

2021 IEEE SA Standards Style Manual



STANDARDS

Introduction

The IEEE Standards Style Manual (PDF) establishes preferred style for the preparation and structure of proposed IEEE standards (drafts). It also cites requirements of the *IEEE SA Standards Board Operations Manual* that are related to the development and publication of IEEE standards.

The standards committee of an IEEE Standards project is responsible for providing the IEEE SA Standards Board with a complete, technically accurate draft of the standard, and this manual serves as a reference for working groups during the IEEE standards development lifecycle, particularly when drafting the standard.

IEEE SA also provides useful templates available in Adobe® FrameMaker® or Microsoft® Word.^{1, 2} The styles and format are built into the templates, which help reduce IEEE post-approval production time.

¹ Adobe and FrameMaker are registered trademarks of Adobe Systems Incorporated.

² Microsoft is a registered trademark of Microsoft Corporation in the United States and/or other countries.

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1. Overview

This manual establishes preferred style for the presentation and structure of proposed IEEE standards (drafts).

It is strongly recommended that working groups consult with IEEE SA content publishing staff before deviating from the style outlined in this manual. Failure to follow the recommendations of this manual may result in delayed approval of the draft standard by the IEEE SA Standards Board or in delayed publication.

This manual is not intended to be a guide to the procedural development of a standard.³ For that, consult the [IEEE SA Standards Board Bylaws](#) and the [IEEE SA Standards Board Operations Manual](#).⁴

2. Helpful resources

2.1 Training and online resources

Easy-to-use guidance on writing the draft is available on the IEEE SA website <https://standards.ieee.org/develop/drafting-standard/index.html>.

Those who are new to the IEEE SA standards development process, or who want to ensure that best practices are being followed, should consider enrolling in IEEE SA's free Working Group Chair Fundamentals course, available on the IEEE Learning Network

(<https://iln.ieee.org/public/TrainingCatalog.aspx>). Editorial information is covered in Module 9, "The Editorial Process" and Module 11, "Final Approval and Publication."

For additional information on SA's standards development training program, visit <https://standards.ieee.org/about/training/index.html>.

³While this manual uses the term "standard," its rules apply generically to guides and recommended practices as well.

⁴IEEE Standards manuals are available on the IEEE Standards website (<https://standards.ieee.org/about/policies/>). Users are encouraged to visit this site for the most up-to-date information.

2.2 Documents

The following documents are helpful resources for writing an IEEE Standards draft. Consult the most recent version of undated sources.

ANSI Y32.9, American National Standard Graphic Symbols for Electrical Wiring and Layout Diagrams Used in Architecture and Building Construction.⁵

ANSI/IEEE Std 260.3TM, American National Standard for Mathematical Signs and Symbols for Use in Physical Sciences and Technology.

IEC 60050, IEC International Electrotechnical Vocabulary.⁶

IEC Multilingual Dictionary—Electricity, Electronics, and Telecommunications, 2005, Edition 6.⁷

IEEE SA Standards Board Bylaws, New York: Institute of Electrical and Electronics Engineers, Incorporated, 2019.

IEEE SA Standards Board Operations Manual, New York: Institute of Electrical and Electronics Engineers, Incorporated, 2019.

IEEE Standards Dictionary Online.⁸

IEEE Std 91TM, IEEE Standard Graphic Symbols for Logic Functions.^{9, 10}

IEEE Std 260.1TM, IEEE Standard Letter Symbols for Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

IEEE Std 260.4TM, IEEE Standard Letter Symbols and Abbreviations for Quantities Used in Acoustics.

IEEE Std 270TM, IEEE Standard Definitions for Selected Quantities, Units, and Related Terms, with Special Attention to the International System (SI).

IEEE Std 315TM, IEEE Standard Graphic Symbols for Electrical and Electronics Diagrams (Including Reference Designation Letters).

IEEE Std 945TM, IEEE Recommended Practice for Preferred Metric Units for Use in Electrical and Electronics Science and Technology.

IEEE Std 991TM, IEEE Standard for Logic Circuit Diagrams.

IEEE/ASTM SI 10, American National Standard for Metric Practice.

ISO/IEC Directives, Sixth Edition, 2011, Part 2, Rules for the structure and drafting of International Standards.

⁵This publication, and other ANSI standards appearing in this clause, are available from The Institute of Electrical and Electronics Engineers, 445 Hoes Lane, Piscataway, NJ 08854, USA (<https://standards.ieee.org/>).

⁶IEC publications are available from the International Electrotechnical Commission (<http://www.iec.ch>) and the American National Standards Institute (<http://www.ansi.org>).

⁷Available via the Internet at <http://www.electropedia.org>.

⁸The *IEEE Standards Dictionary Online* is available at: <http://dictionary.ieee.org>. An IEEE Account is required for access to the dictionary, and one can be created at no charge on the dictionary sign-in page.

⁹IEEE publications are available from The Institute of Electrical and Electronics Engineers, 445 Hoes Lane, Piscataway, NJ 08854, USA (<https://standards.ieee.org/>).

¹⁰The IEEE standards or products referred to in this clause are trademarks of The Institute of Electrical and Electronics Engineers, Incorporated.

ISO/IEC Guide 21: 2005, Regional or national adoption of International Standards and other International Deliverables.

Merriam-Webster's New Collegiate Dictionary. Springfield, MA: Merriam-Webster, Incorporated.

The Chicago Manual of Style. Chicago: The University of Chicago Press.

3. Using IEEE SA templates to write the draft

IEEE drafts should be developed using IEEE SA templates, currently available in Adobe® FrameMaker® and Microsoft® Word.^{11, 12} IEEE SA templates and supporting documentation are available from the [IEEE Standards website](#). Questions about using IEEE SA templates can be sent to sa_templates@ieee.org.

In addition to expediting document creation, the MS Word template easily enables line numbering. If used, line numbers should appear in the margins of the first page and should appear in the margins of each subsequent page. If using a software program other than MS Word or Adobe FrameMaker, please contact IEEE SA content publishing staff as early as possible in the development process.

4. Responsibilities of the standards committee

For information on IEEE standards draft requirements, please refer to the *IEEE SA Standards Board Operations Manual*. The general responsibilities and duties of the standards committee of each project are delineated in [5.1.1](#) and [5.1.2](#) of the *IEEE SA Standards Board Operations Manual*.

If there is a conflict between the *IEEE SA Standards Board Operations Manual* and this manual, the *IEEE SA Standards Board Operations Manual* takes precedence.

5. Copyright and permissions

5.1 General copyright policy

Contributions by standards participants to IEEE standards projects are subject to the IEEE SA copyright policy found in [Clause 7](#) of the *IEEE SA Standards Board Bylaws* and [6.1](#) of the *IEEE SA Standards Board Operations Manual*.

Go to <https://standards.ieee.org/ipr/> for additional information and [FAQs](#) on IEEE SA copyright policy.

5.2 Excerpting material published by other organizations

Any participant who submits contributions from previously published sources shall comply with [7.2.1](#) of the *IEEE SA Standards Board Bylaws*.

Standards developers are encouraged to request permission from copyright owners as soon as the decision is made to include copyrighted material in a draft. Standards developers should initiate the permission-

¹¹ Adobe and FrameMaker are registered trademarks of Adobe Systems Incorporated.

¹² Microsoft is a registered trademark of Microsoft Corporation in the United States and/or other countries.

seeking process prior to the IEEE SA ballot. Permission letters shall be submitted to IEEE SA staff, along with the draft, as part of Mandatory Editorial Coordination (MEC) review. If the copyright material is added to the draft during the IEEE SA ballot, receipt of permission letters shall be required before the draft can be recirculated to the IEEE SA ballot group.

Note that permission letters will be reviewed by IEEE SA staff at the time they are submitted for MEC review and again when the draft is submitted to the IEEE SA Standards Board for approval. If there are difficulties with obtaining permission responses, the working group should consider citing the information normatively rather than including an excerpt.

It is preferred that the IEEE permission form letters are used when seeking permission (see <https://standards.ieee.org/ipr/index.html>). IEEE requests the following:

[N]on-exclusive, irrevocable, royalty-free permission to use this material is granted to IEEE for world rights distribution, with permission to modify and reprint in all future revisions and editions of the resulting draft and approved IEEE standard, and in derivative works based on the standard, in all media known or hereinafter known.

In addition, no limitations on the right of IEEE to determine appropriate business arrangements for its standards shall be included as a stipulation for use of material. Contact the IEEE SA at stds-copyright@ieee.org, with any questions regarding material that might not meet the requirement.

The following credit line shall be used if specific language from the copyright holder is not available:

<Material> reprinted with permission from <copyright owner>, <title of work from which material is excerpted>, © <copyright year>.

The standards committee is responsible for alerting the IEEE SA, stds-copyright@ieee.org, in instances where legal agreements or licenses are required. This includes the adoption of independently developed documents as potential IEEE standards. Working groups shall not negotiate agreements with outside entities with regard to IEEE standards. Please contact the IEEE SA, stds-copyright@ieee.org, with any questions about licensing agreements, copyright, and permission.

6. Patents

Working groups concerned about or interested in the relationship of patents and patent-related requirements to IEEE standards should review the IEEE SA Standards Board [Patent Committee website](#). Please note that any reference to patents or patent applications shall be made only in the frontmatter of the standard. The [IEEE SA templates](#) contain the patent statement that is to be included in the frontmatter.

7. Trademarks

Working groups shall research the proper usage guidelines for any trademarks appropriate for their drafts and ensure that no fees are required, limitations imposed, etc. This information is usually stated on the websites of the trademark owners. If used, any trademarked items shall be identified in the standard and marked as such (with either ® or ™), as appropriate, upon first reference. All trademarked items cited in standards shall be credited to the trademark owner in the frontmatter of the standard. Note that there are restrictions on trademark use. See Clause 8.

IEEE designations are trademarks of the IEEE and shall be identified as trademarks (® or ™, as appropriate) at first citation of each designation in the frontmatter and in the body of the draft.

8. Commercial terms and conditions

The IEEE SA policy on commercial terms and conditions is set forth in [6.2](#) of the *IEEE SA Standards Board Operations Manual*.

Citation of a product, service, or company shall be avoided. In those cases, where a sole source exists, the product, service, or company shall be described generically in text and the product, service or company supplied in a footnote accompanying the text, as follows:

At the time of this publication [product, service, or company] was an example of [name of generic product, etc.]. This information is given for the convenience of users of this standard and does not constitute an endorsement by the IEEE of these products. Equivalent products may be used if they can be shown to lead to the same results.

If every effort has been made to substitute a generic word or phrase in text for the product, service, or company, but no suitable substitute can be found, add the following footnote to accompany the citation:

This information is given for the convenience of users of this standard and does not constitute an endorsement by the IEEE of these products. Equivalent products may be used if they can be shown to lead to the same results.

In addition to the above footnote, within the text add “or the equivalent” after the name of the product, service or company. For example,

“...use an ABC, or the equivalent, to monitor...”

9. Standard language i.e., shall, should, may, and can

Mandatory requirements set within an IEEE standard are clearly distinguished by using specific standard verbs—specifically, shall, should, may, and can.

Shall, should, may, and can are defined in [6.4.7](#) of the *IEEE SA Standards Board Operations Manual*.

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).

Note that the word *must* is deprecated and shall not be used when stating mandatory requirements; *must* is used only to describe unavoidable situations. The word *will* is deprecated and shall not be used when stating mandatory requirements; *will* is only used in statements of fact.

The word *should* indicates that among several possibilities, one is recommended as particularly suitable without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted to*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

10. Additional guidance regarding language use in IEEE standards

10.1 Homogeneity

Uniformity of structure, style, and terminology should be maintained not only within each standard, but also within a series of associated standards. The structure of associated standards and the numbering of their clauses should be identical, as far as possible. Analogous wording should be used to express analogous provisions; identical wording should be used to express identical provisions.

The same term should be used throughout each standard or series of standards to designate a given concept. The use of an alternative term (synonym) for a concept already defined should be avoided. As far as possible, only one meaning should be attributed to each term used.

10.2 That and which

The words *that* and *which* are commonly misused; they are not interchangeable. *That* is best reserved in essential (or restrictive) clauses, *which* is appropriate in nonessential (or nonrestrictive) parenthetical clauses. Simply stated, if a comma can be inserted before the word *that* or *which*, the word should be *which*. If a comma would not be used, the word to use is *that*.

Example:

- a) Defining the inputs and outputs provides a better understanding of the steps *that* are necessary to complete the process.
- b) Defining the inputs and outputs provides a better understanding of these steps, *which* are explained later in this standard.

10.3 “Absolute” verbiage

Avoid making guarantees if there is a possibility of unforeseen situations or circumstances altering an outcome. Review the text for any explicit or implicit guarantees made within the document, especially those that are safety-related.

For example, words such as “ensure,” “guarantee,” “always,” “maximize,” “minimize,” etc., should be modified if they are inaccurate. Substitutions might include “often,” “reduce,” or “improve.” For example, “to ensure safety” might be changed to “to improve safety” or “to prevent” might be changed to “to reduce.”

When applicable suggest “verify” or “assist in ensuring.”

10.4 Use of the terms *safe* or *safety*

Avoid the use of the word *safe* in a standard unless the condition or practice referenced by the word *safe* has been tested under all cases as being, in fact, safe. Typically, this is not the case. Thus, unless it can be demonstrated that such condition or practice is safe, *safe* should not be used. Words such as *safer* or *safest* can be used in a relative context if it can be demonstrated to be the case. For example, it is proper to say that one set of conditions or practices is safer than another, if in fact true, or that it is safer to employ a certain practice than not in a given situation. However, the term *safest* implies an absolute condition, which, in certain contexts, has the same implication as *safe* and, thus, should not be used. For example, *this is the safest set of conditions for using waveguide* is an improper usage.

The word *safety* should be avoided if it is being used to address a set of conditions or practices that have not been established for the purpose of promoting safety under all situations in which such conditions or practices will be employed. For example, the *following 10 safety considerations should be reviewed before implementing this practice* should not be used.

10.5 Inclusive language

IEEE SA uses language and terminology that is in compliance with the IEEE Nondiscrimination Policy <<https://www.ieee.org/about/corporate/governance/p9-26.html>>.

In addition to the IEEE Nondiscrimination Policy, on 3 December 2020, the IEEE SA Standard Board passed the following resolution:

IEEE standards (including recommended practices and guides) shall be written in such a way as to unambiguously communicate the technical necessities, preferences, and options of the standard to best enable market adoption, conformity assessment, interoperability, and other technical aspirations of the developing standards committee. IEEE standards should be written in such a way as to avoid non-inclusive and insensitive terminology (see IEEE Policy 9.27) and other deprecated terminology (see Clause 10 of the IEEE SA Style Manual) except when required by safety, legal, regulatory, and other similar considerations. Terms such as master/slave, blacklist, and whitelist should be avoided.

10.6 Use of personal pronouns

10.6.1 Personal pronouns

The use of personal pronouns should be avoided in standards.

The first-person form of address (*I, we*) or the second-person form of address (*you*) should not be used or implied, e.g., “You should avoid working on lines from which a shock or slip will tend to bring your body toward exposed wires.” This sentence should be rewritten as follows: “Technicians should avoid working on lines from which a shock or slip will tend to bring their bodies toward exposed wires.”

Similarly, third person singular pronouns should not be used, e.g., “He should turn the switch to the off position” should be rewritten as, “The worker should turn the switch to the off position” or “The switch should be turned to the off position.”

If a third person pronoun is needed (and it rarely is), the pronoun *they* should be used. The male or female pronoun alone or the variation *he/she/they* should not be used.

10.6.2 Indefinite pronouns

The indefinite pronoun *one* should be avoided. In references to an organization, the pronoun *it*, not *we* or *they*, should be used.

10.7 Gender specific language

Avoid using words that are unnecessarily gender specific. Use generic titles and roles (e.g., chair rather than chairman, workers rather than workmen, etc.) in the standard.

11. Frontmatter of an IEEE draft standard

11.1 General

The frontmatter of an IEEE standard is informative, meaning it is not officially part of the standard. Drafts should contain a frontmatter and main text, and follow the style outlined in this manual. The frontmatter and body of the draft are paginated with Arabic numerals, e.g., 1, 2, 3, etc. Frontmatter elements *required* in the draft prior to going to ballot are as follows:

- Designation (see 11.2.1)
- Title of the standard
- Introduction
- Draft copyright statements

A statement titled, “Important Notices and Disclaimers Concerning IEEE Standards Documents” (liability, translations, official statements, comments on standards, laws and regulations, copyrights, photocopies, updating of IEEE Standards documents, errata, and patents) is also required. These are included in the [IEEE SA templates](#) or can be obtained by contacting the IEEE SA content publishing staff. ***These shall not be altered.*** See Annex B for an example.

11.2 Required frontmatter elements

11.2.1 Draft labeling and designations

All drafts shall be clearly labeled to reflect their status as unapproved. The title of the document shall start with the word *Draft*. The term *IEEE* shall not be used in a title until a standard is approved by the IEEE SA Standards Board. The draft designation and the date of the draft shall appear in the upper right corner of each page of the draft. The designation and date shall not be combined. See Annex B for examples of appropriate draft labeling.

The IEEE standards designation shall be structured as IEEE Pxxx/DXX, where xxx represents the specific designation and XX is a number that represents the specific draft version of that document. Draft versions shall be maintained, and are most important during a ballot; the draft number should be updated as least as often as the document is modified and/or recirculated.

Go to <https://development.standards.ieee.org/myproject/Public/mytools/init/parnum.pdf> for information on obtaining a designation.

11.2.2 Draft copyright statements

All IEEE drafts are obligated to carry statements of copyright. The following information shall appear on the first page of every IEEE Standards draft (please note that <20XX> shall be replaced with the current year of distribution):

Copyright © 20XX by The Institute of Electrical and Electronics Engineers, Incorporated
Three Park Avenue
New York, New York 10016-5997, USA
All rights reserved.

This document is an unapproved draft of a proposed IEEE Standard. As such, this document is subject to change. USE AT YOUR OWN RISK! IEEE copyright statements SHALL NOT BE REMOVED from draft or approved IEEE standards, or modified in any way. Because this is an unapproved draft, this document must not be utilized for any conformance/compliance purposes. Permission is hereby granted for officers from each IEEE Standards Working Group or Committee to reproduce the draft document developed by that Working Group for purposes of international standardization consideration. IEEE Standards Department must be informed of the submission for consideration prior to any reproduction for international standardization consideration (stds-ipr@ieee.org). Prior to adoption of this document, in whole or in part, by another standards development organization, permission must first be obtained from the IEEE Standards Department (stds-ipr@ieee.org). When requesting permission, IEEE Standards Department will require a copy of the standard development organization's document highlighting the use of IEEE content. Other entities seeking permission to reproduce this document, in whole or in part, must also obtain permission from the IEEE Standards Department.

IEEE Standards Department
445 Hoes Lane
Piscataway, NJ 08854, USA

The following information shall appear on every page of the draft, at the bottom of the page:

Copyright © <20XX> IEEE. All rights reserved.
This is an unapproved IEEE Standards Draft, subject to change.

11.2.3 Open Source draft statement

All Open Source and documentation developed by a Standards Committee or Working Group that has not been approved by the IEEE SASB shall include the following disclaimer:

Disclaimer

This Open Source repository/documentation contains material that may be included in, or referenced by, an unapproved draft of a proposed IEEE Standard. All material in this repository/documentation is subject to change. The material in this repository/documentation is presented “as is” and with all faults. Use of the material is at the sole risk of the user. IEEE specifically disclaims all warranties and representations with respect to all material contained in this repository/documentation and shall not be liable, under any theory, for any use of the material. Unapproved drafts of proposed IEEE standards shall not be utilized for any conformance/compliance purposes.

11.3 Title

Per [4.2.3.2](#) of the *IEEE SA Standards Board Operations Manual*, the title on the draft document shall be within the scope as stated on the most recently approved PAR.

All titles of IEEE drafts shall start with the word *Draft*, followed by

- “Standards [for]” when the standard specifies mandatory requirements.
- “Recommended Practice [for]” when the standard provides recommendations.
- “Guide [for]” when the standard furnishes information.
- “Trial-Use (Standard, Recommended Practice, or Guide) [for]” for when the document will be published for a limited period of time.

The initial letter of each word in the title (except prepositions) should be capitalized.

“IEEE” shall not be placed at the beginning of the title.

Example:

Draft Standard for the Application and Testing of...

When an IEEE standard covers a limited range of quantities, such as voltage, current, power, and size, the numerical limits of the ranges covered shall be included in the title, scope, or purpose, wherever it first appears. The use of non-quantitative terms (such as high and low, large and small, wide and narrow) should be avoided. Abbreviations should be avoided in titles of standards, except in the case of units of measurement (kV, mm, etc.). However, if such use is warranted, the policy stated in 12.5 shall be followed.

11.4 Abstract and keywords

The inclusion of an abstract and keywords in IEEE standards allows the documents to be referenced in a wide range of bibliographic environments, thereby increasing their utility, visibility, and availability to the public. An abstract and keywords shall be included immediately following the title page of each standard. Abstracts should be based on the scope and purpose of the standard as indicated on the PAR. Abstracts should be no longer than 15 lines, and should be written in the passive voice. Keywords should highlight key terms and phrases from the text of the draft standard, and should specify the designation number of the project.

11.5 Participant lists

At a minimum, a roster of the officers and members of the working group that developed the document shall be provided by the working group. Individuals or entities that also contributed to the preparation of the document may be included in addition to the working group list (permission from entities shall be received prior to including the names in the draft).

In the working group roster, full first names are preferred over initials. Titles (Dr., Ms., P.E.) shall not be included with proper names.

The list of voting members of the balloting group is added by IEEE SA content publishing staff during the publication process. Only the balloters (individuals or entities) who vote (approval, disapproval, or abstention) are listed in the standard. The following paragraph shall be placed in the frontmatter of all IEEE drafts, above the list of voting members of the balloting group, and shall reflect the type of ballot that was conducted (individual or entity):

The following members of the <individual/entity> balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

More information regarding the Standards Board and its members can be found at:

<https://standards.ieee.org/content/ieee-standards/en/about/sasb/index.html>.

11.6 Introduction

An introduction should give the history of the standard, a description of its purpose, and, if the standard is a revision, an explanation of the principal changes from the previous edition. The introduction should also explain the document structure for multipart standards or for documents within a family of standards. An introduction is not an official or normative part of the proposed standard and shall not contain requirements or recommendations; therefore, the following statement shall appear in a box above the text:

This introduction is not part of IEEE Pxxx, title of draft.

11.7 Permissions list

Permissions shall be obtained for all material reprinted or excerpted from other sources. The list of permissions should appear in the standard, under a flush left header titled, “Acknowledgments,” in the following format. This segment should appear after the introduction.

Acknowledgments

Permissions have been granted as follows:

Portions of this standard reprinted with permission from Avaya, IETF RFC 2108 Definitions of Managed Objects for IEEE 802.3 Repeater Devices using SMIV2, © 1997.

Portions of this standard reprinted with permission from Microsemi Corporation, IETF RFC 3621 Definitions Power Ethernet MIB, © 2003.

Portions of this standard reprinted with permission from Avaya, IETF RFC 3621 Definitions Power Ethernet MIB, © 2003.

Portions of this standard reprinted with permission from the Hewlett-Packard Company, IETF RFC 3635 Definitions of Managed Objects for the Ethernet-like Interface Types, © 2003.

NOTE—Requests for special acknowledgments that do not include permissions shall be directed to the IEEE SA content publishing staff.

11.8 Table of contents

A table of contents listing the main clauses (identified by one digit) and the first series of subclauses under each clause (identified by two digits) should be supplied. The next series of subclauses (identified by three digits) may be included when deemed appropriate by the IEEE SA content publishing staff and the working group. The table of contents should be generated automatically and should be frequently updated as the draft evolves. Lists of tables and figures are normally not included in the table of contents, although particularly lengthy documents might warrant their inclusion. Only the appropriate clauses, subclauses, and normative and/or informative annexes should be listed. See the example of a draft standard in Annex B.

12. Body of an IEEE draft standard

12.1 Normative and informative clauses

[IEEE standard document structure \(6.4\)](#) of the *IEEE SA Standards Board Operations Manual* defines which parts of a standard are normative and which parts of a standard are informative.

Normative text is information that is required to implement the standard and is therefore necessary to determine conformance with the standard. Informative text is provided for information only and is therefore not necessary to determine conformance with the standard. Both normative and informative text are provided for review and commenting during the IEEE Standards Association ballot.

Normative text (information *required* to implement the standard) includes the following:

- The main clauses of the documents including figures, tables, and equations
- Footnotes to tables
- Footnotes to figures
- Annexes marked “(normative)”

Informative text (text provided for information only) includes the following:

- Frontmatter
- Notes to text, tables, and figures

At the first instance of a note associated with text, a table, or a figure, the following footnote should appear:

Notes to text, tables, and figures are for information only and do not contain requirements needed to implement the standard.

- Annexes marked “(informative),” e.g., Bibliography

Interspersed normative and informative text is not allowed. As such, neither clauses nor subclauses shall be labeled as informative. Contact IEEE SA content publishing staff early in the process if there are questions as to whether material in the draft should be labeled as normative or informative.

12.2 Order of clauses

12.2.1 General

The first clause of a standard, Clause 1, shall always be an overview (except for amendments and corrigenda, which do not usually have an overview, scope, or purpose). If the standard contains normative references and definitions, they shall be Clause 2 and Clause 3, respectively. The clauses that follow Clause 3 can be ordered in any way by the working group. If clause and subclause titles begin with numbers, they should be spelled out, unless unavoidable (e.g., 10BASE-T).

12.2.2 The overview of the draft

The overview includes the scope of the standard that shall be within the scope of that given on the PAR. The overview shall also include a subclause for word usage (see 12.2.5). Therefore, at a minimum, the overview will contain two subclauses—one for the scope and the other for word usage. The overview may include optional topics such as a purpose, applications, and other areas that the working group considers relevant. These optional topics should be presented as separate subclauses of the overview; they should not be lumped in with the scope or word usage.

The overview shall not contain detailed discussions of the general technical content of the standard nor shall it list the contents of the standard (since this is the purpose of the table of contents).

12.2.3 Scope

The scope of the standard shall explain in statements of fact what is covered in the standard and, if necessary, what is not covered in the standard—in other words, the technical boundaries of the document. The scope should be succinct so that it can be abstracted for bibliographic purposes.

For new and revision projects, the scope of the draft shall be within the scope of that given on the PAR, as determined by the balloting group voting on the draft.

For amendments and corrigenda, there is normally no scope in the draft. Therefore, on the PAR, the scope shall state what the amendment/corrigendum is changing.

For standards projects that incorporate Open Source, the fact that the standard incorporates Open Source and the location of that Open Source, via the URL or hyperlink, should be included in the Scope

Regardless of project type, the scope of the draft has to be within the scope of the project given on the PAR form.

Please note the distinction of the scope from the purpose of the standard discussed in 12.2.4.

12.2.4 Purpose

A paragraph describing the purpose of the standard is not mandatory in the draft. However, if included, the purpose of the standard and its intended application shall be included in a separate subclause (1.2). The purpose shall explain why the standards project is needed.

For new and revision projects, the purpose (if included) of the draft shall be within the parameters of the purpose given on the PAR, as determined by the balloting group voting on the draft.

For amendments and corrigenda, there is normally no purpose in the draft standard. Therefore, on the PAR form, the purpose shall state why the changes are being made.

Please note the distinction of the purpose from the scope of the standard discussed in 12.2.3.

12.2.5 Word usage

Include the definitions of “*shall*,” “*should*,” and “*may*” within a draft standard. The subclause appears in Clause 1 Overview of the draft. See 12.2.2 and the example of a draft standard in Annex B for more information.

12.3 Normative references

12.3.1 What is a normative reference?

In an IEEE standard normative references are those documents that contain material that must be understood and used to implement the standard.¹³ Thus, normative references are indispensable when applying the standard. The decision to include something as a normative reference in a standard should be made thoughtfully. Documents to which reference is made only for information or background, and documents that served merely as references in the preparation of the standard, are not normative references. Such documents may, however, be included in a bibliography. (See Clause 19.)

Normative references may include the following:

- a) **Standards:** IEEE standards and standards developed by other recognized standards developing organizations (SDOs) are the preferred source of normative references.
- b) **Non-standards documents:** A document that is not a standard may be cited provided that:
 - It is judged by the balloting group to have wide acceptance and authoritative status.
 - It is publicly available at reasonable cost.
 - The reference includes the edition or date of publication

Be aware that non-standards documents may prove problematic because they might be revised without notice in a manner that might adversely affect the standard in which it is normatively referenced.

- c) **Draft standards:** Unpublished drafts may be used as normative references as long as they are:
 - Dated
 - Readily available
 - Retrievable

A copy of ALL drafts shall be submitted to IEEE SA to be placed on file as an archive. Note that if a referenced IEEE draft is approved prior to publication of the document, the draft reference will be updated to reflect this change during the publication process. If the working groups prefers that the draft reference remain as is, the citation shall be followed by “(this version).”

- d) **Withdrawn standards:** Although they may be included in the Normative References, BE AWARE: withdrawn standards may contain obsolete or erroneous information and may be difficult to retrieve.
- e) **Open Source:** Normatively referenced Open Source shall be listed in the Normative Reference clause. Similar to other types of normative references, normative Open Source may be dated (to reference a specific version) or undated (to reference the most recent version). A decision to have an undated normative reference to Open Source shall be considered carefully by the Working Group. The Working Group is expected to review updates to undated normative references during

¹³ If the standard is intended for adoption by another organization, the working group should consider requirements for normative references by that organization. Contact IEEE SA content publishing staff for information about specific requirements.

the standards development process and after IEEE SA Standards Board approval to determine if they continue to align with the standard, and if not, to take appropriate action (e.g., if a dated reference should be noted in the standard instead, submit a PAR for a revision or amendment to the standard.). Open Source developed in the IEEE Open Source repository may be listed as an undated reference.

The normative reference to Open Source shall specify one or more source code libraries within a specified code repository in a specified project. A reference may specify one or more specific versions of each library, or “the most current version” in the instance of undated references. If the reference is undated, the version approved by the IEEE SA Standards Board approval shall be indicated on the repository, and a footnote shall be provided for access to the approved version.

12.3.2 Dated versus undated normative standards references

First, remember ALL drafts included in the Normative References shall be numbered and dated [see item c) in 12.3.1]. Similarly, ALL non-standards references shall be dated [see item b) in 12.3.1].

When referencing standards, dated and/or undated references are allowed. Make this decision thoughtfully. Using undated references helps eliminate the burden of continuous updates to align standards as they are revised, while ensuring that the most up-to-date information on technologies and statutes is referenced (when appropriate). Dated references can be used in certain circumstances, such as when a high degree of specificity is needed. Note that in-text reference to a specific clause, subclause, table, or figure of another document shall be dated even if the undated version of the document is listed in the normative references. Ultimately, the responsibility of determining whether a reference should be dated or undated lies with the working and balloting groups, who shall determine what is best during implementation of a given standard, and therefore what is best for the standard’s users.

12.3.3 Citing a normative reference in text

As described in [6.4](#) of the *IEEE SA Standards Board Operations Manual*, each normative reference shall be cited in normative text and the role and relationship of each referenced document shall be explained in the body of the standard.

If a reference is not specifically cited in the normative text of the document, then it shall not be listed in the normative references clause. In such cases, it shall be listed in the first or final informative annex, titled Bibliography.

Examples of properly constructed in text citations of a normative reference are as follows:

Dedicated battery systems for control power, starting, and field flashing shall be sized per IEEE Std 485™, or IEEE Std 1115™, and according to postulated number of starts over an extended duration without capability to recharge.

Where the clamping component is used in signal circuits, it is important to know the capacitive loading and its variation with voltage. The capacitance values should be measured at zero voltage bias and at 80% of the minimum limiting voltage threshold (see 5.7 of IEEE Std C62.42.3-2017).

12.3.4 Structure of the normative references clause

The following guidelines shall be followed when structuring the normative references clause:

- a) The normative references clause is introduced with the following paragraph:

“The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.”

- b) IEEE SA content publishing staff will list the information (i.e., title) for the most current edition of the undated material cited. In some cases, the most current edition is not the one required. It is also important for the working group to remember that the dated edition listed in the balloted document will be the one that appears in the published document. Therefore, it is the responsibility of the standards committee to determine not only which edition of a document is applicable in each case, but also to ensure that the balloted document lists the correct edition.
- c) The working group shall endeavor to supply complete and current information for normative references. Note that IEEE SA content publishing staff cannot verify that normative references to updated editions of documents (i.e., undated references) are accurate; therefore, it is up to the standards committee to consult the latest editions to see if they still apply.

12.3.5 Style for standards reference entries

Normative references shall be listed in alphanumeric order by designation, including the full title. Documents that are not standards shall include the edition or date of publication in the citation. A footnote should be inserted in the text after the first cited normative reference in order to tell the reader where the references can be obtained.

For an example of a properly formatted normative references clause, see the example of a draft standard in Annex B.

References should be cited by designation (e.g., IEEE Std 1226.6™ or IEEE Std 1625™-2004) in the text, in tables, in figures, or in notes at the point where the reference applies. Note that IEEE designations shall be identified as trademarks (® or ™, as appropriate) at first citation of each designation in the frontmatter and in the body of the draft.

12.3.6 Style for non-standards citations

Refer to *The Chicago Manual of Style* for rules on citing sources other than standards.

For citing Internet sources, the following format should be used where <entity> is replaced with the name of the organization and <URL> is replaced by the Internet location:

“... is available from the <entity> Website <URL>.”

“(see the information at the following Internet location: <URL>).”

The URL should be the most stable location to avoid inadvertent or intentional changes that would affect the site name, i.e., use the index to the page rather than the page itself.

The working group shall obtain permission where needed. The IEEE SA should be contacted at stds-copyright@ieee.org, in instances where legal agreements are required (see Clause 5).

If a document listed in the bibliography or normative references is accessed from the Internet, the document title, date, version, and other pertinent information should be listed, followed by a footnote that gives the

Internet location. If the document needs to be on the IEEE Standards website, the working group can insert the following placeholder until the site location is assigned:

“This document is available from the IEEE Standards Website <insert IEEE Internet location>.”

Contact IEEE SA content publishing staff with any questions about documents that should be placed on the IEEE Standards website.

12.3.7 Style for Open Source

Open Source developed in the IEEE Open Source repository may be listed as a dated or undated reference as follows:

Dated references

General template:

Company or Creator Last Name, Creator First Name. Year published. Title of Software in Title Case, version number. Place of Publication. Accessed full date. DOI or URL.

Example using DOI: *Brian McFee, Matt McVicar, Stefan Balke, Carl Thomé, Vincent Lostanlen, Colin Raffel, Dana Lee, et al. 2018. “Librosa/librosa: 0.6.2”. Zenodo. doi:10.5281/zenodo.1342708.*

Example using URL: *Brian McFee, Matt McVicar, Stefan Balke, Carl Thomé, Vincent Lostanlen, Colin Raffel, Dana Lee, et al. 2018. “Librosa/librosa: 0.6.2”. <https://github.com/librosa/librosa/archive/0.6.2.zip> (supplement to <https://github.com/librosa/librosa/tree/0.6.2>)¹⁴*

Undated (unversioned) reference

General template:

Company or Creator Last Name, Creator First Name. Year published. Title of Software in Title Case. Place of Publication. Accessed full date. URL.

Example using URL: *Brian McFee, Matt McVicar, Stefan Balke, Carl Thomé, Vincent Lostanlen, Colin Raffel, Dana Lee, et al. 2018. “Librosa/librosa”. <https://github.com/librosa/librosa/archive/master.zip> (supplement to <https://github.com/librosa/librosa/tree/master>)¹⁵*

12.4 Definitions

12.4.1 Definitions and best practices

For the creation and maintenance of IEEE Standards terms and definitions, see Annex A.

¹⁴ Please note that “supplement to” indicates download archive link "<https://github.com/librosa/librosa/archive/0.6.2.zip>" is a supplement (e.g., downloadable file version) to the URL <https://github.com/librosa/librosa/archive/0.6.2.zip>

¹⁵ The “tree/master” refers to the branch of the repository. In general, this should be a link to the latest version being recommended for use and/or development, regardless of whether the branch name is “master” or some other name.

12.4.2 General terminology usage

English words should be used in accordance with their definitions in the latest edition of *Merriam-Webster's New Collegiate Dictionary*. Electrical and electronics terms not defined in *Merriam-Webster's New Collegiate Dictionary* should be used in accordance with their definitions in the [Dictionary Online](#). The Dictionary is a continually-updated electronic version of the former IEEE 100, *The Authoritative Dictionary of IEEE Standards Terms*. Working groups are strongly encouraged to use definitions that already exist instead of creating new definitions or slightly modifying existing definitions. During MEC and during IEEE SA ballot, working groups may be asked to validate the use and presentation of terms. For assistance, IEEE draft developers may also find useful the *IEC Multilingual Dictionary of Electricity, Electronics, and Telecommunications* and the *IEC International Electrotechnical Vocabulary (IEV)*.

12.4.3 Construction of the definitions clause

A definitions clause is typically Clause 3 (unless the standard does not contain normative references, in which case the definitions clause would be Clause 2). Definitions should appear in alphabetical order, and the term defined should be written out completely and should not be inverted (e.g., “*drift rate*” rather than “*rate, drift*”). Each definition should be a brief, self-contained description of the term in question and shall not contain any other information, such as requirements or elaborative text. The term should not be used in its own definition.

All terms defined in IEEE standards are incorporated into the *IEEE Standards Dictionary Online*. For this reason, it is important that terms and definitions have as general an application as possible. Definitions should not include references to other parts of the standard. An informative note may be provided to refer the user to another part of the standard. Terms defined in other standards may be used in IEEE standards as long as they are properly cited, and the proper permission release form is received. After the definition, the source shall be cited in parentheses. It is the working group chair's responsibility to obtain the appropriate permissions if a standard uses a term from another source (see 5.2).

The definition should follow the defined term as a sentence preceded by a colon. Subdefinitions of a term should be marked as **(A)**, **(B)**, etc. Cross-references should occur after the definition and may consist of the following classes, in the order shown: *Contrast:*, *Syn:*, *See:*, and *See also:*. *Contrast:* refers to a term with an opposite or substantially different meaning. *Syn:* refers to a synonymous term. *See:* refers to a term where the desired definition can be found. *See also:* refers to a related term. The cross-references listed under these headings should be in alphabetical order, in bold type, and separated by semicolons when there are more than one. Abbreviations/acronyms should be spelled out at first use.

See Annex A for Guidelines and best practices for the creation and maintenance of IEEE standards terms and definitions.

Next is an example of a correctly styled definitions clause.

X. Definitions

For the purposes of this document, the following terms and definitions apply. The [IEEE Standards Dictionary Online](#) should be consulted for terms not defined in this clause.¹⁶

acceleration-insensitive drift rate: The component of systematic drift rate that has no correlation with acceleration. *See also:* **drift rate; systematic drift rate.**

code set: *See:* **coded character set.**

¹⁶ *IEEE Standards Dictionary Online* is available at: <http://dictionary.ieee.org>. An IEEE Account is required for access to the dictionary, and one can be created at no charge on the dictionary sign-in page.

coded character set: A set of characters for which coded representation exist. *Syn:* **code set.**

drift rate: The slope at a stated time of the smoothed curve of tube voltage drop with time at constant operating conditions. (Adapted from ISO/IEC 9945-1:2003)

input reference axis (IRA): The direction of an axis as defined by the case mounting surfaces, external case markings, or both. *Contrast:* **output reference axis.**

NOTE—See 6.7.

output: (A) Data that has been processed. (B) The process of transferring data from an internal storage device to an external storage device.

systematic drift rate: That component of drift rate that is correlated with specific operating conditions.

12.5 Acronyms and abbreviations

Acronyms and abbreviations can be used to save time and space in the document. If the draft makes extensive use of acronyms or abbreviations, a subclause within the definitions clause titled “Acronyms and abbreviations” may be provided. If acronyms and abbreviations are included in the definitions clause, Clause 3 should be titled “Definitions, acronyms, and abbreviations” and 3.1 and 3.2 titled “Definitions” and “Acronyms and abbreviations,” respectively.

Acronyms and abbreviations, followed by the full term only, should be listed in alphanumeric order. For an example of an acronyms and abbreviations subclause, see the example of a draft standard in Annex B.

Within text, the acronym or abbreviation should follow the first use of the full term (the first time in the introduction, then the first time in the body of the document, and then the first time in any annexes in which the acronym appears). The abbreviation or acronym should be placed in parentheses when following the full term.

Exceptions to the convention listed above are approved SI units. SI unit symbols are not abbreviations and shall not be included in a list of abbreviations and acronyms. The treatment of letter symbols for units (e.g., mm for millimeter), letter symbols for quantities (e.g., R for resistance), and mathematical symbols (e.g., log for logarithm) is covered in IEEE Std 260.1 and IEEE Std 280 (see also Clause 15).

12.6 Annexes

12.6.1 Ordering annexes

Normative and informative annexes shall be referred to as such [e.g., Annex A (normative), Annex B (informative)] in their titles and in the table of contents. Annexes should be referenced in the text by the word *Annex* and its letter only (e.g., “see Annex A”). Annexes should appear in the order in which they are referenced in the body of the standard (e.g., the first annex mentioned should be Annex A, the second Annex B, and so on). This means that normative and informative annexes might be intermixed. An exception to this rule is the bibliography. The bibliography should be either the first or last annex of the standard. If a glossary exists, it should either be the last annex, or it should immediately precede the bibliography (if the bibliography is the last annex).

12.6.2 Normative annexes

Normative annexes required for implementation of the standard and are placed after the body of the standard for reasons of convenience or to create a hierarchical distinction. In many cases, normative annexes are used for optional test procedures, tables, or printed source code. Normative annexes may also be used for context-specific applications of the standard.

12.6.3 Informative annexes

Informative annexes are included in a standard for information only. Standards writers should carefully consider the nature of the material placed in informative annexes. Informative annex material is considered part of the balloted document and copyrighted to IEEE. As such, it shall be submitted to the IEEE SA Standards Board and is not subject to substantive or technical change after approval.

An example of an informative annex is a bibliography. See Clause 19 for information about bibliographic style.

12.7 Indexes

As most standards are now published digitally, the ability to search electronically for terms makes an index largely unnecessary. The IEEE SA content publishing staff cannot guarantee that an index created for a draft standard will be published when the standard is approved; the quality of the index, its usefulness, and whether it can be properly updated or not will be factors in the decision of whether or not to include it. Working groups interested in including an index should contact IEEE SA content publishing staff.

13. Numbering the clauses and subclauses of a standard

13.1 Body clauses

The body of a standard is usually divided into several major clauses that are further divided into subclauses. The IEEE Standards system for numbering clauses uses Arabic numerals in sequence. A subclause should be numbered by adding a decimal point and number to the clause number (e.g., 5.1). Subclauses may be divided into further subclauses by adding a second decimal point and number (e.g., 5.1.1). Five numbers separated by decimal points is the maximum acceptable subdivision (e.g., 5.1.1.1.1). If necessary, the material should be reorganized to avoid subdivisions beyond this point. An exception to this numbering is allowed for amendments (see 20.2.1 for information on numbering in amendments and corrigenda).

Clauses and subclauses should be divided into further subclauses only when there is more than one subclause. For example, Clause 1 should not have a 1.1 unless there is also a 1.2.

All clause and subclause headings should consist of a number and a concise, meaningful, title. Text immediately follows the subclause title, but on a new line. Hanging paragraphs (i.e., unnumbered paragraphs following a main clause head or main subhead) should not be used since reference to the text would be ambiguous. It may be necessary to include a subhead with the title “General” to avoid instances of hanging paragraphs, as shown in Figure 1.

4. Example of hanging paragraph

A hanging paragraph would follow the main clause head. All text following this head is a part of the clause, including all the text within subclauses, as reference to this paragraph would be ambiguous.

4.1 Subclause head

Subclause text.

5. Hanging paragraph corrected

5.1 Subclause head

Text that is no longer a hanging paragraph.

5.2 Subclause head

Subclause text.

Figure 1—Hanging paragraphs

The term *Clause* should be used when referring to major clause headings (e.g., “see Clause 5”) or at the beginning of a sentence. All other cross-references should be made by simply referring to the number (e.g., “see 5.1” not “see subclause 5.1”).

Standards are not published with line numbers (although numbers should be included in balloted drafts). Therefore, the working group should use only clause or subclause numbers in cross-references.

13.2 Numbering annexes

Consecutive capital letters and a title should be used to identify each annex. Text should be organized and numbered as described in 12.1, with the following exception: clause and subclause numbers should be prefaced with the identifying letter of the annex, followed by a period (see the example annex in Annex B). For standards containing only one annex, the letter A should appear in its title and should preface the clause and subclause numbers in the text. Figures and tables included in annexes should also carry the identifying letter of the annex in which they appear, followed by a period. For example, the first figure in Annex B should be identified as Figure B.1.

13.3 Lists

Lists in a subclause may be ordered or unordered. An ordered list of items within a subclause should be presented in outline form, with items lettered a), b), c), etc. If a subdivision of the items is necessary, 1), 2), 3); i), ii), iii); dashed subdivision items, etc., should be used to form a tiered list. Only one occurrence of any level of an ordered list may be presented in any subclause to avoid confusing cross-references [e.g., it is OK to have an a) level list followed by a 1) level list, etc., but there should not be more than one a) level list in the same clause or subclause]. As an alternate solution, authors may want to consider adding an additional subclause. Dashed lists can also be used instead of an ordered list if the list consists of short, unordered items. Annex B contains some examples of dashed lists. Closing punctuation should be omitted for phrases. Punctuation should be used for sentences. Lists shall be preceded by an introductory sentence explaining the relevance of the list. Figure 2 provides examples of the different levels in an ordered list.

- Items that are included on the nameplate include the following:
- a) Name of the manufacturer
 - b) Rated frequency, if other than 60 Hz
 - c) Connection chart showing
 - 1) Full winding development
 - 2) Taps
 - 3) Pole and pocket location
 - d) Instruction book number
 - e) Mutual reactance (for linear coupler transformers)
 - f) Self-impedance (for linear coupler transformers)
 - 1) Resistance
 - 2) Reactance
 - 3) Impedance
 - i) For volts
 - ii) For amperes

Figure 2—Example of a tiered list

14. Quantities, units, and letter symbols

14.1 Quantity

The word *quantity* has many meanings; in this subclause, the word refers to physical quantities, which are described in units of measure such as length, mass, time, and temperature. A unit is a particular sample of a quantity, chosen so that an appropriate value may be specified. Meter, kilogram, hour, and degree Celsius are some of the units used for the four quantities noted previously.

The value of a quantity is generally expressed as the product of a number and a unit. Quantities and units may be represented in text by letter symbols and are always so represented in equations. If a number and unit cannot be identified for a quantity, the discussion may concern an amount rather than a quantity, in which case the term *amount* should be used.

14.2 Numbers

The following rules should be observed:

- a) The decimal marker should be a dot on the line (decimal point).
- b) For numbers of magnitude less than one, a zero should be placed in front of the decimal point (e.g., 0.5).
- c) In general text, isolated numbers less than 10 should be spelled out. However, in equations, tables, figures, and other display elements, Arabic numerals should be used.

- d) The value of a quantity shall be expressed by an Arabic numeral followed by a space and the appropriate unit name or symbol. An upright (Roman) type font should be used for the unit symbol even if the surrounding text uses a sloping (italic) font.
- e) If tolerances are provided, the unit shall be given with both the basic value and the tolerance (150 m \pm 5 mm). Ranges should repeat the unit (e.g., 115 V to 125 V). Dashes should never be used because they can be misconstrued as subtraction signs.
- f) Percent is indicated by the sign (%) and directly follows the number, without a space.

14.3 Metric system

IEEE Policy 9.16 calls for measured and calculated values of quantities to be expressed in metric units [SI (Système International d'Unités)] in IEEE publications.¹⁷ (See IEEE/ASTM SI 10 for guidance on metric practice.)¹⁸ Proposed new standards and revised standards submitted for approval should use metric units exclusively in the normative portions of the standard. Inch-pound data may be included in parentheses after the metric unit if the standards committee believes that the audience for this document would benefit from the inclusion of inch-pound data, based on concerns for safety or clarity. Metric units shall always be the primary unit of measurement.

IEEE Policy 9.16 recognizes the need for some exceptions and contains the following statement: "Necessary exceptions to this policy, such as where a conflicting world industry practice exists, must be evaluated on an individual basis and approved by the responsible major board of the Institute for a specific period of time." Standards Coordinating Committee 14 (SCC14), as part of the coordination process, shall review requests for individual exceptions, including those noted below, and shall report its recommendations to the IEEE SA Standards Board.

Exceptions:

- a) A specific exception is given for trade sizes, such as the AWG wire series and inch-based standards for fasteners. Such data need not be translated into metric terms.
- b) Also excepted are those cases, such as plugs and sockets, where a mechanical fit to an inch-based product is required.
- c) The metric policy does not require metric products to be substituted for inch-based products. For further information, see IEEE/ASTM SI 10, IEEE Std 260.1, and IEEE Std 270.

14.4 Letter symbols

In IEEE standards, letter symbols should be used rather than abbreviations. Letter symbols include symbols for physical quantities (quantity symbols) and symbols for the units in which those quantities are measured (unit symbols). The quantity and its unit can usually be separated by a non-breaking space to avoid unfortunate line breaks. Unlike common abbreviations, letter symbols are invariant in singular and plural, are not followed by a period, and maintain their case independent of the surrounding text (see IEEE Std 260.1).

For example, standard quantity symbols for length, mass, and time are *l*, *m*, *t*. They are set in *italic* letters. Unit symbols for the same three quantities are m, kg, and s, set in Roman (upright) letters. Note especially

¹⁷For more information on IEEE policy, see <http://www.ieee.org/about/corporate/governance/index.html> and <https://standards.ieee.org/content/dam/ieee-standards/standards/web/governance/sasb/metric.pdf>.

¹⁸Additional information can be found <https://standards.ieee.org/content/dam/ieee-standards/standards/web/governance/revcom/scc14.pdf>.

that V is the symbol for the unit “volt,” and V (italic) is the symbol for the quantity “voltage.” Unit symbols may not be used to stand for the quantity being measured, as follows:

Incorrect: “The km between the substations is 20.”

Correct: “The distance between the substations is 20 km.”

Incorrect: “The amperes that flow into the ground.”

Correct: “The current that flows into the ground.”

Incorrect: “Polarity shall be additive for all kVA transformers rated at 200.”

Correct: “Polarity shall be additive for all transformers with an apparent power rating of 200 kVA.”

15. Mathematical expressions

15.1 Letter symbols and units

Letter symbols defined in applicable IEEE standards (see Clause 2) should be used in preparing mathematical expressions. (See 14.4 for a discussion of letter symbols.)

All terms shall be defined, including both quantities and units, in a tabulation following the equation [see Equation (1)]. The list should be preceded by the word *where*, followed by the list of variables and corresponding definitions. See 4.5 in Annex B for an example.

15.2 Numbering of equations

If the standard contains more than one equation, then equations of key importance should be numbered consecutively in parentheses at the right margin. Derivations of equations or examples where values are substituted for variables need not be numbered.

An equation should be cited in the text by the word Equation and its number only [e.g., “see Equation (1)”]. If referring to two or more equations in the same sentence, each should be named separately. For example, use “see Equation (1), Equation (2), and Equation (3),” instead of “see Equations (1) through (3).”

Equations in annexes should be numbered beginning with the letter of the annex where they are found. For example, the first equation in Annex B would be numbered “(B.1)” and the reference to it would be to “see Equation (B.1).”

15.3 Presentation of equations

Certain types of material in displayed equations are automatically italic. Some simple general rules apply. All variables are italic. (e.g., x , y , n). Function names and abbreviations are Roman (sin, cos, sinc, sinh), as are units or unit abbreviations (e.g., deg, Hz), complete words (e.g., in, out), and abbreviations of words (e.g., max, min), or acronyms (e.g., SNR). Single letter superscripts and subscripts may be italic even if they are abbreviations, unless this leads to inconsistency between italic and roman characters for similar types of subscripts.

A multiplication sign (\times), not the letter “x” or a multidot (\cdot), should be used to indicate multiplication of numbers and numerical values, including those values with units (e.g., 3 cm \times 4 cm).

Although the stacked style of fractions is preferred, exceptions should be made in text to avoid printing more than two lines of type. For example, in text a/b is preferable to $\frac{a}{b}$.

The general rules regarding the use of upright (Roman) and italic text in equations [see Equation (1)] are as follows:

- Quantity symbols (including the symbols for physical constants), subscripts or superscripts representing symbols for quantities, mathematical variables, and indexes are set in italic text.
- Unit symbols, mathematical constants, mathematical functions, abbreviations, and numerals are set in upright (Roman) text.

Example:

$$E_0 = \frac{\sum_{i=1}^N E_i}{N} \quad (1)$$

where

- E_0 is the dc value of the waveform
- N is the number of sample data in one period
- E_i is the i^{th} sample data of the waveform

Table 1 lists a number of functions and operators that are set in upright (Roman) text.

Table 1—Examples of functions and operators set in upright (Roman) text

arg (argument)	hom (homology)	min (minimum)
cos (cosine)	Im (Imaginary)	mod (modulus)
cot (cotangent)	inf (inferior)	Re (Real)
det (determinant)	ker (kernel)	sin (sine)
diag (diagonal)	lim (limit)	sup (superior)
dim (dimension)	log (logarithm)	tan (tangent)
exp (exponential)	max (maximum)	var (variance)

Additional examples of the presentation of equations are provided in Annex B.

15.4 Quantity and numerical value equations

Equations shall be dimensionally correct. Equations may be in either quantity equation form or in numerical value equation form. Stipulation of units for substituted values in the variable list below the equation does not suffice to meet this requirement.

A quantity equation is valid regardless of the units used with the substituted values, once any unit conversions and prefix scaling factors have been taken into account. For example, $F = ma$ is always correct.

A numerical value equation depends on the use of particular units and prefixes. Such equations may be presented in one of two forms. One form represents a numerical relationship among quantities whose dimensions have been reduced to 1 due to division by the appropriate (prefixed) units. For example,

$$t/^{\circ}\text{C} = T/\text{K} - 273.15$$

The other form annotates the quantities with the units to be used. For example,

$$\{t\}_{^{\circ}\text{C}} = \{T\}_{\text{K}} - 273.15$$

16. Tables

16.1 Labeling and presentation of tables

Tables provide a clear and concise way of presenting large amounts of data in a small space. The example draft in Annex B shows examples of properly formatted tables.

Working groups shall obtain permission to use any table from another source, including from a manufacturer, prior to using it in a draft standard (see Clause 5).

Formal tables should be given a number and a concise title, and they should be cited in the text with the word *Table* followed by the number. (See 16.2 for information on the numbering of tables.) Tables should be boxed, ruled and organized to fit on a single page. with the term, “Table” and the table number, followed by an em dash and the table title, all on one line, centered above the top border of the table, as follows: “Table 1—Title”. If a table carries over to more than one page, complete column headings should be repeated at the top of successive pages. The table number and title, with the term, “continued,” in parentheses and in italics, should be repeated and centered above the top border of the table on the successive pages, as follows: “Table 1—Title (*continued*).”

16.2 Numbering and capitalization in tables

Tables should be consecutively numbered in a separate series and in the order of their reference in the text (e.g., Table 1, Table 2, Table 3). Hyphenated numbers should not be used except in standards of considerable length. In the latter case, it is appropriate to label the first table in a clause with the number 1, preceded by the clause number (e.g., Table 6-1, Table 6-2).

Tables included in annexes should also carry the identifying letter of the annex in which they appear, followed by a period. For example, the first table in Annex B should be identified as Table B.1.

Tables should be referenced in the text by the word, “Table” and their number only (e.g., “see Table 1”). If referring to two or more tables in the same sentence, each should be named separately. For example, use “see Table 1, Table 2, and Table 3,” instead of “see Tables 1 through 3.”

Only the initial letter of the first word and proper nouns should be capitalized in

- Table titles
- Column and line headings in tables (see Table B.1 in Annex B)

16.3 Presentation of data and table format

16.3.1 Units of measure

Units of measure shall always be provided in the title (in parentheses); or preceded by a solidus in the column headings [e.g., for volts either E (V) or E/V would be acceptable]; or in a NOTE. The same units of measure shall be used throughout each column; ohms shall not be combined with megohms, millimeters with centimeters, or seconds with minutes. To save space, abbreviations and letter symbols should be used in column and line headings wherever possible. (See IEEE Std 260.1 and other standards referenced in Clause 2 for the appropriate abbreviations and symbols for use in standards.)

16.3.2 Numerical values

Digits should be separated into groups of three, counting from the decimal point toward the left and right. The groups should be separated by a space, and not a comma, period, or dash. If the magnitude of the number is less than one, the decimal point should be preceded by a zero. In numbers of four digits, the space is not necessary, unless four-digit numbers are grouped in a column with numbers of five digits or more.

Examples:

73 722 7372 0.133 47

All numbers should be aligned at the decimal point, where appropriate. Only as many significant digits should be used as the precision of data justifies. Decimal fractions should be used in tabulations unless fractions are commonly used in the field.

Common fractions and decimal fractions shall not be combined in the same table. An em dash (—) should be used to indicate the lack of data for a particular cell in a table.

16.4 Notes and footnotes to tables

Subclause [6.4](#) of the *IEEE SA Standards Board Operations Manual* defines which parts of a standard are normative and which parts of a standard are informative.

A table note (a note to a table) is informative. A table footnote is normative. This distinction should be kept in mind when determining whether information should go in a table note or a table footnote.

A table note should be set immediately following the table to which it belongs, enclosed within the boxed table, above the bottom border of the table. The text in the table note shall not contain mandatory requirements. Also, important information on safety, health, or the environment related to the table shall not be included in table notes.

Table notes should appear in the following order:

- a) *General notes and specific notes.* General notes apply to the entire table and should be introduced by “NOTE—” set in all, uppercase letters. Specific notes should refer to specific material or parts of the table and should also be introduced by “NOTE—” set in all, uppercase letters. Multiple notes in sequence should be numbered “NOTE 1—”, “NOTE 2—”, etc.
- b) *Crediting source.* Use either of the following credit lines:

Reprinted with permission from... (Use when data is derived from another source from which permission to reproduce material has been obtained.)

Source: (Use when data is derived from another IEEE standard.)

A table footnote always contains normative information. A table footnote should be set outside of the boxed table to which it belongs, immediately below the bottom border. The text in the footnote may contain mandatory requirements. Any important information on safety, health, or the environment related to the table shall be included in the footnote.

A table footnote should be marked with lowercase letters starting with “a” for each table.

16.5 Informal tables

Simple tabulations that are not referred to outside of the subclause in which they appear may be organized into short informal tables that do not exceed five lines in depth. However, it is recommended that all tables be numbered and titled, if possible. See the example draft in Annex B for an example of an informal table.

17. Figures

17.1 Requirements for creating figures

Figures may be created using any of a number of graphics programs. For specific requirements concerning the preparation of figures, see Table 2.

Table 2—Figure preparation and requirements

Characteristic	Requirements
Resolution	Black and white: 300 DPI Grayscale: 300 DPI Line art: 1200 DPI CMYK: 300 DPI
Size	Portrait page—maximum 8.5 in (H) × 6 in (W) Landscape page—maximum 6 in (H) × 9 in (W)
Color	Color in figures shall not be required for proper interpretation of the information.
Line drawings	Save line art as black and white.
Line drawings with shaded areas	Save line drawings with shaded areas as grayscale.
Line weight	Lines should be of an adequate thickness, at least 0.5 points to 1.0 points. Hairline rules may appear broken up on screen or in printed document, or not show up at all.
Photographs	Save photographs as grayscale.
Fonts in graphics	All fonts shall be embedded into the figure. Arial font is preferred. Preferred font size is 9 points (can be 8 or 10 points if needed).
Text point size	IEEE SA uses 8-point type size. All capital letters or mixed uppercase and lowercase letters may be used, depending on the amount of text, as long as the presentation is consistent throughout the document.
Cropping	Each figure should be one image regardless of how many separate images make up the figure. There should be no borders around the graphic.

Characteristic	Requirements
	Remove any excess white space around the image edges.
Original art	Original source files (from the graphics programs used) should also be submitted. The original art files should be grouped separately from those saved in the formats previously listed. All original art files will be archived for the working group.
Naming graphic files	<p>Numbered figures take the standard number and year and “_figX.tif” (X being the figure number).</p> <p><i>Example</i> 1856-2016_fig5.eps</p> <p>Images in a table cell are numbered according to the table, row, and column numbers as TabXRowXColX.tif (TabX being Table #, RowX being Row#, and ColX being Column #).</p> <p><i>Example</i> Tab3Row5Col2.tif</p> <p>NOTE: Multiple images in a table cell are to be saved as one image.</p>

Working groups should create figures using programs that create vector output. Figures created in programs that do not support vector illustrations may result in bitmapped graphics or graphics that do not translate well into other applications, that may not scale appropriately, or that may not retain their quality. If it is unavoidable, however, a TIFF version of the file may be submitted.

When working with FrameMaker files, the FrameMaker graphics editor can be used for simple line drawings and TIFF versions do not need to be submitted.

See the example draft in Annex B for an example of a properly formatted figure.

17.2 Figure numbering and titles

Figures should be numbered consecutively in a separate series and in the order of their reference in the text (e.g., Figure 1, Figure 2, Figure 3). Hyphenated numbers should not be used except in standards of exceptional length. In the latter case, it is appropriate to label the first figure in a clause with the number 1, preceded by the clause number (e.g., Figure 6-1, Figure 6-2, Figure 6-3).

Figures included in annexes should carry the identifying letter of the annex in which they appear, followed by a period. For example, the first figure in Annex C should be identified as Figure C.1.

A figure should be referenced in the text by the word Figure and its number only (e.g., “see Figure 1”). If referring to two or more figures in the same sentence, each should be named separately. For example, use “see Figure 1, Figure 2, and Figure 3,” instead of “see Figures 1 through 3.” This enables accurate cross-referencing.

Only the initial letter of the first word and proper nouns should be capitalized in figure titles.

Figures should be given a number, a concise title, and cited in the text with the term, “Figure” followed by the number. Figures should be organized to fit on a single page with the term, “Figure” and the figure number, followed by an em dash and the figure title, centered below the figure, as follows: “Figure 1—Title”.

17.3 Notes and footnotes to figures

As described in 6.4 of the *IEEE SA Standards Board Operations Manual*, a note to a figure is informative; a footnote to a figure is normative. This distinction should be kept in mind when determining whether information should go in a figure note or a footnote.

Important information on safety, health, or the environment shall not be included in notes to figures. Notes to a figure should appear in the following order:

General notes and specific notes. General notes apply to the entire figure and should be introduced by “NOTE—” set in upright capital letters. Specific notes should detail specific material or parts of the figure and should also be introduced by “NOTE—” set in upright capital letters. Multiple notes in sequence should be numbered “NOTE 1—”, “NOTE 2—”, etc.

Crediting source. Use either of the following credit lines:

Reprinted with permission from... (Use when the figure is taken from another source from which permission to reproduce has been obtained.)

Source: (Use when figure is taken from another IEEE standard.)

Footnotes to figures may contain normative information. They should be marked with lowercase letters starting with “a” for each figure.

Both figure notes and figure footnotes should be placed under the figure, but above the title.

18. Notes, footnotes, examples, warnings, and cautions

18.1 Notes

The *IEEE SA Standards Board Operations Manual*, 6.4, states that notes are informative. Notes are explanatory statements used in the text for emphasis or to offer informative suggestions about the technical content of the standard. Notes provide additional information to assist the reader with a particular passage and shall not include mandatory requirements. Because a note in the text is an informative part of the approved standard, important information on safety, health, or the environment shall not be included. A note should follow that paragraph to which it belongs, and shall be set apart from the text by introducing the statement with the capitalized word “NOTE—.” Within each subclause, notes should be numbered sequentially, i.e., “NOTE 1—”, “NOTE 2—”, etc. The one exception is when notes appear in the definitions clause. Notes in the definitions clause should only be numbered if there are multiple notes that apply to a single definition. That is, each definition is treated as if it were its own subclause.

“Note that” is normative and is translated to mean “pay special attention to.” “Note that” is usually part of a paragraph while “NOTE—” is set apart as its own paragraph.

18.2 Footnotes

The *IEEE SA Standards Board Operations Manual*, 6.4 states that footnotes are informative. Footnotes in text may be included in a standard only for information, clarification, and/or aid applicable to the use of the standard. Mandatory requirements shall not be included in text footnotes. Note that footnotes to tables and figures follow different rules (see 16.4 and 17.3) and may contain normative information.

Footnotes in the frontmatter, body, and annexes should be numbered consecutively using Arabic numerals. When there are footnotes within tables and figures, they should be lettered. If a footnote is cited more than once, each additional citation should refer back to its first mention as follows:

² See Footnote 1.

18.3 Examples

Examples may be used as illustrations to foster understanding of the standard. Examples are not a normative part of the standard; therefore, requirements shall not be included in the text of the example. (See 10.2 and 19.2 for illustrations of examples.)

18.4 Warnings and cautions

Warnings call attention to the use of materials, processes, methods, procedures, or limits that have to be followed precisely to avoid injury or death.

Cautions call attention to methods and procedures that have to be followed to avoid damage to equipment. A warning is more important than a caution. If both are to be included in the same clause or subclause, the warning shall precede the caution.

Warnings and cautions should start with a clear instruction, followed with a short explanation (if necessary). If the warning or caution is of a general nature (and is applicable throughout the text), it should be placed at the start of the text. This avoids the necessity of repeating the same warning or caution frequently throughout the text. Warnings and cautions shall not be placed in informative text or notes.

WARNING

Serious injury may result if the following parameters are not followed exactly.

19. Bibliography

19.1 General

The bibliography shall always be an informative lettered annex that appears as either the first or last annex of the standard. See Annex B for an example.

If bibliographic items are cited in text, tables, figures, or notes, the citation should be placed at the point where reference is made to them. If the item is a standard, the designation (e.g., IEEE Std 1226.6-1996) and bibliographic reference number (e.g., [B4]) should be cited. If the reference is to an article, book, or other type of publication included in the bibliography, the title or author of the publication and the bibliographic reference number should be cited.

The bibliography should be ordered alphanumerically, without respect to the type of publication being cited.

19.2 Citing standards in a bibliography

Standards listed shall include designation and title. They can be either dated or undated, whichever is appropriate to a particular entry.

Example:

[B1] ASME BPVC-I-2004, Boiler and Pressure Vessel Code, Section 1—Power Boilers.

[B2] Code of Federal Regulations Title 29 Part 1210 Section 354 (29CFR1210.354), Health and Safety Standards—Head injury.

[B3] ISO/IEC 7498-4, Information processing systems—Open Systems Interconnection—Basic Reference Model—Part 4: Management framework.

19.3 Articles in periodicals

Consult *The Chicago Manual of Style*, current edition, for detailed information on how to list periodicals.

Articles listed shall include the following information in the order shown:

- a) Last name of author or authors and first name or initials, or name of organization
- b) Title of article in quotation marks
- c) Title of periodical in full and set in italics
- d) Volume, number, and, if available, part
- e) First and last pages of article
- f) Date of issue

Example:

[B1] Boggs, S. A., and N. Fujimoto, “Techniques and instrumentation for measurement of transients in gas-insulated switchgear,” *IEEE Transactions on Electrical Installation*, vol. ET-19, no. 2, pp. 87–92, Apr. 1984.

19.4 Books

Consult the current *The Chicago Manual of Style* for detailed information on how to list books.

Books listed shall include the following information in the order shown:

- a) Last name of author or authors and first name or initials, or name of organization. Note that for a book with two or more authors, only the first-listed name is inverted in the bibliography entry.
- b) Title of book (in italics)
- c) Edition number (if applicable)
- d) Place of publication (city)
- e) Name of publisher

- f) Year of publication
- g) First and last page of reference

Example:

[B26] Peck, R. B., W. E. Hanson, and T. H. Thornburn, *Foundation Engineering*, 2nd ed. New York: McGraw-Hill, 1972, pp. 230–292.

19.4.1 Other types of bibliographies

For instructions on citing sources other than those listed in this subclause, refer to the current edition of *The Chicago Manual of Style*.

19.4.2 Annotated bibliography

[B10] Henry, S., and Selig, C., “Predicting source-code complexity at the design stage,” *IEEE Software*, vol. 7, no. 2, pp. 36–44, Mar. 1990.

This paper states that the use of design metrics allows for determination of the quality of source code by evaluating design specifications before coding, causing a shortened development life cycle.

19.4.3 Articles in corporate reports

[B6] Dale, S. J., “Performance of a technical and economic feasibility study of an HVDC compressed gas-insulated transmission line,” Westinghouse Electric Corporation, Trafford, PA, Final Report, Dec. 1983.

19.4.4 Articles presented at conferences

[B3] Cookson, A. H., and B. O. Pedersen, “Thermal measurements in a 1200 kV compressed gas insulated transmission line,” *Seventh IEEE Power Engineering Society Transmission and Distribution Conference and Exposition*, Atlanta, GA, pp. 163–167, Apr. 1979.

19.4.5 Government publications

[B2] Cookson, A. H., “Particle Trap for Compressed Gas Insulated Transmission Systems,” U.S. Patent no. 4554399, Nov. 1985.

[B3] EPRI EL-2040, *Project 1352-1, Probability-Based Design of Wood Transmission Structures—Volume 3: User’s Manual, POLEDA-80—POLE Design and Analysis*, Final Report, Goodman, J., Vanderbilt, M., Criswell, M., and Bodig, J.

19.4.6 Uniform resource locators (URLs)

For articles or sources that were consulted online, the URL should be listed along with the source’s title and date accessed to create a more stable reference.

Example:

[B18] Moore, James W., *IEEE/EIA 12207 as the Foundation for Enterprise Software Processes*, 2nd ed. Virginia: The MITRE Corporation, accessed October 14, 2012, http://www.techwell.com/sites/default/files/articles/XML0181_0.PDF.

19.4.7 Theses, dissertations, and other unpublished works

[B5] Diessner, A., “Studies on Compressed Gas Insulation.” Master’s thesis, Stanford University, 1969.

[B6] Hazel, R. L., “DC Breakdown and Anode Corona Characteristics of Sphere and Rod-Plane Gaps Insulated with Compressed Sulphur Hexa Fluoride.” Ph.D. diss., University of Windsor, 1974.

19.4.8 Open Source informative references

Informative references to Open Source software shall be listed in the bibliography. The requirements of item e) in 12.3.1 do not apply to informative references; however, the Working Group should consider the source, stability, maintenance, and security of the Open Source that is informatively referenced.

20. Amendments, corrigenda, and errata

20.1 General

There are several ways of changing a published standard:

- a) *Amendment*. A document that adds to, removes from, or alters material in a portion of an existing IEEE standard and may make editorial or technical corrections to that standard.
- b) *Corrigendum*. A document that only corrects editorial errors, technical errors, or ambiguities in an existing IEEE standard.
- c) *Erratum*. A document that contains only corrections of errors introduced during the publishing process of an existing IEEE standard. Errata are not balloted documents and can be accessed via <https://standards.ieee.org/standard/index.html>. Search for standard number and year of approval to access the web page of the published standard. Errata links are located under the Additional Resources Details section.¹⁹

IEEE SA content publishing staff can assist standard committees in determining whether an amendment or revision is appropriate.

20.2 Amendments and corrigenda

Amendments and corrigenda are independent projects, processed with separate PARs, and balloted independently in accordance with the requirements of these procedures, including submission to the IEEE SA Standards Board.

Amendments and corrigenda provide explicit instructions on how to change the text in an existing base standard or an existing amendment. The editing instructions are important because the user should

¹⁹ Errata are also available in IEEE Xplore: <https://ieeexplore.ieee.org/browse/standards/collection/ieee/>. Users are encouraged to periodically check for errata.

understand how the changes affect the base standard, particularly because these documents ultimately will be incorporated into the base standard.

Both types of documents have the same format. The following text shall appear at the beginning of either an amendment or a corrigendum:

NOTE—The editing instructions contained in this <amendment/corrigendum> define how to merge the material contained therein into the existing base standard and its amendments to form the comprehensive standard.

The editing instructions are shown in *bold italic*. Four editing instructions are used: change, delete, insert, and replace. *Change* is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~striketrough~~ (to remove old material) and underscore (to add new material). *Delete* removes existing material. *Insert* adds new material without disturbing the existing material. Deletions and insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. *Replace* is used to make changes in figures or equations by removing the existing figure or equation and replacing it with a new one. Editing instructions, change markings, and this NOTE will not be carried over into future editions because the changes will be incorporated into the base standard.

Editing instructions and text indicating the changes to the base document follow the “NOTE. Change bars shall not be included.” (See Annex C for an example of an amendment/corrigendum.) Only material being affected by the changes of the amendment/corrigendum shall be included with the appropriate clause/subclause headings.

20.2.1 Numbering in amendments and corrigenda

Amendments and corrigenda shall follow the clause numbering outlined in Clause 13. However, if text is inserted between existing consecutive clauses or subclauses, an additional letter may be included in the heads (e.g., if clauses are inserted between Clause 4 and Clause 5, the new clauses would be labeled Clause 4A, Clause 4B, Clause 4C). This would also apply to subclauses (e.g., subclauses inserted between 4.1.3 and 4.1.4 would be labeled 4.1.3a, 4.1.3b, 4.1.3c). This numbering may be more appropriate for amendments with extensive changes that would affect numbering throughout the base standard (so it would be difficult to outline all the numbering changes that would occur), or for amendments to standards where exact references to clauses, figures, equations, and tables are required.

Additional amendments to a base standard may insert text between already amended clauses or subclauses. In these cases, numbering of clauses may become very complex. IEEE SA content publishing staff can assist with complex numbering formats. Working groups should consider a revision of the document in these instances. For tables and figures in amendments and corrigenda, clause or subclause numbering should follow the numbering outlined in 16.2 and 17.2. However, if an amendment or corrigenda inserts a table between consecutive tables, or a figure between consecutive figures, the addition of a letter may be used.

Exceptions may be made for numbering established in previously published amendments. Exceptions shall only be valid until a revision occurs, after which the numbering described in Clause 13 will be implemented. Table 3 shows appropriate numbering formats that may be used for amendments and corrigenda. (See Annex C for examples of amendment numbering.)

20.2.2 Editorial instructions in amendments and corrigenda

Amendments submitted for ballot shall clearly indicate the changes to the existing standard. Editorial instructions shall clearly outline how the changes should be implemented in the base standard, as modified by all previously approved amendments or corrigenda. The instructions shall not require interpretation by

the IEEE SA content publishing staff, by the balloter, or by any user. Therefore, the placement of the changes, as well as any required renumbering, shall be delineated in an unambiguous manner.

Editorial instructions shall precede all changes, and should begin with one of the four types of editing instructions, which are formatted in bold italic: *change*, *insert*, *delete*, and for figures or equations, *replace*.

Change shall be used when text or tables are being modified; therefore, strikethrough (for deletions) and underscore (for insertions) should be indicated.

Insert shall be used to add new text, equations, tables, or figures in the standard.

Delete shall be used to remove existing text, equations, tables, or figures without exchanging the information (i.e., it is not permissible to delete a paragraph and insert a new one rather than showing the changes in the paragraph using the change instruction).

Replace shall be used only for figures and equations by removing the existing figure or equation and replacing it with a new one. (See Annex C for examples of editorial instructions in amendments or corrigenda.)

IEEE SA content publishing staff is available for questions that arise while preparing these documents.

20.2.3 Amendment versus revision

The greater the number of amendments or corrigenda associated with a standard, the more complex the editing instructions become for all subsequent amendments and corrigenda. If three amendments to a standard exist however, working groups are encouraged to revise the standard rather than develop an additional amendment. Refer to [8.1.2](#) and [9.1](#) of the *IEEE SA Standards Board Operations Manual* for additional information on amendments, corrigenda, and revisions.

Table 3—Numbering of amended material

Location of inserted material	Original order	Revised order
Clause heads First level	Clause 1 Clause 2	Clause 1 Clause 1A 1A.1 Clause 1B Clause 2
Second level	1.1 1.2	1.1 1.1a 1.1a.1 1.1b 1.2
Figures	Figure 1 Figure 2	Figure 1 Figure 1a Figure 1b Figure 2
Tables	Table 1 Table 2	Table 1 Table 1a Table 1b Table 2

Location of inserted material	Original order	Revised order
Equations	Equation (1) Equation (2)	Equation (1) Equation (1a) Equation (1b) Equation (2)
Annexes Annex heads	Annex A Annex B	Annex A Annex A1 Annex A2 Annex B
First level	A.1 A.2	A.1 A.1a A.1a.1 A.1b A.2
Second level	A.1.1 A.1.2	A.1.1 A.1.1a A.1.1a.1 A.1.1b A.1.2

21. Adoption and joint development overview

21.1 Style for IEEE documents to be adopted by another organization

An IEEE standard shall conform to the IEEE SA Standards Style Manual, even if it is expected that the standard will also be submitted to another recognized SDO for adoption. This includes, but is not limited to, the use of American English spelling and the use of a period as a decimal sign. For guidance on style issues not explicitly addressed in this manual, please consult *The Chicago Manual of Style* or consult the IEEE SA content publishing staff. Deviations from the style set forth in this manual shall be approved by IEEE SA publishing management.

21.2 IEEE documents developed jointly with other organizations

IEEE standards may be developed jointly with other organizations with the appropriate agreements in place.

An IEEE SA Program Manager shall be notified at the beginning of the standards development process if there is an intention to jointly develop a standard with another organization.

Annex A

(normative)

Guidelines and best practices for the creation and maintenance of IEEE standards terms and definitions

A.1 The IEEE Standards Dictionary Online

All terms defined in approved IEEE standards are automatically included in the *IEEE Standards Dictionary Online*, which is updated on a regular basis.

Any terms that working groups, committees, or societies/standards committees use within their group that are intended for inclusion in the *IEEE Standards Dictionary Online* must be written into drafts that go for ballot and IEEE SA Standards Board approval.

The *IEEE Standards Dictionary Online* is available at <http://dictionary.ieee.org>. An IEEE Account is required for access to the dictionary, and one can be created at no charge on the dictionary sign-in page.

A.2 Creation of new terms and definitions

The following guidelines should be followed when creating new terms and definitions:

- a) New terms and definitions included in IEEE standards should be written in plain English using clear and concise descriptions. Terms themselves should not be used in their own definitions.
- b) Needless customization should be avoided so that definitions have as broad an application as appropriate. Definitions that are too specific should be avoided.
- c) New definitions that serve to add a new definition to an existing term(s) of the same name should be different enough from the other term(s) so as to justify the addition. Having more than two or three acceptable definitions for any term is discouraged.
- d) Terms and definitions that are included in IEEE standards but that are taken from other sources must be accompanied by an appropriate permission acknowledgment. The sources should be identified in a parenthetical statement that immediately follows the term/definition.
- e) Supplemental material that accompanies a term for clarification but is not an official part of the actual definition should be included either in the body of the document or in a note that immediately follows the term/definition. Definitions should not include references to other clauses/subclauses in the standard.
- f) Definitions should have no commercial connotations and should be completely non-proprietary.
- g) Symbols should be defined as appropriate.
- h) Acronyms and abbreviations should be included in a separate subclause.

Suggestions for oversight (at the working group, committee, or society/standards committee level):

- It is recommended that every standards-developing society/standards committee have a definitions group of some kind. If a society has multiple groups (whether at the committee or working group levels), there should be one ruling group responsible for making ultimate decisions and resolving any differences.

- Working groups should be advised to ask themselves to technically justify new terms and their definitions before proposing them.
- New terms and definitions should be examined in consideration of: subject matter; existing terms in the *IEEE Standards Dictionary Online* and general-usage dictionaries; usage within other IEEE societies/IEEE SA committees; comparable international terms; usage in relevant literature; etc.
- The creation of new terms can be time consuming and may take place either before or after working group meetings and may take place in a subgroup before presenting to the working group.

A.3 Revision of existing terms and definitions

The following guidelines should be followed when revising existing terms and definitions:

- a) Because all terms, including revised terms, must be seen and approved by balloters, all existing terms that require revision should be included in revision drafts. A note indicating that the term is being revised may be appropriate.
- b) Groups should revise terms only if necessary. Previously published terms and definitions should not be changed due to possible widespread use in other standards. Revisions for minor or editorial changes is discouraged.

Suggestions for oversight (at the working group, committee, or society/standards committee level):

- Societies may appoint the task of revising terms to the same group responsible for the general oversight of the creation of terms and definitions.
- If the revision of an existing term is being done to include requirements of other societies, etc., communication should take place first with members of the definitions-review teams within those other groups so as to consider relevant factors.

A.4 International harmonization

For IEEE standards that are, might be, or will be used in the international arena, it is suggested that the text of the definitions also be included in the text of the standards themselves.

In some cases, if a particular IEEE definition is preferred over a definition used elsewhere in the international arena, this should be indicated.

Special attention should be given to definitions intended to be included in dual logo documents.

Suggestion for oversight (at the working group, committee, or standards committee level):

- When creating terms/definitions for international projects, it is appropriate to research any international requirements/differences.
- Questions regarding style for international projects should be directed to the IEEE SA content publishing staff.

Annex B

(informative)

Example of a draft standard

This annex contains an example of a draft standard that was prepared using the IEEE SA word template. It points out common style issues. This example is meant to be used as a quick and easy reference to issues discussed in this manual. In most instances, a clause or subclause has been provided for easy reference.

1 **P987.6™/D3**
2 **Draft Recommended Practice for**
3 **Preparing an IEEE Standards Draft**

4 Developed by the
5
6 **Standards Staff Engineering Committee**
7 of the
8 **IEEE Template Society**
9

10
11 Approved <Date Approved>
12

13 **IEEE SA Standards Board**
14

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Abstract: Key discussion points covered in the draft are stated here in a few complete sentences, using passive rather than active voice. The more specific the better since the abstract often populates search engines and catalog databases.

Keywords: designation, document development, draft, equation, figure, guide, IEEE 987.6™, introduction, list, purpose, recommended practice, scope, standard

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EXAMPLE

1 **Introduction**

2 This introduction is not part of IEEE P987.6/D3, Draft Recommended Practice for Preparing an IEEE Standards Draft.

3 The introduction of the frontmatter is informative. It serves to give readers context, including background,
4 key themes, history, etc.

5

6 **Acknowledgments**

7 Permissions have been granted as follows:

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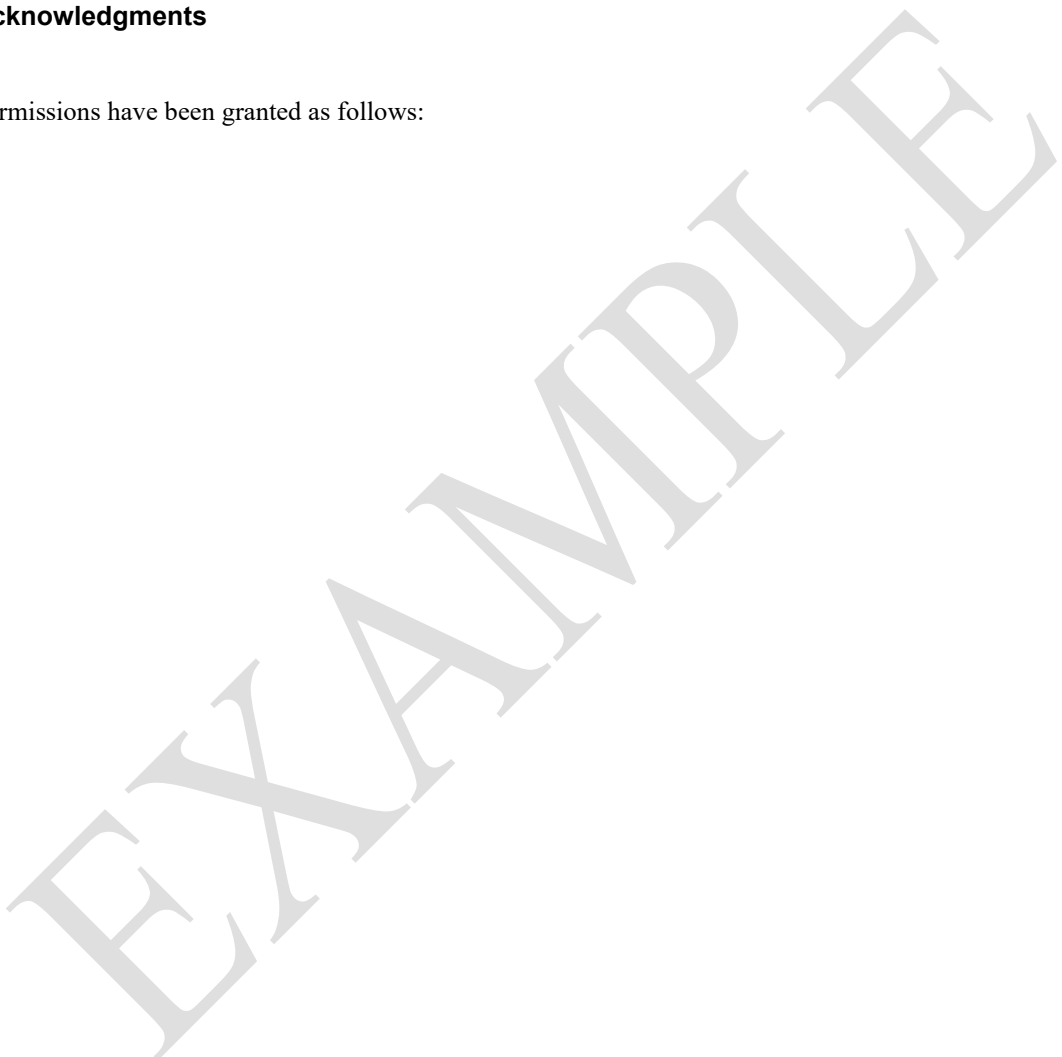
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2	1. Overview	7
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5	1.3 Word usage.....	7
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7	3. Definitions, acronyms, and abbreviations	8
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21		

EXAMPLE

1 Draft Recommended Practice for 2 Preparing an IEEE Standards Draft

3 1. Overview

4 1.1 Scope

5 The scope shall be within the technical boundaries, as determined by the balloting group, of the scope
6 submitted on the PAR.

7 If the standard incorporated Open Source, this should be noted in the Scpe along with a link to the Open
8 Source of the URL.

9 1.2 Purpose

10 The purpose shall be within the technical boundaries, as determined by the balloting group, of the purpose
11 submitted on the PAR.

12 1.3 Word usage

13 The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard
14 and from which no deviation is permitted (*shall* equals *is required to*).^{1,2}

15 The word *should* indicates that among several possibilities one is recommended as particularly suitable,
16 without mentioning or excluding others; or that a certain course of action is preferred but not necessarily
17 required (*should* equals *is recommended that*).

18 The word *may* is used to indicate a course of action permissible within the limits of the standard (*may*
19 equals *is permitted to*).

20 The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can*
21 equals *is able to*).”

22

¹ The word *must* is deprecated and cannot be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

² The word *will* is deprecated and cannot be used when stating mandatory requirements; *will* is only used in statements of fact.³ National Electrical Safety Code and NESC are both registered trademarks and service marks of The Institute of Electrical and Electronics Engineers, Incorporated.

1

2 **2. Normative references**

3 The following referenced documents are indispensable for the application of this document (i.e., they must
4 be understood and used, so each referenced document is cited in text and its relationship to this document is
5 explained). For dated references, only the edition cited applies. For undated references, the latest edition of
6 the referenced document (including any amendments or corrigenda) applies.

7 IEEE/ASTM SI 10™, American National Standard for Metric Practice.

8 Accredited Standards Committee C2-2012, National Electrical Safety Code® (NESC®).^{3, 4}

9 IEEE P802.21™ (Draft 14, November 2003), Draft Standard for Local and Metropolitan Area Networks—
10 Media Independent Handover Services.⁵

11 IEEE Std 91™, IEEE Standard Graphic Symbols for Logic Functions.^{6, 7}

12 IEEE Std 260.1™-2004, IEEE Standard Letter Symbols for Units of Measurement (SI Units, Customary
13 Inch-Pound Units, and Certain Other Units).^{8, 9}

14 ISO/IEC 27002-:2013, Information technology—Security techniques—Code of practice for information
15 security controls.¹⁰

16 NFPA 70, 2011 Edition, National Electrical Code® (NEC®).^{11, 12}

17 **3. Definitions, acronyms, and abbreviations**

18 **3.1 Definitions**

19 For the purposes of this document, the following terms and definitions apply. The *IEEE Standards*
20 *Dictionary Online* should be consulted for terms not defined in this clause.¹³

21 **acceleration-insensitive drift rate:** The component of ... *See also:* **drift rate; systematic drift rate.**

22 **code set:** *See:* **coded character set.**

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⁴ The NESC is available from The Institute of Electrical and Electronics Engineers at <http://standards.ieee.org/>.

⁵ Numbers preceded by P are IEEE authorized standards projects that were not approved by The IEEE SA Standards Board at the time this publication went to Sponsor ballot/press. For information about obtaining drafts, contact the IEEE.

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¹⁰ ISO/IEC publications are available from the ISO Central Secretariat at <http://www.iso.org/>. ISO/IEC publications are available in the United States from the American National Standards Institute at <http://www.ansi.org/>.

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¹² The NEC is published by the National Fire Protection Association (<http://www.nfpa.org/>). Copies are also available from The Institute of Electrical and Electronics Engineers at <http://shop.ieee.org/>.

¹³ The *IEEE Standards Dictionary Online* is available at: <http://dictionary.ieee.org>.

- 1 **coded character set:** A set of characters ... *Syn:* **code set.**
- 2 **drift rate:** The slope at a stated time of ... (adapted from ISO/IEC 9945-1:2003).
- 3 **input reference axis (IRA):** The direction of an axis ... *Contrast:* **output reference axis.**
- 4 NOTE—See 6.7.¹⁴
- 5 **output:** (A) Data that ... (B) The process of ...
- 6 **systematic drift rate:** That component of drift rate that ... (IEEE Std 260.1-2004).

7 **3.2 Acronyms and abbreviations**

8 DER	distributed emission regeneration
9 DIS	distributed interactive simulation
10 ISDN	integrated services digital network
11 LAN	local area network
12 PDU	protocol data unit

13 **4. Important elements of IEEE standards drafts**

14 **4.1 General**

15 IEEE drafts should be created using one of the approved IEEE SA templates. The templates have built-in
16 macro features that allow for easy tagging of each of the draft elements.¹⁵

17 Sources listed in the normative references clause shall also be cited in text. Explain the role and
18 significance of each normative reference. Note that IEEE drafts may be included in the normative
19 references clause as long as they are properly cited. See reference to IEEE P802.21 (Draft 14, November
20 2003) in Clause 2 of this sample.

21 NOTE 1—A normative reference is a document that users of the standard need to have on hand and understand in order
22 to correctly implement the material contained in an IEEE draft.

23 NOTE 2—Documents that serve as supplemental information that authors of the standard found useful when
24 researching the material, but that do not carry the same weight as the normative references, are usually informative and
25 therefore would belong in a bibliography (informative annex).

26 All IEEE standards shall use metric units as the primary units of measure. Customary equivalents may be
27 included in the text after the metric units in parentheses. In the case of tables, separate tables for metric and
28 customary units may be included. See National Electrical Safety Code® (NESC®) (Accredited Standards
29 Committee C2-2012) and National Electrical Code® (NEC®) (NFPA 70, 2011 Edition) for examples. For
30 more information on the use of metric in IEEE standards, see IEEE/ANSI SI 10. For guidance on the use of
31 letter symbols for units of measurement, refer to IEEE Std 260.1-2004.

¹⁴ Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.

¹⁵ IEEE SA approved templates can be found online at <https://standards.ieee.org/develop/drafting-standard/resources.html>.

1

2 4.2 Lists

3 Lists in a clause or subclause may be ordered or unordered.

4 The following is an example of a properly formatted ordered list:

- 5 a) Name of the manufacturer
- 6 b) Connection chart showing
 - 7 1) Full winding development
 - 8 2) Taps
- 9 c) Self-impedance (for linear coupler transformers)
 - 10 1) Reactance
 - 11 2) Impedance
 - 12 i) For volts
 - 13 ii) For amperes

14 The following is an example of a properly formatted unordered list:

- 15 — Begin with a capital letter.
- 16 — Include final punctuation for all items in the list if one item in the list is a complete sentence.

17 4.3 Tables

18 Tables should be cited in text and the significance of the tables explained. Table titles are positioned above
19 the tables. Table 1 shows the nomenclature of a properly formatted table.

20

Table 1—Table formatting

Column heading	Column heading	Column heading ^a	
		Column heading	Column heading
Line heading Subheading Subheading	Tabulated data (individual positions within the body of the table are called <i>cells</i>)		
Line heading			

NOTE 1—This table is provided as an example. The structure of actual tables may vary depending on the data being displayed.
NOTE 2—Use 0.75 *Xd* for hydrogenerators without amortisseur windings.

21 ^a Table footnotes are considered to be a normative part of the document.

22 Column headings are in bold and centered. If a table extends beyond one page, carry the title of the table
23 over to each subsequent page with “(continued)” after the title. Table notes are informative; table footnotes
24 are normative.

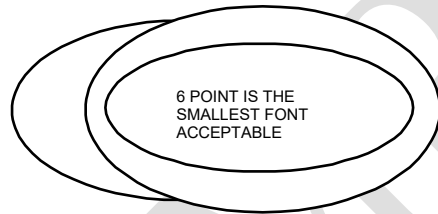
1 The following is an example of an informal table. Note that there is no title or table number. Use these
 2 sparingly. It is preferred that all tables are numbered and titled.

Cable type	Rated voltage (kV)
High pressure	69–161
Low pressure	10–29
Gas-filled	30–46
Low and medium pressure	15–161
Liquid-filled	230

3 **4.4 Figures**

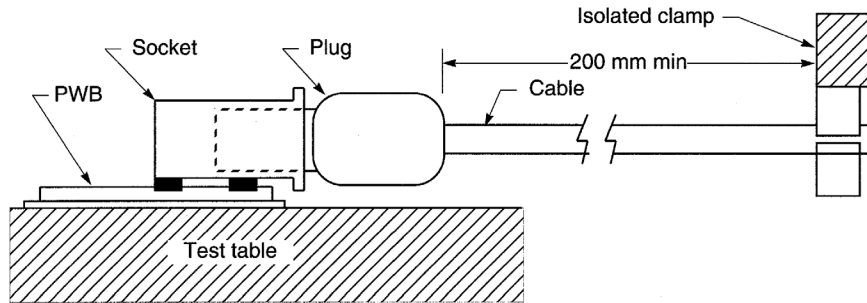
4 Figures should be cited in text and the significance of the figures explained. Figure titles are positioned
 5 below the figures themselves. Figures can be created using text or graphics software. Figure 1 and Figure 2
 6 show properly formatted figures.

SHORTER CAPTIONS
 SHOULD BE ALL CAPS,
 IN 8 POINT TYPE

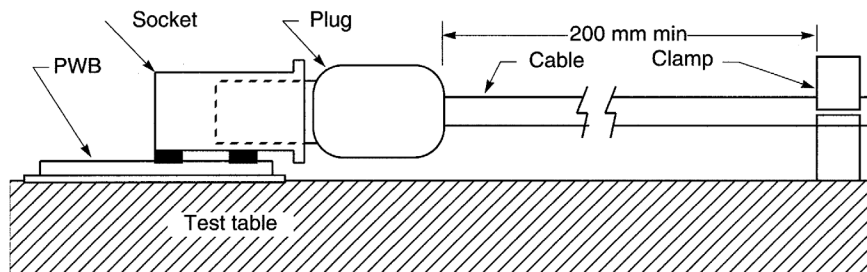


This is an example of 8 point
 Arial in initial capital (should not
 be used with all-caps caption)

7 **Figure 1—Typographical specifications for figure title**



a) vibration test



b) shock test

NOTE—Notes to figures are formatted between the graphic and the figure caption.

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2 **Figure 2—A sample of figure presentation**

3 **4.5 Equations**

4 Equations should be cited in text and the significance of each equation explained. The equation number
5 should be right-aligned. See Equation (1).

6
$$Y(x) = Y_0 \exp[-(x - x_0)^2 / (2f^2)] \quad (1)$$

7 where

8 $Y(x)$ is the amplitude of the Gaussian function at channel x

9 Y_0 is the height of the Gaussian at the centroid channel

10 x is the channel number

11 x_0 is the centroid of the Gaussian

12 f is the width of the Gaussian

13

EXAMPLE

1 **Annex A**

2 (informative)

3 **Sample bibliography**

4 Bibliographical references are resources that provide additional or helpful material but do not need to be
5 understood or used to implement this standard. Reference to these resources is made for informational use
6 only.

7 [B1] *Name of Book Title in Italics*. City of Publication, State: Name of Publisher, Year of Publication.
8 First and Last Page of Reference.

9 [B2] IEEE Std XXX™-YEAR, IEEE Standard for Something Industry Needs.

10

EXAMPLE

1 **Annex B**

2 (normative)

3 **Structure of a sample annex**

4 **B.1 Overview**

5 **B.1.1 Title**

6 Every annex shall be given a title and shall be designated either a normative or an informative annex.
 7 Notice that the numbering now contains the annex letter. See Equation (B.1):

8
$$Y(x) = Y_0 \exp[-(x - x_0)^2 / (2f^2)] \tag{B.1}$$

9 where

- 10 $Y(x)$ is the amplitude of the Gaussian function at channel x
- 11 Y_0 is the height of the Gaussian at the centroid channel
- 12 x is the channel number
- 13 x_0 is the centroid of the Gaussian
- 14 f is the width of the Gaussian

15 **B.1.2 Clause and subclause organization**

16 The material in an annex should be organized into clauses and subclauses just like the body text. There
 17 should be at least two subclauses in any subdivision so that if there is one second-level header, there should
 18 be at a minimum one other one.

19 **B.2 Material in annexes**

20 Tables, figures, equations, lists, etc., in an annex are formatted like they would be in the body of the text
 21 except that

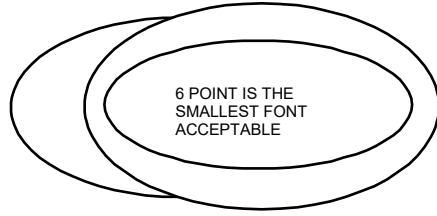
- 22 — Tables are numbered according to the annex letter (see Table B.1).
- 23 — Figures are labeled according to the annex letter (see Figure B.1).

24 **Table B.1—Sample table in an annex**

Column heading	Column heading	Column heading	
		Column heading	Column heading
Line heading	Tabulated data (individual positions within the body of the table are called <i>cells</i>)		
Subheading			
Subheading			
Line heading			

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SHORTER CAPTIONS
SHOULD BE ALL CAPS,
IN 8 POINT TYPE



This is an example of 8 point
Arial in initial capital (should not
be used with all-caps caption)

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Figure B.1—Sample figure in an annex

EXAMPLE

Annex C

(informative)

Example of a draft amendment/corrigendum

This annex contains an example of a draft amendment that was prepared using the IEEE SA Word template for amendments/corrigenda.

1 **P987.6™/D2**
2 **Draft Recommended Practice for**
3 **Preparing an IEEE Standards Draft**
4 **Amendment #**

5 Developed by the
6
7 **Standards Staff Engineering Committee**
8 of the
9 **IEEE Template Society**

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Abstract: Key discussion points covered in the draft are stated here in a few complete sentences, using passive rather than active voice. The more specific the better since the abstract often populates search engines and catalog databases.

Keywords: designation, document development, draft, equation, figure, guide, IEEE 987.6™, introduction, list, purpose, recommended practice, scope, standard

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EXAMPLE

1 **Introduction**

2 This introduction is not part of IEEE P987.6/D2, Draft Recommended Practice for Preparing an IEEE Standards
3 Draft—Amendment #

4 The introduction of the frontmatter is informative. It serves to give readers context, including background,
5 key themes, history, etc.

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EXAMPLE

1	Contents	
2	2. Normative references.....	7
3	4. Important elements of IEEE standards drafts.....	7
4	4.3 Tables.....	7
5	4.4 Figures.....	8
6	Annex C (informative) Glossary	9
7		
8		

EXAMPLE

1 Draft Recommended Practice for 2 Preparing an IEEE Standards Draft 3 Amendment

4 NOTE—The editing instructions contained in this **amendment** define how to merge the material contained therein into
5 the existing base standard and its amendments to form the comprehensive standard.

6 The editing instructions are shown in ***bold italic***. Four editing instructions are used: change, delete, insert, and replace.
7 ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the
8 change and describes what is being changed by using ~~strike through~~ (to remove old material) and underscore (to add
9 new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material.
10 Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used
11 to make changes in figures or equations by removing the existing figure or equation and replacing it with a new one.
12 Editing instructions, change markings, and this NOTE will not be carried over into future editions because the changes
13 will be incorporated into the base standard.

14

15 2. Normative references

16 *Change the following reference in Clause 2:*

17 IEEE Std P802.21™ (~~Draft 14, 21 November 2003~~), Draft IEEE Standard for Local and Metropolitan Area
18 Networks—Part 21: Media Independent Handover Services.

19 *Insert the following references in Clause 2 in alphanumeric order:*

20 IEEE P802.21a™ (D06, November 2011), Draft Standard for Local and Metropolitan Area Networks—
21 Part 21: Media Independent Handover Services—Amendment 2: Security Extensions to Media Independent
22 Handover Services and Protocol.

23 IEEE P802.21b™ (D06, November 2011), Draft Standard for Local and Metropolitan Area Networks—
24 Part 21: Media Independent Handover Services—Amendment 1: Extension for Supporting Handover with
25 Downlink Only Technologies.

26 4. Important elements of IEEE standards drafts

27 4.3 Tables

28 *Change Table 1 as follows:*

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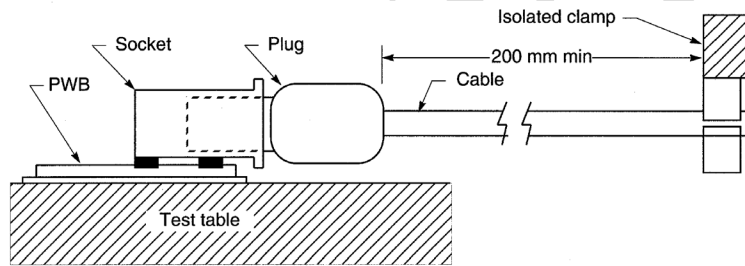
Table 1—Table formatting

Column heading	Column heading	Column heading ^a	
		Column heading	Column heading
Line heading	Tabulated data (individual positions within the body of the table are called <i>cells</i>)		
Subheading			
Subheading			
Line heading			
NOTE 1—This table is provided as an example. The structure of actual tables may vary depending on the data being displayed.			
NOTE 2—Use $0.75 X_d$ for hydrogenerators without amortisseur windings.			

2 ^a Table footnotes are considered to be a normative part of the document.

3 **4.4 Figures**

4 *Replace Figure 2 with the following:*



5

6 NOTE—Notes to figures are placed between the graphic and the figure caption.

7

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8

Figure 2—A sample of figure presentation

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1 **Annex C**

2 (informative)

3 **Glossary**

4 *Insert Annex C after Annex B. Add the following terms in alphabetical order:*

5 **circuit breaker:** A device designed to open and close a circuit by non-automatic means, and to open the
6 circuit automatically on a predetermined overload of current, without injury to itself when properly applied
7 within its rating.

8 **continuous current:** The maximum constant rms power frequency current that can be carried continuously
9 without causing further measurable increase in temperature rise under prescribed conditions of test, and
10 within the limitations of established standards.

11 **loading:** The modification of a basic antenna such as a dipole or monopole caused by the addition of
12 conductors or circuit elements that change the input impedance or current distribution or both.

13

14

15






16

EXAMPLE



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