SI Base Units			
Quantity	Unit	Symbol	
length	meter	m	
mass	kilogram	kg	
time	second	s	
electric current	ampere	A	
thermodynamic temperature	kelvin	K	
amount of substance	mole	mol	
luminous intensity	candela	cd	

(from Table 1, IEEE/ASTM SI 10 - 1997)

X2.5 Table of SI Prefixes and Symbols (commit this to memory).

SI Prefixes					
Factor	Prefix	Symbol	Factor	Prefix	Symbol
10 ²⁴	yotta	Y	10 ⁻²⁴	yocto	y
10 ²¹	zetta	Z	10 ⁻²¹	zepto	z
10 ¹⁸	exa	E	10 ⁻¹⁸	atto	a
10 ¹⁵	peta	P	10 ⁻¹⁵	femto	f
10 ¹²	tera	T	10 ⁻¹²	pico	p
10 ⁹	giga	G	10 ⁻⁹	nano	n
10 ⁶	mega	M	10 ⁻⁶	micro	μ
10 ³	kilo	k	10 ⁻³	milli	m
10 ²	hecto	h*	10 ⁻²	centi	c*
10 ¹	deka	da*	10 ⁻¹	deci	d*

(from Table 5, IEEE/ASTM SI 10 - 1997)

X2.6 Quotes from SI 10, Section 3.2.2, regarding units and prefixes.

X2.6.1 When expressing a quantity by a numerical value and a unit, give preference to a prefix that yields a numerical value between 0.01 and 1000.

X2.6.2 In expressing area and volume, the prefixes hecto, deka, deci, and centi may be required; for example, cubic decimeter, square hectometer, cubic centimeter.

X2.6.3 For certain quantities in particular applications, one particular multiple or submultiple is often used.

. . . the millimeter is used for linear dimensions in engineering drawings even when the values lie far outside the range of 0.01 mm to 1000 mm.

. . . the centimeter is usually used for body measurements and clothing sizes.

X2.7 SI Derived Units With and Without Special Names and Symbols.

X2.7.1 Table Showing Some Derived Units With Special Names and Symbols.

Quantity SI units	Name	Symbol	Expression in terms of other SI units
angle, plane	radian	rad	m/m = 1
Celsius temperature	degree Celsius	°C	K
electromotive force	volt	V	W/A
electrical resistance	ohm	Ω	V/A
energy, work	joule	J	N·m
force	newton	N	kg·m/s ²
frequency	hertz	Hz	1/s
illuminance	lux	lx	lm/m ²
power, radiant flux	watt	W	J/s
pressure, stress	pascal	Pa	N/m ²

(from Table 2, IEEE/ASTM SI 10 - 1997)

X2.7.2 Table Showing Some Derived Units Without Special Names and Symbols.

Quantity	Name	Symbol
acceleration	meter per second squared	m/s ²
area	square meter	m ²
density (mass)	kilogram per cubic meter	kg/m ³
luminance	candela per square meter	cd/m ²
molar energy	joule per mole	J/mol
radiance	watt per square meter steradian	W/(m ² ·sr)
velocity	meter per second	m/s
volume	cubic meter	m ³
wave number	1 per meter	1/m

(from Table 4, IEEE/ASTM SI 10 - 1997)

X2.8 Table Showing Some Units in Temporary Use.

Name	Symbol	Value in SI Units
nautical mile	—	1 nautical mile = 1852 m
knot	—	1 nautical mile per hour = (1852/3600) m/s
hectare	ha	ha = 1 hm ² = 10s ⁴ m ²
bar*	bar	1 bar = 100 kPa
bam	b	1 b = 100 fm ² = 10 ⁻²⁸ m ²
curie	Ci	1 Ci = 3.7 × 10 ¹⁰ Bq
roentgen	R	1 R = 2.58 × 10 ⁻⁴ C/kg
rad	rad,rd**	1 rad = 1 cGy = 10 ⁻² Gy
rem	rem	1 rem = 1 cSv = 10 ⁻² Sv

* limited to meteorology

** rd may be used, if no risk of confusion

(from Table 7, IEE/ASTM SI 10 - 1997)

X2.9 Table Showing Units Not To Be Used.

Name	Symbol	Value in SI Units
ångström	Å	= 0.1 nm = 10 ⁻¹⁰ m
atmosphere, standard	atm	= 101.325 kPa
calorie (physics)	cal	= 4.184 J
candlepower	cp	= cd
dyne	dyn	= 10 ⁻⁵ N
erg	erg	= 10 ⁻⁷ J
G, g (as a unit)	—	= 9.80665 m/s ²
kilocalorie	kcal	= 4.184 kJ
kilogram-force	kgf	= 9.80665 N
kiloliter	1000 L	= m ³
langley	cal/cm ²	= 41.84 kJ/m ² = 4.184 × 10 ⁴ J/m ²
micron	μ	= μm = 10 ⁻⁶ m
millimeter of mercury	mmHg	= 133.3 Pa
poise	P	= dyn-s/cm ² = 0.1 Pa-s

(from Table 8, IEEE/ASTM SI 10 - 1997)

X2.10 Other stated advantages of SI.

X2.10.1 Eliminates nonsignificant digits.
12300 m becomes 12.3 km

X2.10.2 A convenient alternative to powers-of-ten notation preferred in computation.

X2.10.2.1 No advice given about conversion from this "convenient spoken and written form" to a usable computational form.

X2.11 Other advice on SI Usage.

X2.11.1 Minimize use of units from other systems. In fact, the best advice is: do not use them.

X2.11.2 Avoid the abbreviations ppm (parts per million) and ppb (parts per billion). Names of large numbers, like one billion and one trillion, are not uniform worldwide.

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).