Designation: D4968 – 17

Standard Practice for Annual Review of Test Methods and Specifications for Plastics[1]

This standard is issued under the fixed designation D4968; 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.

1. Scope*

1.1 This practice is intended to assist the subcommittees and sections of Committee D20 on Plastics with the process of standards evaluation during the five-year review mandated by ASTM or when changes to test methods and specifications are required. It is intended to complement the *Form and Style for ASTM Standards* ("Blue Book") not replace it.

NOTE 1—There is no known ISO equivalent to this standard.

1.2 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D883 Terminology Relating to Plastics

D5740 Guide for Writing Material Standards in the Classification Format

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E456 Terminology Relating to Quality and Statistics

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E2653 Practice for Conducting an Interlaboratory Study to Determine Precision Estimates for a Fire Test Method with Fewer Than Six Participating Laboratories

E2935 Practice for Conducting Equivalence Testing in Laboratory Applications

Form and Style for ASTM Standards (Blue Book)

3. Terminology

3.1 *Definitions*—For definitions of terms that appear in this practice relating to plastics, refer to Terminology D883.

3.2 For definitions of terms that appear in this practice relating to quality and statistics, refer to Terminology E456.

3.2.1 *Repeatability*—precision under repeatability conditions.

3.2.2 *Reproducibility*—precision under reproducibility conditions.

3.2.3 *Repeatability Limit*—the value below which the absolute difference between two individual test results obtained under repeatability conditions may be expected to occur with a probability of approximately 0.95 (95 %).

3.2.4 *Reproducibility Limit*—the value below which the absolute difference between two individual test results obtained under reproducibility conditions may be expected to occur with a probability of approximately 0.95 (95 %).

3.3 The International Code Council (ICC) has issued guidelines for standards that are appropriate for reference in ICC codes, which include the requirement that they shall be written in mandatory language.

3.3.1 In practice, the key issue is to avoid using the terms "may" and "should," except within definitions, appendixes and non-mandatory notes.

4. Significance and Use

4.1 It is the intention of this practice, in addition to the *Form and Style for ASTM Standards*, to assist persons revising test methods and specifications in Committee D20 to ensure that all required elements are included and that the revised document is presented in the most user-friendly manner possible.

4.2 This practice is intended for use by Committee D20 when test methods and specifications under its jurisdiction are revised because of technical changes or upon five-year review.

4.3 The figures in Annex A1 contain three flowcharts. Fig. A1.1 is a flowchart that shows the review process for standards that have been revised or reapproved recently. Fig. A1.2 is a flowchart for standards that have neither been revised nor reapproved within five years of a new review. Fig. A1.3 is a flowchart for the precision and bias process in outline form.

[1] This guide is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.90 on Executive.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard**

4.4 Specific instructions to be followed when revising Committee D20 documents are given in this practice.

4.5 The model precision and bias (P and B) statements included in Annex A3 were developed to standardize the presentation of data.

5. Evaluating the Need for Revisions

5.1 Society regulations require that all D20 standards be reviewed in detail every five years. Ballots to revise individual sections of a document (which have the potential to change the date of issue) do not absolve the responsible D20 subcommittee from the requirement to conduct the detailed review every five years. Begin the review for revision, reapproval, or withdrawal at least one year prior to the required revision year, that is, four years after the last full review. The date of the last complete document review must be listed in the Summary of Changes section at the end of the document.

5.2 The goal of the review process is to determine if the document under review is to be balloted for:

5.2.1 Reapproval without change,

5.2.2 Reapproval with editorial changes,

5.2.3 Revision with technical changes, or

5.2.4 Withdrawal.

5.3 Two figures with flowcharts for review of plastics standard test methods or specifications are found in Annex A1.

5.3.1 The flowchart in Fig. A1.1 applies only to reviews of standards that have either been revised or have been reapproved less than five years before any new review.

5.3.2 When a standard test method or a standard specification has neither been revised nor reapproved for at least five years a new ballot is required, in accordance with Fig. A1.2 and the flowchart in Fig. A1.1 does not apply.

5.3.3 The following sections describe the details for each step of the flowcharts.

5.3.4 With the permission of the Section or Subcommittee chairman, as appropriate, a task group is formed with a task group chairman to head it. The task group shall be composed of either one person or a small group. The subcommittee chairman generates a project number to help track the progress. The task group chairman registers the project with ASTM through the website and an ASTM Work Item number is generated. This WK number will appear on ballots.

5.3.5 *Is it Recommended that the Standard Be Withdrawn?*—If the examination of the standard indicates that it is obsolete or basically flawed in light of more recent knowledge, ballot for withdrawal. Ballot for withdrawal is also in order if the standard has been replaced by a more current standard.

5.3.6 *Are changes required?*—If the review of the standard using the instructions in this document and the current version of the ASTM Form and Style for ASTM Standards (Blue Book) indicate that no changes are needed, it is recommended that the standard be balloted for reapproval without change.

5.3.7 *Are Changes Editorial?*—If the subcommittee, section, or task group considers the intended changes to be editorial in nature, the appropriate standards editor at ASTM Headquarters shall be consulted. If the changes meet the qualifications for editorial revision, within a five-year period since last publication, the standard can be editorially changed without balloting, as shown in Fig. A1.1. Such a revised standard will be published with an indication that it has been reissued with editorial changes. However the document must still be balloted for revision or reapproval at least every five years regardless of whether it has been reissued with editorial changes, and the process shown in Fig. A1.2 shall be followed.

5.3.8 *Is Technical Revision Necessary?*—If it is decided that the changes needed in the standard modify the technical content in any way, or if the review using this practice finds missing elements, technical changes shall be balloted. If major changes are needed, a subcommittee ballot is recommended. Otherwise a concurrent subcommittee, Main Committee, and Society ballot is recommended, providing this approach is approved by the main committee chairman and the subcommittee chairman or by a simple majority vote of the membership of the main committee and subcommittees.

5.3.9 *Model Precision and Bias (P and B) Statement:*

5.3.9.1 It is a requirement of ASTM that all test methods have a precision and bias section. For test methods that produce a numerical test result, an interlaboratory study (ILS, round robin) shall be conducted. Practice E691 describes the recommended practice for conducting an ILS to determine the precision of a test method, when six or more laboratories are involved.

5.3.9.2 Practice E691 requires a minimum number of six laboratories generating usable data for a round robin for an acceptable round robin. As a result, Practice E691 is not applicable in all cases. Other statistical practices are appropriate for use if they yield equivalent information. It is recommended that the statistical practice used be reviewed by Subcommittee D20.13 on Statistics.

5.3.9.3 If an ILS (round robin) cannot be accomplished prior to initial balloting of a test method, single-laboratory data must be used in the P and B statement. Use the model statement in Annex A3 as a model for such statements and follow the guidance from the ASTM Form and Style for ASTM Standards. No test method shall remain a valid ASTM standard without at least a single-laboratory P and B statement after a five year period from publication.

5.3.9.4 ASTM International requires that an ILS study (round robin) be performed, if possible, within five years of the test method's initial publication. If an insufficient number of laboratories is available to complete a round robin by the five-year review, the model statement in Annex A3 is still acceptable, but a statement modeled after the "Type B" statement in Annex A3 shall be added.

5.3.9.5 When acceptable ILS (round-robin) data has been developed, it shall be written using a statement modeled after the "Type C" statement in Annex A3 and it shall be balloted for approval as a technical change. Documentation for the round robin shall be assembled in a technical report and submitted to the staff manager. A footnote documenting the report number shall be included in the standard.

6. Revising the Standard

6.1 Keep the audience in mind.

6.1.1 There are many different users of ASTM standards. When revising documents, write the standard to be of use to the proper audience. A standard can be used by such diverse users as design engineers, product specifiers, quality control persons, testing laboratory managers, and technicians who will perform tests and all of their requirements need to be taken into account.

6.1.2 Keep in mind, however, that certain sections of the documents are directed at specific audiences. For example, the procedures section of a test method will primarily be used by the technician who does the test. It is recommended that this section be written in an imperative mood giving direct instructions on how to do the test, just as it would be done if the standard were speaking to the person. It is recommended not to add unnecessary explanations in the mandatory sections of the standard but to give clear and concise instructions. It is recommended that explanations that are not needed for conducting the test be, preferably, included in an appendix or in an explanatory note.

6.1.3 Sections such as the scope are to give direction to the user on how and for what the standard is to be used. Setup and calibration will be used by a test laboratory manager, and so forth. For each section, it is essential to consider the potential user and to write that section to give the most direct and usable information to that potential user in the most concise and understandable manner possible.

6.2 Whenever a new standard is developed, or revisions to an existing standard are prepared for ballot, a Work Item must be registered with ASTM at the ASTM web-site (www.astm.org). When the Work Item is registered with ASTM an e-mail will be sent to the technical contact with a link that permits the download of an electronic copy of the current standard. It is recommended to use the "track changes" function in MS Word to show changes. Deleted text will be shown as struck out. New text will be shown as underlined. Be aware that it is possible that the paragraph numbers and their references will change as a result of these edits.

6.3 Whenever a document is revised and circulated for ballot, it must be accompanied by a cover letter that explains the purpose of the ballot.

6.4 When circulating a standard for ballot, the standard shall have the following working caveat in bold print on the front page of the revision draft:

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, 100 Barr Harbor Drive, WEST CONSHOHOCKEN, PA, 19428-2959 ALL RIGHTS RESERVED.

6.5 Reference the *Form and Style for ASTM Standards* for detailed information regarding the form and style for the document.

6.6 The standard shall be reviewed to ensure that all procedures, directions, instructions, etc. are written as mandatory requirements. Explanatory material, intended either for emphasis or for offering informative suggestions not properly part of the standard, shall be incorporated as notes or appendixes and is not required to be written in mandatory language.

6.7 Documents that have been developed for, or have the potential of being referenced in, model codes such as those from the International Code Council (ICC) and from the National Fire Protection Association (NFPA) shall be written completely in mandatory language (except for terminology, notes and appendixes). Explanatory material shall only be used in appendixes, notes and footnotes unless the footnote is integral to a table and the document shall contain the following statement:

"The text of this standard references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard."

7. Reviewing Test Methods

7.1 Use the following assessment sections as an aid in test method review. Strive to ensure that the Committee D20 test methods are not more complex than necessary. One of the goals of a five-year review is to make test methods as user friendly as possible. Read each section. If it is not clear and does not contain the points mentioned in this section, rewrite it!

7.1.1 Note that, in order to provide uniformity in standardization, Practice D4968 makes mandatory the inclusion in standard test methods under the jurisdiction of Committee D20 sections that are not necessarily required by the *ASTM Form and Style of ASTM Standards* (Blue Book).

7.2 *Title (Mandatory)*—Determine if the title accurately defines the test method described. Change it if it does not.

7.3 *Scope (Mandatory)*—The scope shall contain the following essential items:

7.3.1 Clearly state the purpose of the test method in one or two sentences.

7.3.2 If there are any cautions or concerns regarding the use of the results of the test method or how it is performed, insert the following sentence in the Scope: See the Significance and Use section for cautions in using this test method.

7.3.3 Committee D20 considers SI units to be primary. The scope shall include the sentence shown in 7.3.3.1 in accordance with instructions in the ASTM Form and Style of ASTM Standards (Blue Book). In some instances a statement such as that shown in 7.3.3.2 is an acceptable alternative. Make these numbered paragraphs in either case.

7.3.3.1 "The values stated in SI units are to be regarded as standard."

7.3.3.2 "The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, each system shall be used independently of the other.

It is possible that combining values from the two systems will result in nonconformance with the standard."

7.3.4 Ensure that the test method has the following mandatory caveat included as a numbered paragraph in the scope. "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, health and environmental practices and determine the applicability of regulatory limitations prior to use."

7.3.5 If specific hazards are known, put them in a Hazards section and cite any appropriate additional warnings.

7.3.6 All test methods shall have an ISO equivalency statement. A note must be included to the end of the scope section with an ISO equivalency statement. See Annex A2 of this practice for the proper formats and instructions.

7.4 *Referenced Documents (Mandatory):*

7.4.1 Ensure that all ASTM standards (including the document designation and title) that are cited in the text of the standard are referenced in this section.

7.4.2 Also list other organizations' standards if they are referenced in the text.

7.5 *Terminology (Mandatory):*

7.5.1 A terminology section is mandatory. If the document does not have this section, it must be added.

7.5.2 Include a section that references to Terminology D883 and that states as follows: "For definitions of terms used in this test method and associated with plastics issues refer to the terminology contained in D883." Include also a reference to Terminology D883 in the section on referenced ASTM standards.

7.5.3 Check Terminology D883 for terms relevant to the test method. If any terms from the test method which appear in Terminology D883, would be helpful to the user of the standard, include a definition identical to that in Terminology D883.

7.5.4 Determine from the text a list of terms used which are potentially unclear to the user of the standard. Add definitions of those terms into the terminology section of the test method.

7.5.5 Determine whether specific terminology documents apply to the standard. Reference any terminology standard if a term from it is included in the terminology section.

7.5.6 If a term is listed in the document which is not found in the terminology documents, develop a definition and include the term in the Terminology section of the update to be balloted. In addition, if the term is of general interest to D20 standards, submit the definition to the chairperson of Subcommittee D20.92 for review and possible inclusion in Terminology D883.

7.6 *Summary of Test Method (Mandatory)*—Include a brief outline of the test method. Describe essentially how the test method is performed without any details of the procedure or sequence.

7.7 *Significance and Use (Mandatory)*—Examine the Significance and Use section. Ensure that it includes the following:

7.7.1 State when, where, and why the test method is to be used.

7.7.2 State how the test method is to be used by industry.

7.7.3 State how suitable the test method is for use in specifications.

7.7.4 For test methods where appropriate, add the following statement:

"Before proceeding with this test method, if appropriate, make reference to the specification associated with the material or product being tested. Any test specimen preparation, conditioning, dimensions, or testing parameters, or combination thereof, covered in the relevant ASTM material or product specification shall take precedence over those mentioned in this test method. If there are no relevant ASTM specifications, then the default conditions apply."

7.7.5 State what are the significant features of the test method.

7.7.6 State any appropriate warnings which restrict the use of the results of the test method.

7.8 *Interferences*—If the successful execution of the test method requires explanatory statements on interference effects, briefly list the constituents or properties that are most likely to cause interference, and the amounts that they are known to interfere.

7.9 *Apparatus:*

7.9.1 If the required equipment for performing the test method is no longer available, ballot the test method for withdrawal.

7.9.2 If the equipment is available from only one manufacturer, the source for obtaining the equipment shall be listed in a footnote that clarifies that information. Use language such as the following:

"The sole source of supply of the apparatus known to the committee at this time is (name and address of the supplier). If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters."

7.9.3 If there are two or more sources of the equipment for performing the test method, no mention of the equipment manufacturer or where the equipment can be obtained is permitted.

7.9.4 In some cases, when there is interest in retaining the test method, the following statement is acceptable:

"It is believed that the instrument specified in this test method is no longer commercially available."

7.10 *Hazards:*

7.10.1 Point out safety precautions in this section or in the notes where appropriate in the text if specific hazards are known.

7.10.2 Cite any precautions or warnings at the end of the generic safety hazards caveat.

7.11 *Sampling, Test Specimens, and Test Units*—Give mandatory instructions for any sampling techniques.

7.12 *Preparation of Apparatus*—Give mandatory instructions.

7.13 *Calibration and Standardization*—Give mandatory instructions.

7.14 *Conditioning:*

7.14.1 Specify, in the imperative mood, the conditioning atmosphere required during the test and the time of exposure to the atmosphere.

7.14.2 If the wording of the conditioning section contains the term "... for those tests where conditioning is required ...," replace this wording with "... unless otherwise specified ..."

7.15 *Procedure (Mandatory)*—Give mandatory instructions. It is important that this be a step-by-step instruction on how to perform the test method.

7.16 *Calculation*—State the directions for calculating the results in mandatory form.

7.17 *Report (Mandatory)*—State detailed information required in reporting the results of the tests.

7.18 *Precision and Bias (Mandatory):*

7.18.1 All test methods must have a statement on precision (P) and a statement on bias (B) in a precision and bias section.

7.18.2 The precision data presented in the test method shall be representative of the conditions defined in the standard. However, in some cases it is possible that the material preparation and specific test conditions included in the ASTM material specification will result in a deviation from the P and B statement. In such cases this would require additional study.

7.18.3 If the test result is a non-numerical report of success or failure or other categorization or classification based on criteria specified in the procedure, use the following statement of P and B:

"No information is presented about either the precision or bias of Test Method XXXX for measuring (insert here the name of the property) since the test result is non-quantitative."

7.18.4 If a round robin has been conducted, refer to the instructions for including the P and B statement in Annex A3 of this practice, included recommended wording.

7.19 *Keywords (Mandatory)*—List in alphabetical order appropriate terms for indexing, selected from both the title and body of the document and including general, vernacular, and trade items.

7.20 *Tables*—Tables shall be referenced in the text. Number tables in the order in which they are cited in the text. Make sure that the tables contain titles.

7.21 *Figures*—Figures shall be referenced in the text. Number figures in the order in which they are cited in the text. Make sure that the figures contain titles. The subcommittee is responsible for providing camera-ready artwork that does not require retouching or corrections.

7.22 *Annexes (for Mandatory Information)*—Include detailed information on apparatus, materials, and other items when such information is too lengthy to include in the text but is essential to the test method.

7.22.1 Examples of such information are as follows: glossary of terms used in the applicable specification, list of symbols, and instructions for calibrating and standardizing apparatus.

7.23 *Appendixes (for non-mandatory information)*—An appendix is informative only and is not a mandatory part of the specification.

7.23.1 Examples of such information are as follows: example calculations, report forms, and rationale used in the development of the specification.

7.24 *Summary of Changes (Mandatory for ASTM D20 Standards):*

7.24.1 List all changes from the last revision so that persons reading the standard will know what items are different from previous additions. If multiple revisions occur within a 12 month span include all changes made within those 12 months.

7.24.2 List of changes shall be in numerical form and be limited to one sentence for each item.

7.24.3 List the year of the last complete review/revision of the standard

8. Reviewing Specifications

8.1 Use the following assessment sections as an aid in review of a specification. Strive to ensure that the Committee D20 specifications are not more complex than necessary. One of the goals of a five-year review is to make specifications as user friendly as possible. Read each section. If it is not clear and does not contain the points mentioned in this section, rewrite it!

8.1.1 Note that, in order to provide uniformity in standardization, Practice D4968 makes mandatory the inclusion in standard specifications under the jurisdiction of Committee D20 sections that are not necessarily required by the *ASTM Form and Style of ASTM Standards* (Blue Book).

8.2 *Title (Mandatory)*—Determine if the title accurately defines the specification. Change it if it does not.

8.3 *Scope (Mandatory)*—Clearly state the purpose of the specification, preferably in one or two sentences.

8.3.1 State whether SI units or other units are preferred.

8.3.2 If the specification contains test methods within the body of the document include the following caveat in the scope:

"The following safety hazards caveat pertains only to the test method or test methods described in this specification. 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, health and environmental practices and determine the applicability of regulatory limitations prior to use."

8.3.3 All specifications must have an ISO equivalency statement. A note must be included to the end of the scope with an ISO equivalency statement. See Annex A2 for the proper formats and instructions.

8.3.4 If the specification includes recycled plastics, insert a sentence in the scope which mentions the extent to which the document deals with these materials. It is also potentially appropriate to include reference to recycled plastics in the title, the Referenced Documents section, and in the Keywords section.

8.4 *Referenced Documents*—Ensure all ASTM standards cited in the text are referenced in this section. Include the ASTM designation and title. Also list other organizations' standards if they are referenced in the text and are available to the public.

8.5 *Terminology (Mandatory):*

8.5.1 A terminology section is mandatory. If the document does not have this section, it must be added.

8.5.2 Include a section that references to Terminology D883 and that states as follows: "For definitions of terms used in this specification and associated with plastics issues refer to the terminology contained in D883." Include also a reference to Terminology D883 in the section on referenced ASTM standards.

8.5.3 Check Terminology D883 for terms relevant to the specification. If any terms from the specification which appear in Terminology D883, would be helpful to the user of the standard, include a definition identical to that in Terminology D883.

8.5.4 Determine from the text a list of terms used which are potentially unclear to the user of the standard. Add definitions of those terms into the terminology section of the specification.

8.5.5 Determine whether specific terminology documents apply to the specification. Reference any terminology standard if a term from that terminology is included in the standard.

8.5.6 If a term is listed in the document which is not found in the terminology documents, develop a definition and include the term in the Terminology section of the update to be balloted. In addition, if of the term is of general interest to D20 standards, submit the definition to the chairperson of Subcommittee D20.92 for review and possible inclusion in Terminology D883.

8.6 *Classification (Optional):*

8.6.1 If required, use an appropriate classification system for the corresponding types of plastic materials. Guide D5740 provides guidance when developing standard specifications for thermoplastic materials.

8.7 *Materials and Manufacture*—In this section, include any general requirements about the materials and manufacturing process to be used, especially when reference is made to a specific manufacturing process, such as injection molding.

8.8 *Chemical Composition (Optional):*

8.8.1 Give detailed requirements for chemical composition to which the specified material, product, or system must conform.

8.8.2 It is recommended that this information be presented in a table.

8.8.3 When presenting these requirements, clearly indicate the following:

8.8.3.1 Name of each specified constituent, given sequentially,

8.8.3.2 Whether a requirement is the maximum, minimum, or a range,

8.8.3.3 Applicable units,

8.8.3.4 Notes and footnotes appropriate for clarification, and

8.8.3.5 Appropriate analytical methodology.

8.8.4 Begin this section with the preferred statement:

"This material (or product) shall conform to the requirements prescribed in Table (x)."

8.8.5 Add the following statement to the tables of chemical requirements when applicable for non-specified elements:

"By agreement between the purchaser and the supplier, it is possible that analysis will be required and limits established for elements or compounds not specified in the table of chemical composition."

8.9 *Other Requirements:*

8.9.1 Give detailed requirements as to characteristics to which the material, product, or system shall conform.

8.9.2 Include the following in the requirements:

8.9.2.1 Name of each property or requirement,

8.9.2.2 Whether a requirement is the maximum, minimum, or a range,

8.9.2.3 Applicable units,

8.9.2.4 Notes and footnotes for clarification, and

8.9.2.5 Appropriate test methodology.

8.9.3 *Physical Properties*—Present requirements for electrical, thermal, optical, and similar properties, preferably in a table.

8.9.4 *Mechanical Properties*—Present requirements for tensile strength, yield strength, elongation, and similar properties.

8.9.5 *Performance Requirements*—Present functional, environmental, and similar requirements.

8.9.6 *Additional Requirements*—Include any additional requirements, as needed.

8.10 *Dimensions, Mass, and Permissible Variations:*

8.10.1 Include details as to standard shapes, mass, and size ranges.

8.10.2 Present, preferably in tabular form, with brief reference in the text.

8.10.3 Indicate in the tables where the various size ranges are divided (for example, ranges from 0 to 250 mm, 250 to 500 mm, and 500 to 750 mm shall be more properly stated as 250 mm and under, over 250 to 500 mm, inclusive, over 500 to 750 mm, inclusive, and so forth).

8.10.4 Include permissible variations in dimensions, mass, and so forth, in the same tables with the nominal sizes. State whether the tolerances specified are both plus and minus or apply in only one direction.

8.11 *Workmanship, Finish, and Appearance:*

8.11.1 Include general requirements, such as type of finish and general appearance of color, uniform quality and temper (for metals), and whether the item is clean, sound, and free of scale and injurious defects. To avoid misunderstanding, these requirements shall be spelled out clearly.

8.11.2 State provisions for removal or repair of minor surface imperfections that are not considered cause for rejection.

8.11.3 For some products, it is customary to specify absence of defects such as fractures, large or deep cracks, checks, blisters, laminations, and surface roughness. The finish and shape of the ends shall also be specified.

8.12 *Sampling (Optional):*

8.12.1 If a specification applies to a unit of product or material from which specimens are to be taken for testing, the procedure for obtaining these specimens shall be described.

8.12.2 If a specification pertains to individual units of a lot and sampling inspection is likely to be the normal procedure, it is desirable for the specification to reference or include in a

supplementary section a sampling procedure for determining acceptability of the lot.

8.12.3 If a specification pertains to the mean value of a lot, in particular to the mean of a lot of bulk material, the procedure for sampling the lot or the formation of sample test units, or both, shall be described or referenced. The criterion for determining conformance of the lot shall be specifically stated.

8.12.4 If a specification applies to a lot of bulk material, state the number of increments required to create a sample test unit and the number of test units to be taken to determine conformance of the lot.

8.12.5 Indicate the minimum amount of material required to conveniently carry out all the tests in the specification for the convenience of the user of the specification.

8.13 *Number of Tests and Retests:*

8.13.1 State the number of test units and the number of test specimens that are required to determine conformance of the material or product to the specifications. In the sampling of a lot of bulk material, state the size of the sample in terms of the number of primary (first stage) sampling units that is required to determine conformance to the specifications.

8.13.2 When a specification pertains to several different properties of a material to be determined by a variety of test methods, a test unit is defined as a unit or portion of the material that is sufficient to obtain a single, adequate set of test results for all properties to be measured.

8.13.3 If a material or product fails to meet the requirements of the specification, it shall not be certified to the specification.

8.14 *Specimen Preparation:*

8.14.1 Include this section when special preparation is required (for example, in specifications for molding materials).

8.14.2 Refer to a standard test method if possible.

8.14.3 If no standard test method exists, include sufficient detail in the specification to ensure acceptable reproducibility of test results.

8.14.4 State that specimens are to be prepared in accordance with the recommendations of the manufacturer only if neither 8.14.2 nor 8.14.3 is feasible.

8.15 *Test Methods or Analytical Methods within Specifications:*

8.15.1 List the standard test methods used for measurement of all requirements of a specification. Refer to the ASTM or ISO test methods used in testing the material to determine conformance with the specification. This includes sampling; chemical analysis; and mechanical, electrical, thermal, optical, and other testing procedures. When alternative procedures are given in the test methods, it is important to state which particular procedure shall be used as the basis for the specification requirement.

8.15.2 When no ASTM or ISO test method is specified for a particular quality or property of a specified material, describe the test procedure to be followed in detail in the specification, following the *Form and Style of ASTM Standards*, Part A (Test Methods). Include all mandatory sections listed for test methods.

8.15.3 Where a method of some other organization is being used and the committee has not approved the test as an ASTM test method, a reference to the original source shall be included in the section on referenced standards.

8.15.4 State all procedures in mandatory form.

8.16 *Inspection:*

8.16.1 Use a statement such as the following to address potential conflicts between suppliers and purchasers, if needed: "Inspection of the material shall be agreed upon between the purchaser and the supplier as part of the purchase contract."

8.16.2 Any technical requirements on inspection such as sampling plan or physical or mechanical properties shall be placed in other appropriate parts of the specification.

8.17 *Rejection and Rehearing*—Use a statement such as the following to address potential conflict related to rejection of a material or product, if needed: "Material that fails to conform to the requirements of this specification is permitted to be rejected. Rejection shall be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier is entitled to claim for a rehearing."

8.18 *Certification:*

8.18.1 Use a statement such as the following to address certification, if needed:

"When specified in the purchase order or contract, the purchaser shall be furnished certification that samples representing each lot have been either tested or inspected as directed in this specification and the requirements have been met. When specified in the purchase order or contract, a report of the test results shall be furnished."

NOTE 2—It is possible that specifications dealing with recycled plastics will need additional statements.

8.18.2 Upon request of the purchaser in the contract or order, it is acceptable to consider the certification of an independent third party indicating conformance to the requirements of this specification.

8.19 *Product Marking*—Specify the information to be marked on the material or included in the package, or on attached label or tag. This information shall include information potentially required for a specific material. Examples are: the name, brand, or trademark of the manufacturer; quantity; size; weight and ASTM designation.

8.20 *Packaging and Package Marking*—When it is customary and desirable to package, box, crate, wrap, or otherwise protect the item during shipment and storage in accordance with a standard practice, it is customary to state the requirements.

8.21 *Supplementary Requirements:*

8.21.1 Supplementary requirements are specified in some standards. When they are, these requirements shall appear separately in a Supplementary Requirements section. These requirements usually only apply when specified by the purchaser in the inquiry, contract, or order. A statement to that effect, such as the following, shall appear in the first paragraph of the Supplementary Requirements section:

"The following supplementary requirements shall apply only when specified by the purchaser in the contract or order."

8.21.2 Two examples of supplementary requirements are quality assurance and qualification.

8.21.2.1 *Quality Assurance*—If included, it shall be qualified by a statement such as the following:

"When specified in the contract or purchase order."

8.21.2.2 Reference to a suitable document such as an ASTM, ANSI or MIL specification, shall be made by agreement between the supplier and the purchaser.

8.21.2.3 *Qualification*—When qualification is determined to be feasible and necessary, it shall be included in the Supplementary Requirements section with a statement such as the following:

"Items furnished under this specification shall be products that are qualified for listing on the applicable qualified products list at the time set for opening of bids."

8.22 *Keywords (Mandatory)*—List in alphabetical order appropriate terms for indexing, selected from both the title and body of the document and including general, vernacular, and trade items.

8.23 *Tables*—Tables shall be referenced in the text. Number tables in the order in which they are cited in the text. Make sure that the tables contain titles.

8.24 *Figures*—Figures shall be referenced in the text. Number figures in the order in which they are cited in the text. Make sure that the figures contain titles. The subcommittee is responsible for providing camera-ready artwork that does not require retouching or corrections.

8.25 *Annexes (for Mandatory Information)*—Include detailed information on apparatus, materials, and other items when such information is too lengthy to include in the text but is essential to the specification.

8.25.1 Examples of such information are as follows: glossary of terms used in the specification, list of symbols, and instructions for calibrating and standardizing apparatus.

8.26 *Appendixes (for Non-mandatory Information)*—An appendix is informative only and is not a mandatory part of the specification.

8.26.1 Examples of such information are as follows: example calculations, report forms, and rationale used in the development of the specification.

8.27 *Summary of Changes (Mandatory for ASTM D20 Standards):*

8.27.1 List all changes from the last revision so that persons reading the standard will know what items are different from previous additions. If multiple revisions occur within a 12 month span include all changes made within those 12 months.

8.27.2 List of changes shall be in numerical form and be limited to one sentence for each item.

8.27.3 List the year of the last complete review/revision of the standard.

9. Keywords

9.1 plastics; precision and bias; revisions; specification; test method

ANNEXES

(Mandatory Information)

A1. PERIODIC REVIEW OF STANDARDS AND PRECISION AND BIAS

A1.1 Standards shall be reviewed periodically following the flowchart in Fig. A1.1 for standards that have been revised or reapproved recently and following the flowchart in Fig. A1.2 for standards that have neither been revised nor reapproved within five years of a new review.

A1.2 The process for development of precision and bias statements is contained in the flowchart in Fig. A1.3.

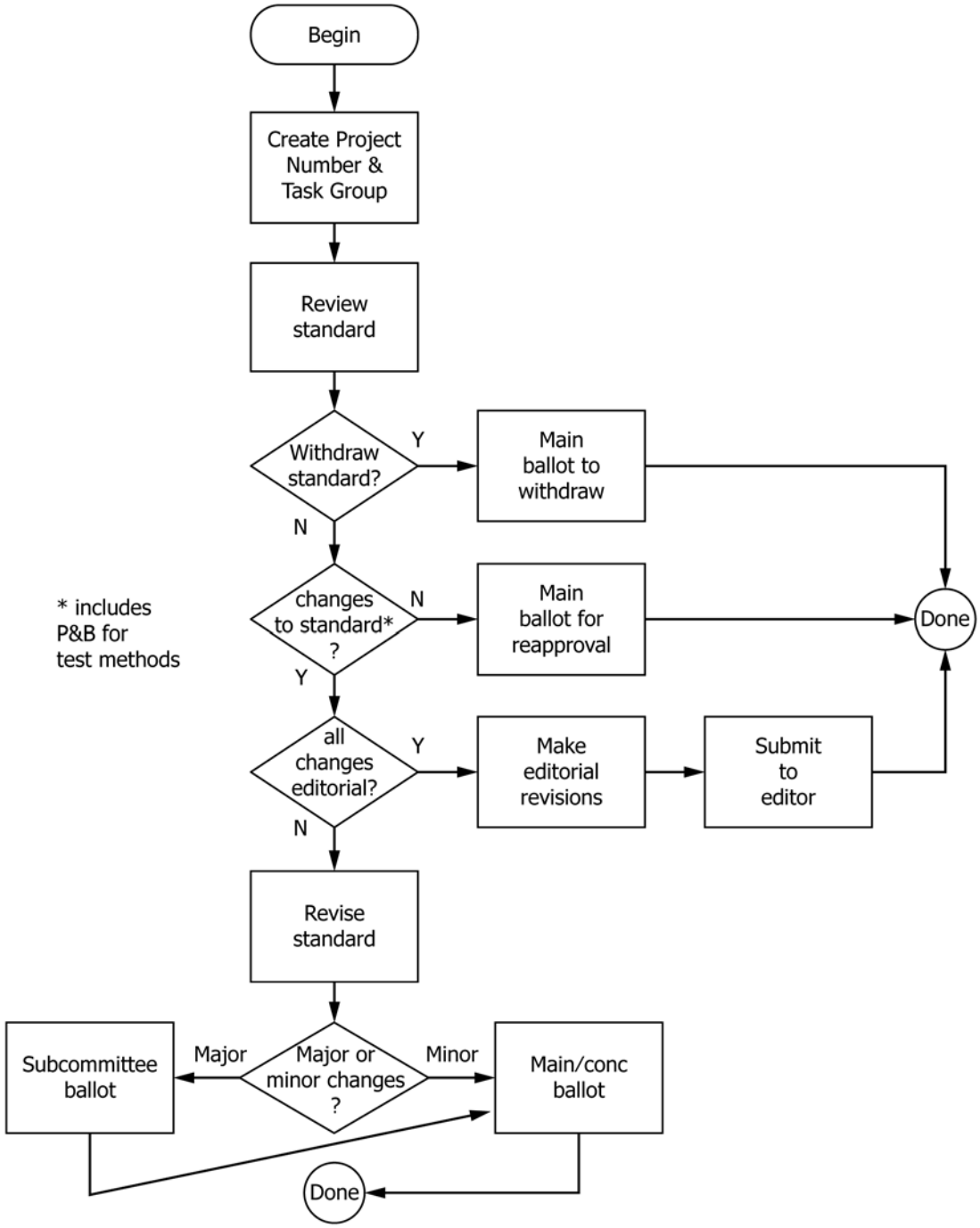

FIG. A1.1 Flowchart for Review of Standards That Have Been Revised Recently

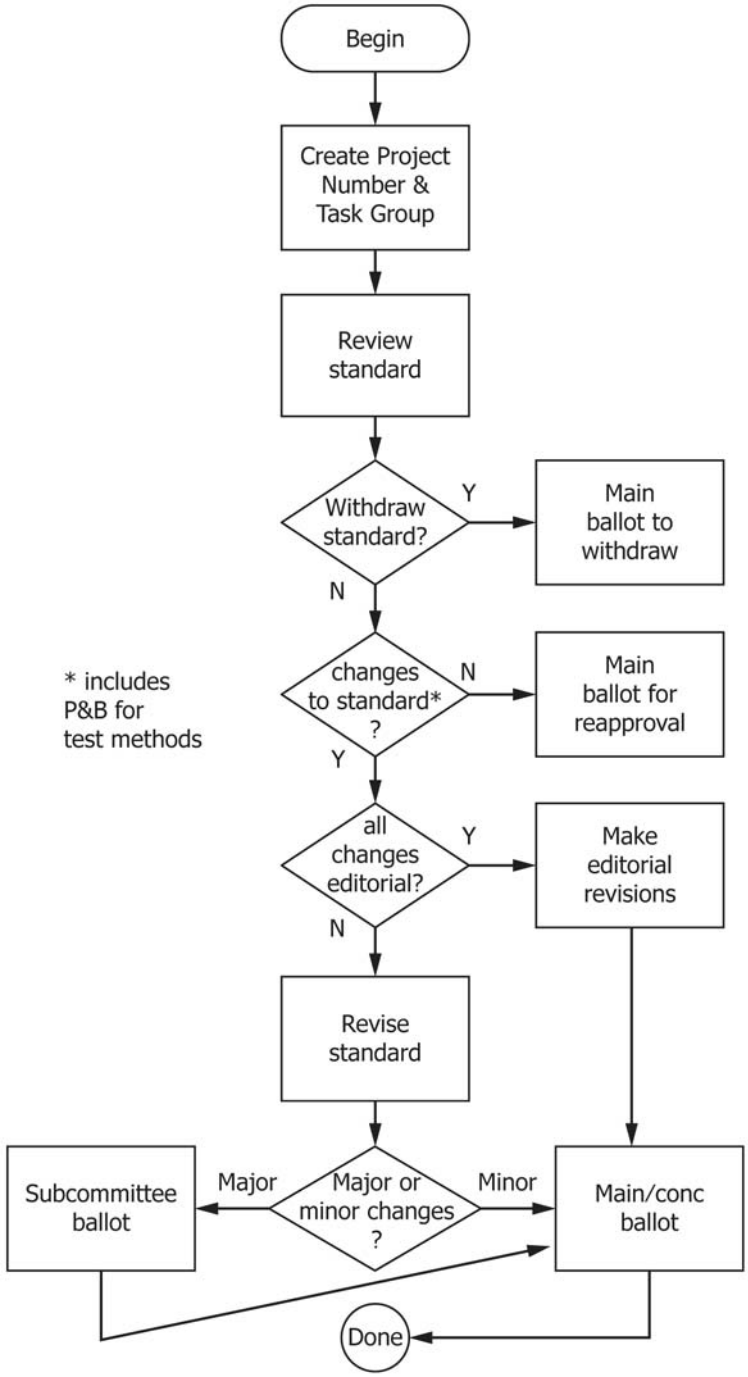

FIG. A1.2 Flowchart for Review of Standards That Have Not Been Revised Recently

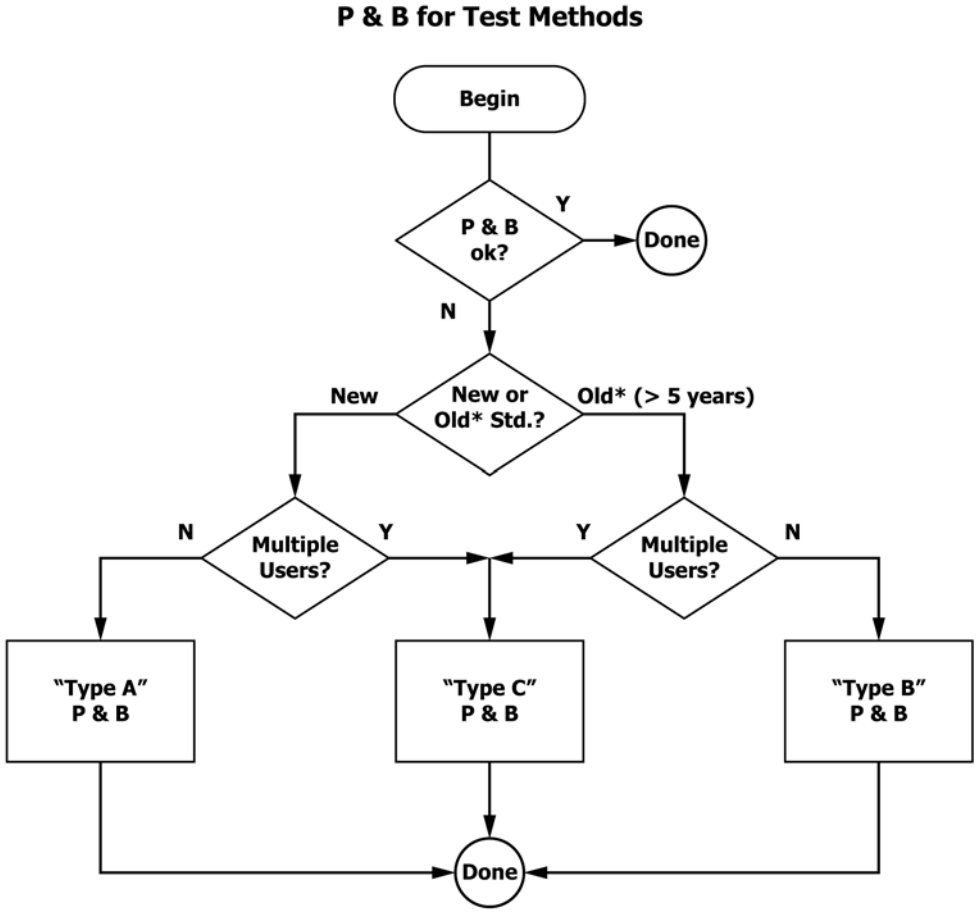

FIG. A1.3 Flowchart for Development of Precision and Bias of Test Methods

A2. INFORMATION ON ISO EQUIVALENCY

All Committee D20 standards shall contain an ISO equivalency statement. The following definitions and discussion will assist in the development of the statement. All ISO equivalency statements must be balloted through the full ballot process. The ISO equivalency statement is formatted as a note at the end of the Scope section of the standard. Use one of the following:

A2.1 There is no known ISO equivalent to this standard.

A2.2 This standard is identical to ISO XXXX.

A2.3 This standard is equivalent to ISO XXXX.

A2.4 This standard and ISO XXXX address the same subject matter, but differ in technical content.

NOTE A2.1—For test methods, add a statement addressing comparison of results at the end of A2.4.

Examples:

... technical content, and results shall not be compared between the two test methods.

... technical content, and results shall be compared only within the test conditions and range studied in (insert the reference of the comparison study such as "ASTM D6779, Appendix X1.").

NOTE A2.2—When sections of a standard are equivalent, but other sections or portions are not, use a combination of A2.3 and A2.4 to inform the user which portions of the ASTM standard are equivalent and which are not equivalent.

Example—This test method is equivalent to ISO XXXX in the measurement of Section x.x.x. It is not equivalent to ISO XXXX in any other measurement or section.

Identical—The technical content is equivalent and fully corresponding in presentation. Anything acceptable in the International standard will be acceptable in the ASTM standard. The "vice versa" principle must apply. This means that actions taken in the ISO standard will give "identical" results to those actions performed as a result of following the ASTM standard and "vice versa." In other words, it is possible that the two documents will have some minor form differences, but otherwise are fully the same.

Equivalent—The technical content is equivalent, but not fully corresponding in presentation. This means that some additions or subtractions occur from one document to the other, which have absolutely no effect on the technical content. The vice versa principle must apply.

Not equivalent—The technical content of the documents are different, even if the differences are minor.

It is possible to have sections of an ASTM standard that are identical or equivalent to a corresponding ISO standard. For example, it is possible that a test method will have a Test Method A, which is equivalent to an ISO test method, but also contain a Test Method B which is not. In such cases, the equivalent or identical sections of the ISO and ASTM standards must be clearly identified in the ISO equivalency statement.

If a standard is deemed "not equivalent" actions need to be taken by the responsible subcommittee to determine if there is a need to harmonize the documents into one that is "equivalent." Three actions are then possible. They are as follows:

(1) Modify the ASTM standard to be of the same technical content as the ISO standard.

(2) Institute a new work item through ASTM Subcommittee D20.61 to make changes in the ISO document.

(3) Make a conscious decision not to harmonize the documents. The action to take is to be decided by the subcommittee working on the documents and shall be based on actions that produce the best technical standard which serves the industry.

Each Committee D20 subcommittee chairperson shall maintain a listing of the document actions in progress to harmonize ISO and Committee D20 ASTM standards.

A3. PRECISION AND BIAS (P AND B) STATEMENTS

A3.1 "TYPE A" Precision and Bias Statement

A3.1.1 When test methods are first published, round-robin data are not always available. However, the ASTM Blue Book requires information on at least single-laboratory repeatability be included at first publication. To comply with this requirement, use the statement in A3.1.3 as a guide.

A3.1.2 As soon as possible, an ILS (round robin) using Practice E691 or other suitable method for developing Precision and Bias statement shall be initiated. The P and B statement in A3.1.3 is not permitted to be used in the standard past the first five-year review without addition of wording such as that in A3.2.1.

A3.1.3 A sample "Type A" P and B statement is as follows: "Precision—The repeatability standard deviation has been determined to be (insert the test values and corresponding repeatability values). The reproducibility of this test method is not yet available." Include also a footnote stating as follows: "Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR: D20-XXXX."

A3.2 "TYPE B" Precision and Bias Statement

A3.2.1 If no round-robin data is available which meets the requirements of Practice E691 or other suitable alternative statistical procedure as determined by Subcommittee D20.13, the following sample "Type B" P and B is recommended for use.

"Precision—The repeatability standard deviation has been determined to be (insert the test values and corresponding repeatability values). Attempts to develop a full precision and bias statement for this test method have not been successful. For this reason, data on precision and bias cannot be given. Because this test method does not contain a round-robin-based numerical precision and bias statement, it shall not be used as a referee test method in case of dispute. It is recommended that anyone wishing to participate in the development of precision and bias data contact the Chairman, Subcommittee D20.00 (Section 20.00.00), ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428."

Include also a footnote stating as follows: "Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR: D20-XXXX."

A3.3 "TYPE C" Precision and Bias Statement

A3.3.1 Guidelines for a P and B statement following the conduction of a round robin. The P and B statement shall contain the following information: (a) describe how the actual round robin was carried out, (b) present information on repeatability (r) and reproducibility (R), (c) present information on probability of the information being correct and (d) present information on bias. Examples of the type of statements required are shown below. Model tables for the P and B statements are also shown below.

(1) "Table ((s)) _____ is/((are)) based on a round robin(x) conducted in _(insert year)__ in accordance with Practice E691, involving _(insert number of materials)__ materials tested by __(insert number of laboratories)__ laboratories. For each material, all the samples were prepared at one source, but the individual specimens were prepared at the laboratories which tested them. Each test result was the average [[or median or other function]] of __C__ individual determinations. Each laboratory obtained __ (insert number)_ _test results for each material."

(2) "Caution—The explanation of the repeatability (r) and reproducibility (R) is only intended to present a meaningful way of considering the approximate precision of this test method. Do not apply the data in Table((s)) _____ to acceptance or rejection of materials, as these data apply only to the materials tested in the round robin and are unlikely to be rigorously representative of other lots, formulations, conditions, materials, or laboratories. Users of this test method need to apply the principles outlined in Practice E691 to generate data specific to their materials and laboratory (or between specific laboratories). The principles would then be valid for such data."

(3) Repeatability—Precision under repeatability conditions.

(4) Reproducibility—Precision under reproducibility conditions.

(5) Any judgement in accordance with the repeatability and reproducibility statements shown above would have an approximate 95 % (0.95) probability of being correct.

(6) Bias—There are no recognized standards by which to estimate bias of this method.

A3.3.2 If the data presented comes from a round robin that used less than 6 laboratories, the statement about reproducibility between labs must be based on statistics calculated based on a method other than Practice E691. Data for within lab repeatability shall be acceptable whatever the number of labs involved.

A3.3.3 *Equivalence*—The definitions relating to the terms repeatability, reproducibility, repeatability limit and reproducibility limit appear in Terminology E456 and in the Practice D4968 terminology section. The definitions for repeatability and reproducibility are also shown above. These concepts are important measures of the equivalence procedure, but cannot, alone, determine equivalence. Utilization of the terms repeatability limit and reproducibility limit is discussed in Practice E177. Inferences from applying estimates based only upon variability to equivalence are likely to be incorrect and can easily lead to improper decisions being made. Actual equivalence testing is covered in Practice E2935. Alternatively, it is permissible to use an appropriate test, based on two means, for assessing whether or not results are equivalent.

MODEL TABLES FOR P AND B STATEMENTS (USE EITHER FORM A OR FORM B AS DEEMED APPROPRIATE.)

Form A

Table # _____ (TITLE) _____

Material	Thickness or other Parameter	Average	Values expressed in Units of _____			
			S_r[A]	S_R[B]	r[C]	R[D]
(Name 1)	_____	_____	_____	_____	_____	_____
(Name 2)	_____	_____	_____	_____	_____	_____
(Name 3)	_____	_____	_____	_____	_____	_____
(etc.)	_____	_____	_____	_____	_____	_____

[A] S_r = within laboratory standard deviation for the indicated material. It is obtained by pooling the within-laboratory standard deviations of the test results from all of the participating laboratories:

$$S_r = [[(S_1)^2 + (S_2)^2 \ldots\ldots + (S_n)^2\ ]/n]^{1/2}$$

[B] S_R = between-laboratories reproducibility, expressed as standard deviation:

$$S_R = [S_r^2 + S_L^2]^{1/2}$$

where S_L = standard deviation of laboratory means.
[C] r = within-laboratory critical interval between two test results = 2.8 × S_r.
[D] R = between-laboratories critical interval between two test results = 2.8 × S_R.

Form B

Table # _____ (Title) _____

Material	Thickness or other Parameter	Average	Values expressed in Units of _____			
			V_r[A]	V_R[B]	r[C]	R[D]
(Name 1)	_____	_____	_____	_____	_____	_____
(Name 2)	_____	_____	_____	_____	_____	_____
(Name 3)	_____	_____	_____	_____	_____	_____
(etc.)	_____	_____	_____	_____	_____	_____

[A] V_r = within-laboratory coefficient of variation for the indicated material. It is obtained by first pooling the within-laboratory standard deviations of the test results from all of the participating laboratories:

$$S_r = [[(S_1)^2 + (S_2)^2 \ldots\ldots + (S_n)^2\ ]/n]^{1/2}$$

Then: V_r = (S_r divided by the overall average for the material)× 100
[B] V_R = between-laboratories reproducibility, expressed as coefficient of variation:

$$S_R = [S_r^2 + S_L^2]^{1/2}$$

where S_L = standard deviation of laboratory means.
Then: V_r = (S_R divided by the overall average for the material) × 100
[C] r = within-laboratory critical interval between two test results = 2.8× V_r
[D] R = between-laboratories critical interval between two test results = 2.8 × V_R

A4. INTERLABORATORY TESTING WITH FEWER THAN SIX LABORATORIES

A4.1 If fewer than six laboratories are available to conduct a reproducibility study of interlaboratory precision in accordance with Practice E691, the use of Practice E2653 is an acceptable alternative. The reproducibility statement included in the test method shall contain information that the interlaboratory evaluation was conducted in accordance with Practice E2653.

SUMMARY OF CHANGES

Committee D20 has identified the location of selected changes to this standard since the last issue (D4968 - 16) that may impact the use of this standard. (August 1, 2017)

(1) Added ASTM Practice E2653.
(2) Added Annex A4.
(3) Revised 4.3.
(4) Revised 5.3.
(5) Revised Annex A1 and added a new figure.
(6) Revised 3.3.
(7) Deleted Appendix X1.
(8) Added new standards into 2.1.
(9) Added new definitions into 3.2.
(10) Revised A3.3.1 (3) and A3.3.1 (4).
(11) Added new A3.3.3.

Committee D20 has identified the location of selected changes to this standard since the last issue (D4968 - 15) that may impact the use of this standard. (April 1, 2016)

(1) Deleted old 8.7.3.3.
(2) Revised 8.9.2.2.
(3) Added 5.3.1, 5.3.2, 7.1.1, 8.1, and 8.1.1.

Committee D20 has identified the location of selected changes to this standard since the last issue (D4968 - 09) that may impact the use of this standard. (December 1, 2015)

(1) Converted the standard from a guide to a practice.
(2) Eliminated non-mandatory language.
(3) Updated various sections to be consistent with ASTM terminologies and procedures.
(4) Updated the flow charts in Annex A1.
(5) Deleted old Annex A3 (with a list of D20 standards used in codes).
(6) Created a new Annex A3, addressing precision and bias.
(7) Deleted old Appendixes X1, X2 and X3 and converted into new Annex A3.
(8) Deleted Appendix X5.
(9) Deleted reference to withdrawn standard ASTM D5033.
(10) Added reference to ASTM D5470.