

# IEEE Standards Style Manual

## 1. Overview

This manual establishes preferred style for the preparation of proposed IEEE standards. IEEE Standards Project Editors are available for advice and assistance throughout this process. Please note that many of the suggested guidelines can be adapted and restructured to suit the needs of a particular group; however, it is strongly recommended that working groups consult with IEEE Standards Project Editors before deviating from this style.

This manual is not intended to be a guide to the procedural development of standards.<sup>1</sup> Recommended manuals on this subject are the *IEEE-SA Standards Board Bylaws* [B3]<sup>2</sup>, the *IEEE-SA Standards Companion* [B4], and the *IEEE-SA Standards Operations Manual* [B5], also published by the IEEE Standards Department.<sup>3</sup> For examples of IEEE Standards style of drafts, please see Annex B. An example amendment can be found in Annex C.

## 2. References

The following standards shall be used, when applicable, in preparing manuscripts. When the following standards are superseded by an approved revision, the revision shall apply.

ANSI Y32.9-1972 (Reaff 1989), American National Standard Graphic Symbols for Electrical Wiring and Layout Diagrams Used in Architecture and Building Construction.<sup>4</sup>

ANSI 260.1-1993, American National Standard Letter Symbols for Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

ANSI 260.3-1993, American National Standard for Mathematical Signs and Symbols for Use in Physical Sciences and Technology.

ANSI 260.4-1996, American National Standard for Letter Symbols and Abbreviations for Quantities Used in Acoustics.

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<sup>1</sup>While this manual uses the term “standard,” its rules apply generically to guides and recommended practices as well.

<sup>2</sup>The numbers in brackets correspond to those in the bibliography in Annex A.

<sup>3</sup>All IEEE Standards manuals are available on the IEEE Standards World Wide Web site: <http://standards.ieee.org/guides/index.html>. Users are encouraged to visit this site for the most up-to-date information.

<sup>4</sup>This publication, as well as the subsequent ANSI standards appearing in this clause, are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA (<http://www.standards.ieee.org/>).

IEEE Std 91-1984 (Reaff 1994), IEEE Standard Graphic Symbols for Logic Functions.<sup>5</sup>

IEEE Std 91a-1991 (Reaff 1994), Supplement to IEEE Standard Graphic Symbols for Logic Functions.

IEEE Std 267-1966, IEEE Recommended Practice for the Preparation and Use of Symbols.

IEEE Std 280-1985 (Reaff 1997), IEEE Standard Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

IEEE Std 315-1975 (Reaff 1993), IEEE Standard Graphic Symbols for Electrical and Electronics Diagrams (Including Reference Designation Letters).<sup>6</sup>

IEEE Std 945-1984 (Reaff 1997), IEEE Recommended Practice for Preferred Metric Units for Use in Electrical and Electronics Science and Technology.

IEEE Std 991-1986 (Reaff 1994), IEEE Standard for Logic Circuit Diagrams.

IEEE/ASTM SI 10-1997, IEEE/ASTM Standard for the Use of the International System of Units (SI)—The Modern Metric System.<sup>7</sup>

### **3. Responsibilities of the sponsor and working group chair**

The sponsor of each project shall be responsible for reviewing the final draft to ensure that it is the complete and accurate document approved by the balloting group, that it meets the requirements of this manual, and that it is ready to be submitted to the IEEE-SA Standards Board. When approved by the IEEE-SA Standards Board, the draft will be prepared for publication by the IEEE Standards Project Editor.

The sponsor or a designated representative (usually the working group technical editor or chair) shall serve as the liaison between the working group and the IEEE Standards Project Editor to answer questions and to review the document when it is in its final stages of production to ensure that editorial changes have not affected the technical content of the standard.

### **4. Items to submit to the IEEE**

The sponsor of an IEEE Standards project shall be responsible for providing the IEEE-SA Standards Board with a complete, technically accurate draft of the proposed standard (in paper copy and electronic forms) that meets the requirements of this manual for content, style, and legibility. A cover letter also shall be submitted that states the software application/program (including version number) used to create the document, order of files on the disk, etc. (See 4.2 for further information on electronic submittal.) If applicable, written permission for any copyrighted material (text, figures, or tables obtained from an outside source) used within a project shall be submitted to the IEEE-SA Standards Board as well (see 5.1).

Prior to balloting, the sponsor is encouraged to submit a near-ready draft to an IEEE Standards Project Editor for editorial review. Project Editors are also available for questions that arise as the draft is prepared.

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<sup>5</sup>IEEE publications are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA (<http://standards.ieee.org/>).

<sup>6</sup>Bound with IEEE Std 315a-1986, Supplement to IEEE Std 315-1975.

<sup>7</sup>Formerly numbered IEEE Std 268-1992.

## 4.1 Paper copy of the draft

Paper copies of drafts shall be one column, double-spaced on 215 × 280 mm (8.5 × 11 in) paper. One side of the sheet only should be used. A margin of at least 25 mm (1 in) should be left on all sides of each page. Manuscript pages should be numbered consecutively, starting with the cover page as page 1. See Annex B for an example draft standard.

### 4.1.1 Copyright statements

All IEEE drafts are obligated to carry statements of copyright, as indicated by the Project Authorization Request (PAR).

As per legal counsel, the following information shall appear on the title page of every IEEE Standards draft (please note that *<current year>* shall be replaced with the current year of distribution):

Copyright © *<current year>* by the Institute of Electrical and Electronics Engineers, Inc.  
3 Park Avenue  
New York, NY 10016-5997, USA  
All rights reserved.

This is an unapproved draft of a proposed IEEE Standard, subject to change. Permission is hereby granted for IEEE Standards Committee participants to reproduce this document for purposes of IEEE standardization activities. If this document is to be submitted to ISO or IEC, notification shall be given to the IEEE Copyright Administrator. Permission is also granted for member bodies and technical committees of ISO and IEC to reproduce this document for purposes of developing a national position. Other entities seeking permission to reproduce portions of this document for these or other uses must contact the IEEE Standards Department for the appropriate license. IEEE is the sole entity that may authorize the use of certification marks, trademarks, or other designations to indicate compliance with the materials set forth herein. Use of information contained in the unapproved draft is at your own risk.

IEEE Standards Department  
Copyright and Permissions  
445 Hoes Lane, P.O. Box 1331  
Piscataway, NJ 08855-1331, USA

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

Copyright © *<current year>* IEEE. All rights reserved.  
This is an unapproved IEEE Standards Draft, subject to change.

### 4.1.2 Draft labeling

All copies of the draft shall be clearly labeled to reflect that they are not yet approved standards. 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 IEEE standards designation shall be structured, at a minimum, as *IEEE Pxxx/DXX*, where *xxx* represents the specific designation and *XX* represents the specific draft version of that document. The date of the draft shall also be included. Any additional information (such as the draft chapters) may be included at the discretion of the working group. The draft designation shall appear on each page of the draft in the same location for the sake of continuity (i.e., the upper right corner, the bottom right corner, etc.). See Annex B for examples of appropriate draft labeling.

### 4.1.3 Corrections

All approved corrections or changes to the final draft should be listed in a separate file, and a description should be provided to indicate where they are to be inserted into the text. If corrections are extensive, a new corrected draft shall be submitted with changes clearly indicated by strikethroughs for deleted text and underscores for new text. Changes to figures or tables shall be clearly indicated.

Technical changes shall not be made to a draft after balloting without recirculation, and certain editorial changes that affect the meaning of the text may require recirculation as well.

## 4.2 Electronic submittal

The electronic file of the standard shall be an *exact match* of the paper version submitted to the IEEE-SA Standards Board. In case of a discrepancy, the paper version shall prevail. Any discrepancies can cause serious delays in publication, and the IEEE-SA Standards Board may withhold approval until a correct electronic file is submitted.

For electronic submittal, the use of PC- or Macintosh-based file compression software to “zip” or “stuff” files onto a single 3 1/2 in disk, CD-ROM, or Zip™ disk is preferred. File transfer via File Transfer Protocol (FTP) is also encouraged and preferred for delivery of large electronic files. Smaller files may also be transferred via email. Compressed files should be created as “automatically self-extracting” so that they can be opened by IEEE Standards Department staff without the need for expansion software.

The IEEE Standards Department accepts electronic documents in a wide range of formats and from a wide range of software programs, as follows:

- *Word processing programs*: Files created in commonly used Windows® and Macintosh® word processors, such as Microsoft Word® and WordPerfect® are accepted. Word processing templates for IEEE Standards are available by contacting an IEEE Standards Project Editor or at [http://standards.ieee.org/resources/spasystem/templates/spastyle\\_v\\_6.0.doc](http://standards.ieee.org/resources/spasystem/templates/spastyle_v_6.0.doc).
- *Desktop publishing programs*: Currently, IEEE Standards Project Editors use the desktop publishing program FrameMaker®. Check with an IEEE Standards Project Editor before creating files in FrameMaker®. FrameMaker templates for IEEE standards are available at <http://standards.ieee.org/resources/spasystem/index.html> (under *Style Templates for IEEE Standards*). For those working groups with the capability of working in SGML or XML, please contact an IEEE Standards Project Editor.
- *Graphics programs*: For information on creating and submitting graphics, see 16.1.

The IEEE has strict rules concerning the electronic posting of draft standards.  
Contact an IEEE Standards Staff Liaison for further information.

## 5. Permissions

### 5.1 Copyrighted material from other organizations

When standards developers choose to use copyrighted text, tables, or figures and possibly modify or adapt the material to suit their needs, permission to do so shall be requested from the copyright owner. It is preferred, however, that copyrighted material be referenced rather than reprinted. Standards developers are encouraged to request permission from copyright owners as soon as the decision is made to include copyrighted material in a draft. As draft documents are made available to the public, it is important to acknowledge the ownership of any material that is not original. The following credit line shall be used in the event that specific language from the copyright holder is not available:

<Indicate material> reprinted from <copyright owner, title of publication>, year of publication.

Standards developers incorporating any previously copyrighted material into an IEEE standard shall obtain written permission from the copyright owner, which in most cases is the publisher, *prior* to submittal to the IEEE-SA Standards Board. Copies of the letters requesting and granting permission should be forwarded directly to the IEEE Standards Department and shall be included in the submittal to the IEEE Standards Review Committee (RevCom). Obtaining this permission is the responsibility of the sponsor; any delay in obtaining this will also delay publication of the standard. Sample letters of request and permission appear in Annex D. Please contact the IEEE Standards Contracts Administrator with any questions about copyright and permission.

## 5.2 Submission of independently developed documents

The submission of independently developed documents for consideration as potential IEEE standards or to serve as base documents for standards development is also encouraged. In order to ensure unencumbered development, from working group decisions through the consensus balloting process, a written permission release of unrestricted world rights to use a document as the basis for development of an IEEE standard and for all future revisions and editions of that standard is required. The process of standards development may result in changes to the base document; the IEEE must maintain the right to amend the document as it sees fit to meet the needs of this process.

In some cases, use of an independently developed document as a potential IEEE standard may require that the IEEE obtain a license agreement from the copyright owner allowing development and distribution of the standard. The copyright owner may also require that IEEE pay royalties or other valuable considerations on the use and distribution of the independently developed document. Therefore, it is recommended that the IEEE Standards staff be notified as early in the process as possible so that the staff will have sufficient time to make necessary arrangements.

It is also recognized that, in giving permission to use the document as the basis for an IEEE standard, the copyright owner(s) do not forfeit the copyright to their original text and its future development outside of the IEEE; however, the copyright owner(s) must agree not to refer to their document as an IEEE standard. The copyright owner(s) will be credited for their initial development of the base document in the front matter of the approved IEEE standard. Contact the IEEE Standards Contracts Administrator to obtain a copy of the approved letter to certify the copyright release, or, if necessary, a license agreement.

## 6. Patents

The IEEE is not responsible for identifying all patents for which a license may be required by an IEEE standard or for conducting inquiries into the legal validity or scope of those patents that are brought to its attention. However, the IEEE Standards patent policy allows for the inclusion of patented technology if the working group believes there is technical justification to do so (see Clause 6 of the *IEEE-SA Standards Board Bylaws* [B3] and subclause 6.3 of the *IEEE-SA Standards Board Operations Manual* [B5]). An appropriate notice statement will appear in any standard that contains known patented technology. A different notice appears in all standards that do not knowingly include patented technology at the time of approval of the standard. These notices are contained in 6.3.1 of the *IEEE-SA Standards Board Operations Manual* [B5].

As draft standards are made available to the public prior to approval by the IEEE-SA Standards Board, it is advisable to include the appropriate public notice. It is also necessary to request a letter of assurance from the patent holder prior to adding the “known patent” statement to the draft. The patent holder is not obligated to provide such an assurance, but most agree to do so. If the patent holder does not agree to provide a letter of assurance for known patents that may affect the practice of the standard, it may be necessary to include an additional notice. In any event, it is always advisable to request letters of assurance from patent holders as soon as possible once a decision has been reached to include the patented technology.

Sample letters of request and letters of assurance can be found in Annex A of the *IEEE-SA Standards Companion* [B4].

Please note that any reference to patents shall be made only in the front matter of the standard.

## 7. Trademarks

Trademarks or other proprietary designations should be avoided in standards, and references to commercial equipment should be generic. If a sole source exists for essential equipment or materials, the trademarked name shall be identified in the standard and marked as such (with either ® or ™), as appropriate, upon first reference. The proper use guidelines for trademarks shall be determined by the trademark owner. Trademark owners must grant written permission before their trademarks may be referenced in a standard.

All trademarks shall be credited to the trademark owner in the front matter of the standard. The following text shall introduce any mention of specific trademark information:

The following information is given for the convenience of users of this standard and does not constitute an endorsement by the IEEE of these products.

## 8. Trial-Use standards

The IEEE-SA Standards Board allows the publication of standards documents as trial-use standards if, subsequent to publication, input from a broad constituency is needed. All trial-use standards shall be approved according to the IEEE-SA Standards Board process. The IEEE Standards Project Editor shall insert the following disclaimer in each trial-use standard:

Publication of this trial-use standard for comment and criticism has been approved by the Institute of Electrical and Electronics Engineers. Trial-Use standards are effective for 24 months from the date of publication. Comments for revision will be accepted for 18 months after publication. Suggestions for revision should be directed to the Secretary, IEEE-SA Standards Board, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, and should be received no later than <18 months from publication date>. It is expected that following the 24-month period, this trial-use standard, revised as necessary, shall be submitted to the IEEE-SA Standards Board for approval as a full-use standard.

## 9. Front matter

### 9.1 Title

The title should be exactly the same as that on the approved PAR, and in all cases shall reflect the scope of the standard in as few words as possible. All titles of IEEE drafts shall start with the word *Draft*, followed by

- a) “Standard [for]” when the standard specifies mandatory requirements
- b) “Recommended Practice [for]” when the standard provides recommendations
- c) “Guide [for]” when the standard furnishes information
- d) “Trial-Use (Standard, Recommended Practice, or Guide) [for]” when the document will be published for a limited period, no longer than two years, before it becomes an official IEEE document

Working groups interested in publishing auxiliary materials, such as interpretations (documents issued to explain and clarify the intent of passages within a standard), should contact an IEEE Standards Project Editor for more information.

When an IEEE standard covers only 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. The use of nonquantitative terms (such as *high* and *low*, *large* and *small*, *wide* and *narrow*) should be avoided. Acronyms and 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 procedure stated in 13.6 shall be followed.

## 9.2 Abstract and keywords

The inclusion of abstracts 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. For this reason, abstracts and keywords shall be included on the title page of each standard. Abstracts should be based on the scope and purpose of the standard as indicated on the PAR; keywords should highlight key terms and phrases from the abstract.

## 9.3 Introduction and committee lists

An introduction shall be supplied by the working group, giving 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. An introduction is not a part of a proposed standard; therefore, the following statement shall appear above the text:

(This introduction is not part of IEEE Pxxx, *title*.)

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 (see Figure 1). Individuals who also contributed to the preparation of the document may be included in addition to the working group list. Full first names are preferred over initials. Titles (Dr., Ms., P. E.) shall not be included with proper names. If organizational representatives have balloted the standard, they shall be included in the introduction before the list of voting members of the balloting group, which is usually provided by the IEEE Standards Department.

If footnotes are necessary in an introduction, they shall be noted with lowercase letters (a, b, c, d, etc.).

At the time this standard was completed, the Reuse Processes Working Group had the following membership:		
<b>John Smith, <i>Chair</i></b>		
<b>Ellen Brown, <i>Vice Chair</i></b>		
Peter Armstrong	Patrick Donahue	Gregory Olive
Jessica Bradley	Bob Garnett	Thad Osterhout
Matthew Carroll	Jennifer Haase	Richard Pinola
Steve Connors	Phillip Hall	Joseph Varady
Paul Dobbs	Mark Jones	Thomas Winship
	Daniel Meyers	

**Figure 1—Example of working group list**

## 9.4 Acknowledgments

In the past, some sponsors have included acknowledgment lists of companies in the front or back matter of their published standards. The IEEE-SA Standards Board discourages these acknowledgments. However, individuals may be acknowledged for their contributions to the standard.

## 9.5 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) shall be supplied. The next series of subclauses (identified by three digits) may be included when deemed appropriate by the IEEE Standards Project Editor and the Working Group. Lists of tables and figures shall not be included in the table of contents. Only the appropriate clauses, subclauses, and normative and/or informative annexes shall be listed. (See Annex B for a sample table of contents.)

# 10. Document structure

## 10.1 Order of clauses

The first clause of a standard shall always be an overview. If the standard contains references and definitions, they shall be Clause 2 and Clause 3, respectively. The clauses that follow Clause 2 and 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).

## 10.2 Overview

The overview shall be a succinct description of the scope of the standard and may include, if necessary, the purpose, applications, and other areas that the working group considers relevant. These optional topics may be presented as separate subclauses of the overview. If these separate subclauses are presented, a minimum of two subclauses are required.

This clause shall be entitled *Overview* unless it contains only a scope; in this case, the clause shall be entitled *Scope* without any further subdivision. Detailed discussions of the general technical content should not be part of the overview. If the standard contains annexes, these should be described in the overview.

### 10.2.1 Scope

The scope of the standard shall explain *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 shall be discussed. The scope shall be the same in context as the scope set forth in the current PAR for the standards project. Please note the distinction from the purpose of the standard discussed in 10.2.2.

### 10.2.2 Purpose

A paragraph describing the purpose is not mandatory. However, if included, the purpose of the standard and its intended application shall be included in a separate subclause. The purpose shall explain *why* the standards project is needed. The purpose shall be the same in context as the purpose set forth in the current PAR for the standards project. Please note the distinction from the scope of the standard discussed in 10.2.1.

## 10.3 References

References are a balloted part of an IEEE standard; therefore, the balloting group shall approve the contents of the Reference clause.

References are those normative documents that contain material that must be understood and used to implement the standard. Thus, referenced documents are indispensable when applying the standard. The role and relationship of each referenced document shall be explained in the body of the standard.

IEEE and other nationally or internationally recognized standards developing organizations (SDOs) are to be preferred as the source of references. Specifications published by other organizations may be cited provided that

- The document is judged by the balloting group to have wide acceptance and authoritative status, and
- The document is publicly available at reasonable cost.<sup>8</sup>

Specifications that are not standards present the problem that they might be revised without notice in a manner that might adversely affect any standard that lists them as normative references. Specifications that are cited as normative references shall include the version or date of publication in the citation.

If the standard is intended for international adoption, the working group should take into consideration requirements for normative references by international organizations, such as the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). These requirements may include procedures for justification of normative references that are not international standards. Please contact an IEEE Standards Project Editor for information about specific requirements.

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 for the format of bibliographic entries.)

Reference to withdrawn standards may be made; however, sponsors are cautioned that withdrawn standards may contain obsolete or erroneous information and may be difficult to retrieve.

Sponsors are discouraged from using unpublished draft standards as references unless they are dated, readily available, and retrievable. The Sponsor shall provide a copy of the cited draft to be placed on file in the IEEE Standards Department. Please consult with an IEEE Standards Project Editor if such inclusion is necessary.

### 10.3.1 Structure of references clause

The reference clause is introduced with the following sentence:

This standard shall be used in conjunction with the following publications.

The IEEE Standards Project Editor shall list the most current edition of the specifications cited on the advice of the sponsor. In some cases, the most current specification is not the one required. It is important for the sponsor to remember that the edition listed in the balloted document will be the one that appears in the published document. Therefore, it is the responsibility of the sponsor to not only determine which edition of a specification is applicable in each case, but also to ensure that the balloted document lists the correct version.

If the balloted document contains the following sentence, then on the advice of the sponsor, the most current editions of the references shall always be used:

When the following specifications are superseded by an approved revision, the revision shall apply.

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<sup>8</sup>EPRI documents cannot be cited in the reference clause because they are not readily available.

The sponsor should endeavor to supply complete and current information for references. Note that IEEE Standards Project Editors cannot verify that references to updated editions of specifications are accurate; therefore, it is up to the sponsor to consult the latest editions to see if they still apply.

### 10.3.2 Style for reference entries

References shall be listed in alphanumerical order by designation, including the year and full title. A footnote shall be inserted in the text after the first reference is cited in order to tell the reader where the references are listed. (See 4.1 of Annex B for an example of this type of footnote.)

*Example:*

ANSI T1.602-1989, Telecommunications—Integrated Services Digital Network (ISDN)—Data-Link Layer Signalling Specification for Application at the User-Network Interface.

IEEE Std 802.3u-1995, IEEE Standards for Local and Metropolitan Area Networks—Supplement to Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications—Media Access Control (MAC) Parameters, Physical Layer, Medium Attachment Units, and Repeater for 100 Mb/s Operation.

IEEE P802.9b (Draft 4, March 1994), Local and Metropolitan Area Networks—Functional Specification for AU-to-AU Interworking.

ISO/IEC 7498-4:1989, Information processing systems—Open Systems Interconnection—Basic Reference Model— Part 4: Management framework.

ISO/IEC FDIS 8824-1 (20 September 1999), Information technology—Abstract Syntax Notation One (ASN.1): Specification of basic notation.<sup>9</sup>

ISO/IEC 9945-1:1996 (IEEE Std 1003.1, 1996 Edition), Information technology—Portable Operating System Interface (POSIX<sup>®</sup>)—Part 1: System Application Program Interface (API) [C Language].

ITU-T Recommendation Z.100 (1993), Specification and description language (SDL), Rev. 1.

In the preceding example, note that IEEE Standards style is shown for joint standards and draft standards from several organizations. Note that draft standards are placed in the appropriate alphanumerical order (anticipating their location upon final approval).

References shall be cited by designation (e.g., IEEE Std 1226.6-1996) in the text, in tables, in figures, or in notes at the point where the reference applies.

## 10.4 Definitions

### 10.4.1 General terminology usage

English words shall be used in accordance with their definitions in the latest edition of *Webster's New Collegiate Dictionary* [B8]. Electrical and electronics terms not defined in *Webster's New Collegiate Dictionary* [B8] shall be used in accordance with their definitions in the most recent edition of *The IEEE Standard Dictionary of Electrical and Electronics Terms* [B6]. Working groups are strongly encouraged to use definitions that already exist in *The IEEE Standard Dictionary of Electrical and Electronics Terms* [B6] instead of creating new definitions. It is not necessary to restate terms defined in *The IEEE Standard Dictionary of Electrical and Electronics Terms* [B6]. However, if the working group feels that quoting definitions

<sup>9</sup>Presently at the state of Draft International Standard.

from *The IEEE Standard Dictionary of Electrical and Electronics Terms* [B6] would enhance the usefulness of the document, they may do so. If the definitions in *The IEEE Standard Dictionary of Electrical and Electronics Terms* [B6] do not reflect usage specific to the document, or if terms used are not defined in *The IEEE Standard Dictionary of Electrical and Electronics Terms* [B6], then appropriate definitions shall be provided. Users are also encouraged to use the *IEC Multilingual Dictionary of Electricity, Electronics, and Telecommunications* [B2].

#### 10.4.2 Construction of the definitions clause

A definitions clause, typically Clause 3 (unless the standard does not contain references), is provided for those not already familiar with the terminology in question. Definitions shall appear in alphabetical order and the term defined shall be written out completely. Acronyms shall not be defined in the definitions clause. Each term shall be numbered as a subclause of the definitions clause. Each definition shall be a brief, self-contained description of the term in question. The term should not be used in its own definition.

All terms defined in IEEE standards are incorporated into *The IEEE Standard Dictionary of Electrical and Electronics Terms* [B6]. For this reason, it is important that terms and definitions have as general an application as possible. Definitions shall not include references to other parts of the standard. An explanatory 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. After the definition, the source shall be cited in parentheses. It is the sponsor's responsibility to obtain the appropriate permissions if a standard uses a term from another source (see 5.1).

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

The following is an example of a correctly styled definitions clause:

For the purposes of this standard, the following terms and definitions apply. *The IEEE Dictionary of Electrical and Electronic Terms* should be referenced for terms not defined in this clause.

**3.1 acceleration-insensitive drift rate:** The component of systematic drift rate that has no correlation with acceleration. *See also:* **systematic drift rate.** (IEEE Std 528-1994).

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

**3.3 coded representation:** *See:* **coded character set.**

**3.4 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.

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

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

## 10.5 Acronyms and abbreviations

If the standard makes extensive use of acronyms or abbreviations, a subclause within the definitions clause may be provided. SI units should not be included in this list.

The acronyms and abbreviations subclause is not meant to take the place of the definitions clause. If a definition is needed, the term should be added to the definitions clause as well.

Acronyms and abbreviations, followed by the full term only, shall be listed in alphanumeric order. Refer to ANSI Z39-18-1993 and IEEE Std 280-1985 for the style of presentation of abbreviations.

*Example:*

DER	distributed emission regeneration
DIS	distributed interactive simulation
ISDN	integrated services digital network
ISO	International Organization for Standardization
LAN	local area network
PDU	protocol data unit

For information on the use of acronyms and abbreviations in text, see 13.6.

## 10.6 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 shall be referenced in the text by the word *Annex* and its letter only (for example, “see Annex A”). Annexes shall appear in the order in which they are referenced in the body of the standard (for example, the first annex mentioned shall be Annex A, the second Annex B, and so on). Note that this rule means that normative and informative annexes will be intermixed. An exception to this rule is the bibliography. The bibliography shall be either the first or last annex of the standard.

### 10.6.1 Normative

Normative annexes are official parts of the standard that 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 conformance test procedures or tables. Some standards place syntax definitions, lists of keywords, or printed source code in normative annexes. Normative annexes may also be used for context-specific applications of the standard.

### 10.6.2 Informative

Informative annexes are included in a standard for information only and are not an official part of the standard itself. Standards writers should carefully consider the nature of the material placed in informative annexes. The working group should also understand that informative annex material is considered part of the balloted document and copyrighted to the IEEE. As such, it shall be submitted to the IEEE-SA Standards Board and is not subject to change after approval.

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

## 10.7 Index

Indexes are discouraged unless the document is very long or complicated. However, the working group may include an index in a draft standard when it is deemed necessary or helpful to the reader. Since most indexes are generated electronically, it is important to consult with an IEEE Standards Project Editor before setting up index tags in an electronic file to ensure that the index tags can be maintained and updated for publication. The IEEE Standards Department 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 the IEEE Standards Department whether to use it. (Note that preparing an index will add time to the publication schedule.) Working groups interested in including an index should consult *The Chicago Manual of Style* [B1] or another reliable source on index preparation. Please note, however, that indexes created for an IEEE document will index by subclause number rather than page number.

*Example:*

albatross, 3.4.5.1–3.4.5.5  
antenna, 3.2.1, Clause 9, 12.3.4  
axiom, 4.5.6, A.4.5

## 11. Numbering in text

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 shall be numbered by adding a decimal point and number to the clause number (for example, 5.1). Subclauses may be divided into further subclauses by adding a second decimal point and number (for example, 5.1.1). Five numbers separated by decimal points is the maximum acceptable subdivision (for example, 5.1.1.1.1). If necessary, the material should be reorganized to avoid subdivisions beyond this point.

Clauses and subclauses shall be divided into further subclauses only when there is to be more than one subclause. In other words, clauses and subclauses should not be broken down into further subclauses if another subclause of the same level does not exist. For example, Clause 1 shall not have a subclause 1.1 unless there is also a subclause 1.2.

All clause and subclause headings shall consist of a number and a title. The text follows immediately after the subclause title on a new line. The terms *clause* or *subclause* shall not be used in headings or references except when referring to major clause headings (for example, “see Clause 5”). All other cross-references shall be made by simply referring to the number (for example, “see 5.1”).

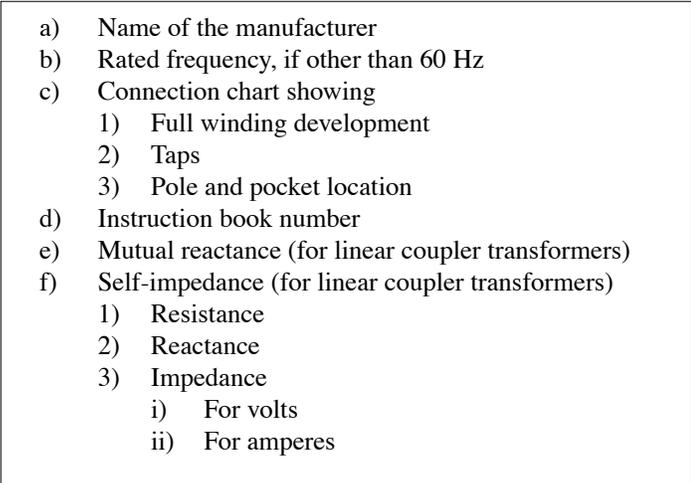
Standards shall not be published with line numbers. Therefore, the working group shall change all cross-references to line numbers to clause or subclause numbers.

### 11.1 Annexes

Consecutive capital letters and a title shall be used to identify each annex. Text shall be organized and numbered as described in this clause, with the following exception: clause and subclause numbers shall 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* shall appear in its title and shall preface the clause and subclause numbers in the text. Figures and tables included in these clauses shall also carry the identifying letter of the annex in which they appear, followed by a period. For example, the first figure in Annex A shall be identified as Figure A.1.

## 11.2 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 further subdivision of the items is necessary, 1), 2), 3); i), ii), iii); etc., should be used to form a tiered list. Only one ordered list may be presented in any subclause to avoid confusing cross-references. Closing punctuation should be omitted in lists of short items or phrases. Punctuation should be used for sentences. Figure 2 provides examples of the different levels of these lists. Clause 22 contains some examples of unordered lists.

- 
- 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**

## 11.3 Exceptions

If standards developers have a valid reason for wishing to diverge from the organization and numbering system described in this clause, they should consult with an IEEE Standards Project Editor as early as possible in the project's development.

## 12. Homogeneity

Uniformity of structure, of style, and of terminology shall 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 shall be identical, as far as possible. Analogous wording shall be used to express analogous provisions; identical wording shall be used to express identical provisions.

The same term shall 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 shall be avoided. As far as possible, only one meaning shall be attributed to each term used.

## 13. Word usage

### 13.1 Shall, should, may, and can

The word *shall* is used to indicate 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*). The use of the word *must* is deprecated and shall not be used when stating mandatory requirements; *must* is used only to describe unavoidable situations. The use of 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* is used to indicate 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; or that (in the negative form) a certain course of action is deprecated but not prohibited (*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*).

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

### 13.2 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 in 5.1 through 5.9.

### 13.3 Gender-Neutral language

In order to reflect the changing practices in language usage, the IEEE Standards Department uses, in as many cases as possible, generic titles (such as *chair* rather than *chairman*) in the body of the standard. The following practices shall apply:

- a) When writing in the third person, the phrase *he or she* shall be used. The male or female pronoun alone or the variations *he/she* or *s/he* shall not be used. Also, the pronoun *they* shall not be used as a singular pronoun.
- b) If a particular sentence becomes cumbersome when *he or she* is used, the sentence should be rewritten in the plural or completely rewritten to avoid using pronouns. The indefinite pronoun *one* should be avoided. In references to a company, the pronoun *it*, not *we* or *they*, should be used.

### 13.4 Use of the terms *safe* or *safety*

Generally, it is preferable to 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*, it 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.

### 13.5 Use of the second-person form of address

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

### 13.6 Abbreviations and acronyms

Technical abbreviations and acronyms should be used to save time and space, but only if their meaning is unquestionably clear to the reader. The first use shall be spelled out, followed by the abbreviation or acronym itself in parentheses. Exceptions to this are approved SI units. A list of abbreviations and acronyms may be included as a separate clause, if necessary (see 10.5).

Abbreviations and acronyms should be avoided in titles of standards. However, if such use is warranted, the procedure stated in the previous paragraph shall be followed.

Refer to ANSI 260.1-1993, ANSI 260.4-1996, and IEEE Std 280-1985 for the style of presentation of abbreviations.

### 13.7 Hyphenation

In most cases, compound adjectives (such as *fiber-optic* cable, *lead-acid* batteries, *power-operated* valve assemblies) should be hyphenated. IEEE Standards Project Editors check documents for consistency of hyphenation; when the working group has a decided preference (such as *life cycle* process), that preference will be enforced. The use of hyphenated multiple adjectives (such as *compressed-air-actuated* power tools) should be limited to cases where such use is necessary to ensure comprehension.

### 13.8 Capitalization

The initial letter of the first word shall be capitalized in

- Clause, subclause, and annex headings
- Specific cross-references in text [e.g., Table 1, Figure 12, Note 2, Equation (3)]
- Captions for figures

- Captions for tables
- Column and line headings in tables (see Table 1)
- Lettered and numbered list entries

## 14. Units

### 14.1 Numbers

The following rules shall be observed:

- a) Decimal points shall be used to indicate fractions in numbers rather than commas. However, if the standard in question is intended for ISO/IEC, see Clause 22.
- b) To facilitate the reading of decimals, a zero shall be placed in front of the decimal point (see 15.3.2).
- c) Arabic numerals shall be used for all units of measure, time, and quantity. In general text, isolated numbers of less than 10 shall be spelled out. Arabic numerals shall always be used before a unit of measurement. If a quantity of a unit is being represented by an Arabic number, that number shall always be followed by the unit symbol. Numbers applicable to the same category should be treated alike throughout a paragraph; numerals should not be used in some cases and words in others.
- d) If tolerances are provided, the unit shall be given with both the basic value and the tolerance (150 m ± 5 mm). Ranges may be written with a dash and without repeating the unit (115–125 V). Text and dashed representations of ranges shall not be combined (“from 25 V–50 V”).

### 14.2 Metric system

In 1995, the IEEE implemented a new metric policy (IEEE Policy 9.20), which calls for measured and calculated values of quantities to be expressed in metric units [SI (Système International d’Unites)] in IEEE publications as of January 2000. (See IEEE/ASTM SI 10-1997 for guidance in metric practice.) This means that all new standards and revised standards submitted for approval shall now use metric units exclusively in the normative portions of the standard. Inch-pound data may be included, if necessary, in footnotes or annexes that are informative only.

Policy 9.20 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.” SCC14, as part of the coordination process, shall review requests for individual exceptions and shall report its recommendations to the IEEE-SA Standards Board. This Implementation Plan does not require metric products to be substituted for inch-based products.

#### *Exceptions:*

- 1) IEEE/ASTM SI 10-1997 gives a specific exception for trade sizes, such as the AWG wire series and inch-based standards for fasteners. Such data need not be translated into metric terms.
- 2) Also excepted are those cases, such as plugs and sockets, where a mechanical fit to an inch-based product is required.

For further information, see IEEE/ASTM SI 10-1997 and ANSI 260.1-1993.

## 14.3 Letter symbols

For expressing the units in which quantities are measured, letter symbols are preferred to abbreviations. A symbol represents a unit or quantity independent of a particular language. Abbreviations, on the other hand, are shortened words or names in a particular language and may be different in other languages; for example, for electromotive force, the letter symbol is E, whereas the abbreviation is emf in English, fem in French, and EMK in German.

### 14.3.1 Letter symbols for units

Letter symbols for units are written in lowercase letters, except for those that are formed from proper names and a very few that are not formed from Roman letters. Even if the symbols appear where the other lettering is all uppercase, such as in titles and figures, lowercase letter symbols shall remain lowercase. Unit symbols are the same for both singular and plural and are not followed by a period. Hyphens should be avoided between a quantity and a letter symbol. However, a hyphen can be added if an ambiguity might arise.

Letter symbols for units are listed in ANSI 260.1-1993.

### 14.3.2 Letter symbols for quantities

Letter symbols for quantities shall comply with IEEE Std 280-1985. When standards for letter symbols in particular fields have been established, they should be used. Deprecated units shall be avoided.

The same letter symbols should be used for the same quantity throughout a particular standard regardless of the units employed or of the special values assigned.

## 15. Tables

Tables provide a clear and concise way of presenting large amounts of data in a small space. Table 1 shows the nomenclature used for the parts of a table, and Table 2 provides a substantive example that can be used as a model.

**Table 1—Nomenclature for the parts of a table**

Column heading	Column heading	Column heading	
		Column subheading	Column subheading
Line heading Subheading Subheading	Tabulated data (Individual positions within the body of the table are called cells)		
Line heading			

**Table 2—A substantive example**

Type of source(s)	Type of calculation					
	First cycle		Interrupting		Medium-voltage circuit breaker close and latch <sup>a</sup>	
	Multiply SCA by	Multiply Xd by	Multiply SCA by	Multiply Xd by	Multiply SCA by	Multiply Xd by
Induction motors Above 75 kW at 1800 rpm	1.0	1.0	0.667	1.5	1.000	1.0
Above 190 kW at 3600 rpm	1.0	1.0	0.667	1.6	1.000	1.0
All others 37 kW and above	1.0	1.0	0.333	3.0	0.833	1.2
All smaller than 37 kW	1.0	1.0	NEGLECT	NEGLECT	—	—

NOTE—Use 0.75 Xd for hydrogenerators without amortisseur windings.  
Reprinted with permission from *Electrical Transmission and Distribution Reference Book*, East Pittsburgh, PA: Westinghouse Electric Corporation, 1964.

<sup>a</sup>Refers to calculations for medium-voltage circuit breakers.

## 15.1 Labeling and presentation of tables

Except for informal tables (see 15.5), tables shall be given a number and a title and shall be cited in the text with the word *Table* followed by the number. See 15.2 for information on the numbering of tables. Tables should be boxed and ruled, as shown in Table 1 and Table 2. Whenever possible, tables should be organized to fit on a single page. When a table must carry over for more than one page, complete column headings should be repeated at the top of successive pages. The table number and title should be repeated at the top of the page as follows: “Table 1—Title (*continued*).”

## 15.2 Numbering and capitalization

Tables shall be numbered consecutively in a separate series and in the order of their reference in the text (for example, Table 1, Table 2, Table 3). Hyphenated numbers shall 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 (for example, Table 6-1, Table 6-2, etc.).

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

Tables shall be referenced in the text by the word *Table* and their number only (for example, “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 shall be capitalized in

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

NOTE—See 16.2 for information on the numbering of figures.

## 15.3 Presentation of data and table format

### 15.3.1 Units of measure

Units of measure shall always be provided either in the title, in parentheses in the column headings, 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 shall be used in column and line headings wherever possible. See ANSI Z39-18-1993 and other standards in Clause 2 for the appropriate abbreviations and symbols for use in standards.

### 15.3.2 Numerical values

To facilitate the comprehension of numbers, digits shall be separated into groups of three, counting from the decimal point toward the left and right. The groups shall be separated by a space, rather than by a comma, period, or dash. If the magnitude of the number is less than one, the decimal point shall 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 shall be aligned at the decimal point. The width of the columns may vary to accommodate the length of the longest entry in each column. Only as many significant digits should be used as the precision of data justifies. Decimals shall be used in tabulations unless fractions are commonly used in the field. Fractions and decimals shall not be combined in the same table. A dash shall be used to indicate the lack of data for a particular cell in a table.

## 15.4 Notes and footnotes to tables

A note to a table is not an official part of the standard and should immediately follow the table to which it belongs. If the text is mandatory, it should appear in the body of the standard or in a footnote to the table. Notes to a table should appear before any table footnotes in the following order:

- a) *General notes.* A general note applies to the table as a whole and should be introduced by the word NOTE(S) set in upright capital letters.
- b) *Crediting source.* Use either of the following credit lines:
  - 1) Reprinted with permission from... (Use when data is derived from another source from which permission to reproduce has been obtained.)
  - 2) Source: (Use when data is derived from another IEEE standard.)
- c) *Notes on specific parts of the table.*

Footnotes to tables may contain mandatory information. They shall be marked with lowercase letters starting with "a" for each table.

### NOTES

1—See Table 2 for examples of these notes.

2—See Clause 18 for information on the style for notes.

## 15.5 Informal tables

Simple tabulations that are not referred to outside of the subclause in which they appear may be organized into informal tables that do not exceed five or six lines in depth; no table number or title is required. However, it is recommended that all tables be numbered and titled if possible.

*Example:*

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

## 16. Figures

### 16.1 Creating figures

Figures appropriate for use in IEEE standards may be black and white graphs, charts, schematic drawings, or photographs. Most working groups now prepare figures in electronic form by using a drawing program or scanner to capture printed material. It is important to keep in mind when preparing figures that coordination with the IEEE Standards Department at the earliest stage can help ensure the most accurate and timely publication of a standard after approval. An IEEE Standards Project Editor should be contacted while figures are still in development.

The following guidelines should be followed when preparing electronic art:

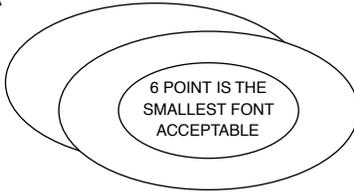
- a) Consistent typographical specifications for text notations (“callouts”) used in artwork should be used. The IEEE Standards Department prefers an 8-point sans serif font (such as Helvetica or Arial) for callouts. In no case should callouts be in a font smaller than 6 points. All capital letters or mixed uppercase and lowercase letters may be used, depending on the amount of text, as long as the presentation is consistent throughout the document. Letter symbols not normally capitalized shall always be lowercased (see Figure 3).
- b) A separate electronic file should be created for each figure in a document and named in correspondence to the figure number (e.g., FIG1.TIF). Multiple figures under a single figure number (e.g., Figure 2a and Figure 2b) should be saved as separate files with corresponding names (e.g., FIG2A.TIF, FIG2B.TIF). Although saved as separate files, they should be submitted to the IEEE on a single disk, CD-ROM, or Zip™ disk, or as a single compressed file. (See 4.2 for complete guidance on electronic submittal.)
- c) Graphics files should be saved as Encapsulated PostScript (EPS), Tagged Image File Format (TIFF), Windows Metafile Format (WMF), or Graphics Interchange Format (GIF). If you cannot provide graphics in these formats or would like to inquire about other possible formats that may be used, please contact an IEEE Standards Project Editor.

Some working groups cannot provide electronic files of figures. In this case, the figures provided to the IEEE Standards Department shall be submitted in *camera-ready copy* form; that is, as first-generation prints with

typeset or typed text notations. A separate package of figures should be provided. If photographs must be used, glossy black and white prints shall be provided by the working group.

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

SHORTER CAPTIONS  
SHOULD BE ALL CAPS  
8-POINT HELVETICA



This is an example  
of 8-point Helvetica  
type in uppercase and  
lowercase (should not be  
mixed with all-caps callouts)

**Figure 3—Typographical specifications for figure callouts**

A figure shall be labeled by the word *Figure* followed by a number, a dash, and a title as exemplified in Figure 3 above.

## 16.2 Numbering and capitalization

Figures shall be numbered consecutively in a separate series and in the order of their reference in the text (for example, Figure 1, Figure 2, Figure 3). Hyphenated numbers shall not be used except in standards of considerable 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 (for example, Figure 6-1, Figure 6-2, etc.).

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

A figure shall be referenced in the text by the word *Figure* and its number only (for example, “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.”

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

NOTE—See 15.2 for information on the numbering of tables.

## 16.3 Notes to figures

A note to a figure is not an official part of the standard and should immediately follow the figure to which it belongs. If the text is mandatory, it should appear in the body of the standard. Notes to a figure should appear in the following order:

- a) *General notes.* A general note applies to the figure as a whole and should be introduced by the word NOTE(S) set in upright capital letters.
- b) *Crediting source.* Use either of the following credit lines.
  - 1) Reprinted with permission from... (Use when figure is derived from another source from which permission to reproduce has been obtained.)
  - 2) Source: (Use when figure is derived from another IEEE standard.)

NOTE—See Clause 18 for information on the style for notes.

## 17. Mathematical expressions

Letter symbols from applicable IEEE standards should be used in preparing mathematical expressions (see Clause 2).

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.

### 17.1 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 referred to in the text by its number [for example, “see Equation (1)”].

### 17.2 Presentation of equations

A multiplication sign ( $\times$ ), rather than a multidot ( $\cdot$ ), shall be used to indicate multiplication of numbers and numerical values.

Although the stacked style of fractions is preferred, exceptions shall 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 and italic text in equations 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 text.

*Example:*

$$x = r \sin \theta \cos \phi \tag{1}$$

where

- $x$  is the x-coordinate on a cartesian plane,
- $r$  is the length of the position vector,
- $\theta$  is the angle between the position vector and a coordinate axis,
- $\phi$  is the angle from the plane in which both the axis and the position vector lie to either of the coordinate planes including that axis.

Table 3 lists a number of functions and operators that are commonly set in upright text.

**Table 3—Functions and operators commonly set in upright 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)

Further examples of the presentation of equations are given in Equation (2) and Equation (3). Equation (2) illustrates the use of italics and exponential function in an equation. Equation (3) shows the alternative use of exponential function to avoid double superscripts.

$$C_{d_s} = \frac{\lambda T_s}{1 - e^{-\lambda T_s}} \quad (2)$$

where

- $C_{d_s}$  is the correction factor for decay during sample collection,
- $\lambda$  is the radionuclide decay constant,
- $T_s$  is the sampling duration,
- $e$  is the base of the natural logarithm.

$$Y(x) = Y_0 \exp[-(x - x_0)^2 / (2f^2)] \quad (3)$$

where

- $Y(x)$  is the amplitude of the Gaussian function at channel  $x$ ,
- $Y_0$  is the height of the Gaussian at the centroid channel,
- $x$  is the channel number,
- $x_0$  is the centroid of the Gaussian,
- $f$  is the width of the Gaussian (FWHM = 2.355 $f$ ).

## 18. Notes and footnotes

### 18.1 Notes

Explanatory statements may be used in the text for emphasis or to offer informative suggestions about the technical content of the standard. These notes provide additional information to assist the reader with a particular passage. A note in the text is *not* an official part of the approved standard and should follow that paragraph to which it belongs. Such statements shall be set apart from the text by introducing them with the capitalized word “NOTE—”. Within each subclause, multiple notes in sequence should be numbered. (See Annex B for examples.)

## 18.2 Footnotes

Footnotes may be included in a standard only for information, clarification, and aid in the use of the standard. Mandatory requirements shall not be included in footnotes because footnotes are not officially a part of the standard, but they shall be included in the draft that is submitted to the IEEE-SA Standards Board.

Footnotes in the front matter shall be indicated separately. Front-matter footnotes should be indicated with lowercase letters.

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

<sup>2</sup> See Footnote 1.

## 18.3 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 written for the same related 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.

*Example:*

<p><b>WARNING</b></p> <p>Serious injury may result if the following parameters are not followed exactly.</p>
--

## 19. Bibliography

Complete and current information for bibliographic entries shall be supplied by the working group. The bibliography always shall be an informative numbered annex that appears as either the first or last annex of the standard (see Annex B for an example bibliography).

Bibliographic items shall be cited in the text, in tables, in figures, or in notes 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 bibliographical reference number (e.g., [B4]) shall 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 bibliographical reference number shall be cited.

### 19.1 Standards

Standards shall be listed alphanumerically by designation and title.

*Example:*

[B1] ANSI T1.602-1989, Telecommunications—Integrated Services Digital Network (ISDN)—Data-Link Layer Signalling Specification for Application at the User-Network Interface.

[B2] ISO/IEC 7498-4:1989, Information processing systems—Open Systems Interconnection—Basic Reference Model—Part 4: Management framework.

## 19.2 Articles in periodicals

Articles in periodicals shall be listed in alphabetical sequence and 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 Fujimoto, N., “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.

## 19.3 Books

Books shall be listed in alphabetical sequence and 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 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., Hanson, W. E., and Thornburn, T. H., *Foundation Engineering*, 2d ed. New York: McGraw-Hill, 1972, pp. 230–292.

NOTE—Consult *The Chicago Manual of Style* [B1] for more information on how to list books and periodicals.

## 19.4 Other types of bibliographies

The examples shown in 19.4.1 through 19.4.5 are other types of bibliographical entries.

### 19.4.1 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.*

### 19.4.2 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.

### 19.4.3 Articles presented at conferences

[B3] Cookson, A. H., and Pedersen, B. O., “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.

### 19.4.4 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.

### 19.4.5 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 Hexafluoride.” Ph.D. diss., University of Windsor, 1974.

## 20. Revisions

Working groups with access to the electronic publishing tools used by the IEEE Standards Department should be aware that source files of text and graphics are available for electronic revision. Therefore, those who are working on a revision should contact an IEEE Standards Project Editor.

## 21. Amendments and corrigenda

Changes to standards can be implemented by issuing amendments and corrigenda. (These were previously referred to as supplements.)

An amendment is a document that contains new material to be incorporated into an existing IEEE standard and that may contain substantive corrections to that standard as well. A corrigendum is a document that contains only substantive corrections to an existing IEEE standard.

Amendments and corrigenda are balloted documents that give explicit instructions on how to change the text in an existing base standard or an existing amendment. The requirements for amendments and corrigenda are the same as for standards. However, these documents also contain editing instructions for each change. This is important because the user should understand how the changes affect the base standard. The editing instructions are also important because these documents are incorporated into the base standard sometime in the future.

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 herein 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 small corrections in existing text or tables. The editing instruction

specifies the location of the change and describes what is being changed by using ~~strikethrough~~ (to remove old material) and underline (to add new material). **Delete** removes existing material. **Insert** adds new material without disturbing the existing material. Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. **Replace** is used to make large changes in existing text, subclauses, tables, or figures by removing existing material and replacing it with new material. Editorial notes 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.

## 22. IEEE standards and ISO, IEC, and ITU

### 22.1 Preparing for submissions

Working groups preparing IEEE standards may wish to submit their standards to ISO, IEC, or ITU. The IEEE Standards Department assists working groups in preparation of their documents from both a stylistic and technical perspective.

If there is an interest in such submissions, working group chairs should contact an IEEE Standards Project Editor early in the development cycle of their standards. Issues involving coordination and/or cooperation with committees from ISO, IEC, or ITU should be directed to your Standards Staff Liaison. The requirements contained in the IEEE copyright notice for draft standards shall be followed (see 4.1.1).

### 22.2 Adoption of ISO and IEC style requirements

The IEEE Standards Department has harmonized its style with the principles of ISO/IEC style, as stated in the *ISO/IEC Directives Part 3*. However, the IEEE has made some exceptions to the ISO/IEC directives. The following guidelines may prove helpful in understanding these exceptions:

- The IEEE shall continue to designate and to title standards as done previously. If a working group intends that its standard shall one day be an ISO/IEC standard, the chair should consult with IEEE staff when preparing the PAR so that the title incorporates ISO/IEC considerations.
- While ISO and IEC do not credit individual members of their developing committees, the IEEE shall continue to credit its working group and the voting members of the balloting group in the informative front matter of standards. Groups developing ISO/IEC standards should consult with IEEE Standards Project Editors to clarify their actions with regard to this.
- ISO and IEC mandate the use of a foreword in their documents. The foreword gives the development history of the document and contains statements on the normative and informative structure of the standard. This is in addition to the IEEE introduction.
- The IEEE shall continue to use the period as a decimal sign rather than the comma.
- Since American English is acceptable internationally, the IEEE shall continue to use American English grammar and spelling in its standards. This should pose no difficulty to groups developing international standards. In cases where British spelling is used in an internationally recognized term (e.g., “Fibre Distributed Data Interface”), that spelling may be retained.
- ISO/IEC lists international standards first in reference clauses; the IEEE lists standard references alphanumerically. ISO/IEC also uses an introductory paragraph different from IEEE standards, and working groups looking at ISO/IEC standardization should consider using this paragraph, which is available from IEEE Standards Project Editors.
- ISO and IEC use periods in abbreviations and acronyms; however, the IEEE style of not using abbreviations and acronyms is acceptable.

The following information should be useful for those who are developing standards that will be forwarded to ISO or IEC:

- The use of trade names, product names, and trademarks within the standard should be avoided.
- All subclauses within a clause shall be titled.
- Families of documents should be similar in organization and in their use of definitions.
- The foreword should contain any mention of closely related standards, changes from any previous editions of the standard, and the structure of the normative and informative parts of the standard. Historical or specific technical commentary about the preparation of the standard should be included in the introduction.
- All tables and figures should be titled and numbered.
- Photographs should be avoided as artwork; if possible, concepts should be depicted as drawings rather than photographs.
- Cross-references using page citations are not permitted.

## Annex A

(informative)

### Bibliography

The IEEE Standards Department follows *The Chicago Manual of Style* [B1] and *Words Into Type* [B9] for general style issues.

The most recent editions of the following texts are recommended as guides on points of editorial style and usage:

[B1] *The Chicago Manual of Style*. Chicago: The University of Chicago Press.

[B2] *IEC Multilingual Dictionary of Electricity, Electronics, and Telecommunications*, Amsterdam: Elsevier Science Publishers.

[B3] *IEEE-SA Standards Board Bylaws*, New York: Institute of Electrical and Electronics Engineers, Inc.

[B4] *IEEE-SA Standards Companion*, New York: Institute of Electrical and Electronics Engineers, Inc.

[B5] *IEEE-SA Standards Operations Manual*, New York: Institute of Electrical and Electronics Engineers, Inc.

[B6] *The IEEE Standard Dictionary of Electrical and Electronics Terms*—Sixth Edition, New York, Institute of Electrical and Electronics Engineers, Inc.

[B7] Miller, C., and Swift, K. *The Handbook of Nonsexist Writing*. New York: HarperCollins.

[B8] *Webster's New Collegiate Dictionary*. Springfield, MA: Merriam-Webster, Inc.

[B9] *Words Into Type*. Englewood Cliffs, NJ: Prentice-Hall, Inc.

## **Annex B**

(informative)

### **Example draft standard**

The following pages contain an example draft standard that 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.

IEEE P10062/D4.2, January 2000

The title of the standard should be the same as that on its PAR. For more information about this, see 9.1.

Remember to include the standard designation, the draft number, and the date on every page. See 4.1.2 for more information.

# IEEE P10062/D4.2 Draft Recommended Practice for Acquiring Software

This is the draft copyright statement that shall appear on the title page. For more information, see 4.1.1.

Prepared by the Acquiring Software Working Group of the Software Engineering Standards Committee

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Piscataway, NJ 08855-1331, USA

This notice shall appear at the bottom of each page of the draft. See 4.1.1 for more information.

Be sure to number every page of the draft.

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This is an unapproved IEEE Standards Draft, subject to change.

These are dashed lists. A dashed list can be used singly and is used when there is a lettered list within the same subclause. This avoids confusing cross-references. For more information, see 11.2.

### Introduction

Since the introduction is not a part of the standard, this statement needs to appear.

(This introduction is not a part of IEEE P10062, Draft Recommended Practice for Acquiring Software.)

This introduction provides some background on the rationale used to develop this recommended practice. This information is meant to aid in the understanding and usage of this recommended practice.<sup>a</sup>

This recommended practice describes the management and execution of software acquisition activities. It is intended for the following:

- Individuals or organizations who use software and acquire that software from suppliers
- Individuals or organizations who acquire software from a developer for resale to other individuals or organizations
- Individuals or organizations who influence how software is acquired from suppliers
- Suppliers interested in providing high-quality software to acquirers

This recommended practice is designed to help organizations and individuals

- Incorporate quality considerations during the definition, evaluation, selection, and acceptance of supplier software for operational use
- Determine how supplier software should be evaluated, tested, and accepted for delivery to end users

This recommended practice is intended to satisfy the following objectives:

- a) Promote consistency within organizations in acquiring third-party software from software suppliers
- b) Provide useful practices on including quality considerations during acquisition planning
- c) Provide useful practices on evaluating and qualifying supplier capabilities to meet user requirements
- d) Provide useful practices on evaluating and qualifying supplier software
- e) Assist individuals or organizations judging the quality of supplier software for referral to end users

Note that when a standard is a recommended practice or guide it should be referred to as such within the document.

Note that a colon is used to introduce a list only when the words "following" or "follows" are used in the introductory sentence, or if the sentence is complete grammatically. If the introduction is an incomplete sentence, then a colon is not used.

<sup>a</sup>This is for example purposes only.

Front matter footnotes should be indicated with lowercase letters.

**The use of this title is optional. It should be used if the introduction is divided into sections.**

IEEE P10062/D4.2, January 2000

## Participants

At the time this recommended practice was completed, the Software Acquisition Working Group had the following membership:

**The working group is responsible for supplying the working group list. For more information on working group and other committee lists, see 9.3.**

Karen Allison  
Ellen M. Augustine  
David L. Boudreau  
Rick Burgess  
Christopher Cooke  
Patricia M. Daggett

**Phillip C. Marriott, *Chair***  
**Flo Harteloo, *Vice Chair***

Thomas Gray  
Paul Haller  
Frank Henninger  
Lloyd Johnson  
Miles Kehoe  
Bob Kessler

Louis R. Mills  
Rafael E. Padilla  
Robert H. Randolph  
David P. Schwartz  
Paulette Spink  
Richard Taylor

The following member of the balloting committee voted on this standard:

(to be supplied by IEEE)

**Only balloters who vote are listed in the standard.**

**If the balloting has been done by the IEEE, the balloting roster will be supplied by the IEEE Standards Project Editor at the time of publication.**

**Contents** ————— **For more information on what should be included in the table of contents, see 9.5.**

- 1. Overview ..... 5
  - 1.1 Scope ..... 5
  - 1.2 Purpose ..... 5
- 2. References ..... 6
- 3. Definitions ..... 6
- 4. Introducing the software acquisition process ..... 7
  - 4.1 Software acquisition life cycle ..... 7
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  - 4.3 Using the software ..... 9
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  - A.2 Example figure in an annex ..... 10
- Annex B (informative) Bibliography ..... 11

Whether the annex is  
 normative or informative  
 shall be included in the  
 annex title in parentheses.  
 For more information,  
 see 10.6.

**Listing the contents  
 of the clauses of an  
 annex is optional.**

# Draft Recommended Practice for Software Acquisition

The first level within a standard is called a clause. Further subdivisions are called subclauses.

## 1. Overview

This recommended practice is divided into four clauses. Clause 1 provides the scope of this recommended practice. Clause 2 lists references to other standards that are useful in applying this recommended practice. Clause 3 provides definitions that are either not found in other standards, or have been modified for use with this recommended practice. Clause 4 establishes the nine steps involved in a software acquisition process, relates each of these steps to a major acquisition phase, and identifies the key inputs and outputs of each step.

This recommended practice also contains two annexes. Annex A explains how to number tables and figures in annexes. Annex B provides bibliographical references, such as EPRI documents [B1].<sup>1</sup>

### 1.1 Scope

This is a recommended practice for performing software acquisitions. It describes a set of useful quality practices that can be selected and applied during one or more steps in a software acquisition process.

### 1.2 Purpose

This recommended practice is meant to provide organizations with criteria to be used during a software acquisition process.

The first bibliographical reference cited in the document should have this footnote.

<sup>1</sup>The numbers in brackets correspond to those of the bibliography in Annex B.

Clause 1 is always the overview. It shall contain a scope, and may contain a purpose and other subclauses. For more information, see 10.2.

This is how a publication listed in the bibliography should be referenced within the standard. For more information, see Clause 19.

When referring to an annex within the text, "Annex" should start with a capital letter A.

References are those documents that must be available to the user of the standard for its implementation. Items shall be listed in alphanumeric order. See 10.3 for more information.

The first sentence shall introduce all references. The second sentence is optional.

## 2. References

If the standard contains references, these shall be listed in Clause 2.

This recommended practice shall be used in conjunction with the following publications. If the following publications are superseded by an approved revision, the revision shall apply.

ASTM 1340-90, Standard Guide for Rapid Prototyping of Computerized Systems.

EIA IS-64, Two Millimeter, Two-Part Connectors for Use with Printed Boards and Backplanes, March, 1991.

IEC 60050-161 (1990-09), International Electrotechnical Vocabulary. Chapter 161: Electromagnetic compatibility.

IEEE Std 610.12-1990, IEEE Standard Glossary of Software Engineering Terminology.

IEEE Std 694-1985 (Reaff 1994), IEEE Standard for Microprocessor Assembly Language.

IEEE P1014.1 (D2, March 1993), Draft Standard for Futurebus+/VME64 Bridge.

Also, include the latest draft number and the date of this latest draft.

When referencing a draft, "Std" is not included in the designation. Instead, a "P" (for project) comes directly before the standard number.

If the standard includes definitions, these shall be included in the clause immediately following the reference clause. If the standard does not contain references, then the definitions shall be listed in Clause 2. See 10.4 for more information.

Each term should be numbered and shall be in alphabetical order.

## 3. Definitions

These sentences shall introduce the definitions.

For the purposes of this recommended practice, the following terms and definitions apply. *The IEEE Standard Dictionary of Electrical and Electronics Terms* should be referenced for terms not defined in this clause.

**3.1 acquisition:** The process of obtaining a system or software product.

**3.2 developer:** A person or organization that performs development activities (including requirements analysis, design, testing through acceptance) during the software life cycle process.

**3.3 emanations security:** Protection of electromagnetic emanations of systems from unauthorized interception and analysis, and protection of the system from electromagnetic interference.

See also: **tempest.**

See 10.4.2 for more information on cross-references.

Only the first letter of the first word and proper nouns shall be capitalized in clause and subclause titles. This is also true for table and figure titles. For more information, see 13.8.

## 4. Introducing the software acquisition process

### 4.1 Software acquisition life cycle

The software acquisition life cycle represents the period of time that begins with the decision to acquire a software product and ends when the product is no longer available for use. It typically includes a planning phase, contracting phase, product implementation phase, product acceptance phase, and follow-on phase. This life cycle provides an overall framework within which most software acquisitions occur (see IEEE Std 830-1993).<sup>2</sup>

The phases in the life cycle are broadly defined by a set of milestones that establish the beginning and ending of each phase. Some phases may have a longer duration than others or may include more activities than other phases. These phases and their key milestones are as follows:

- a) *Planning phase.* This phase begins when the idea or need is established for acquiring software and ends when the Request for Proposal (RFP) is released.
- b) *Contracting phase.* After the RFP is released, this phase includes activities necessary to ensure that the products of the supplier and services can satisfy the quality criteria of the acquirer before signing the contract.
- c) *Product implementation phase.* This phase covers the period from contract signing until the software product has been received. A key activity is monitoring the supplier's efforts to ensure that all work and milestones are satisfactorily completed prior to delivery of the software product.
- d) *Product acceptance phase.* This phase includes all activities necessary to evaluate, test, and accept the software product. It begins when the software product is received and ends when the product is accepted.
- e) *Follow-on phase.* After the software product is accepted, this phase includes using the product to meet the objectives of the acquirer and evaluating user satisfaction with the software product, its documentation, and support provided from the supplier. This phase continues until all provisions provided in the contract have been completed or until the software product is no longer available for use.

This is an example of a lettered list. For more information, see 11.2.

In this example, the items in italics are explained in the text following. Though this technique helps to make the item stand out, it is not mandatory.

Each of these phases and their key milestones are summarized in Table 1. A special feature of this table includes a listing of the software acquisition process steps associated with each life cycle phase.

NOTE—Users should pay particular attention to the information in the footnotes to this table.

Notes always start with the word "NOTE" in capital letters, followed by a dash, and are set in 9-point type.

When referring to a table within the text, "Table" should start with a capital letter T. See 15.2 for more information.

<sup>2</sup>For information on references, see Clause 2.

For information on footnotes, see 18.2.

See Clause 15 for more information on tables. Note that table titles appear above the table, and that the tables are numbered consecutively within the standard.

Table 1—Recommended diagnostic characteristics

In table titles, column headings, and cell headings, only the first letter of the first word and proper nouns shall be capitalized. For more information, see 15.2.

Procedure	New transformer	Service-aged transformer
Power factor	< 0.5%	< 2.0%
Total dissolved gas <sup>a</sup>	< 0.5%	< 0.8%
Moisture content	< 10 ppm	< 15 ppm
Turns ratio	—	Within 0.5% of nameplate

For more information on letter symbols, see 14.3.

Use a dash for missing data. For more information, see 15.3.2.

Footnotes within tables and figures should be lettered. For more information, see 15.4 and 16.3.

<sup>a</sup>If units are equipped with nitrogen blankets, total dissolved gas should not exceed 1.0%.

#### 4.2 Nine steps in acquiring quality software

The software acquisition process provides a structure of major acquisition steps that are applicable to the acquisition of either fully developed software or modified-off-the-shelf software. The activities contained in each step all bear upon the development of a software product with the potential for high quality. Other related project objectives may also be improved upon or enhanced through the application of quality principles.

When referring to a figure within the text, "Figure" should start with a capital letter F. See 16.2.

For an understanding of the steps that an acquirer and supplier go through, see Figure 1.

Each step in the software acquisition process has certain key inputs and outputs. These are identified in Table 3. Note that outputs from various steps are also inputs to subsequent steps. Overall, defining the inputs and outputs provides a better understanding of each of the steps, which are explained in 5.1 through 5.9.

$$V_r = \frac{P_z}{I}$$

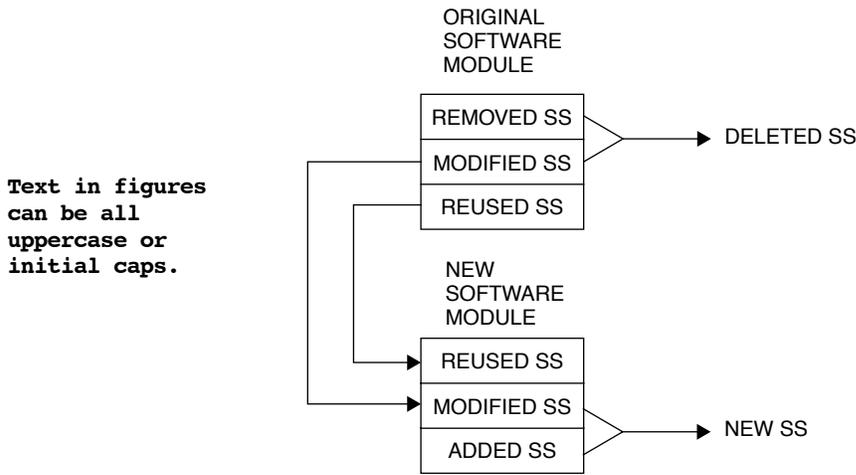
(4)

See 13.2, which explains the appropriate use of the word which.

where

- $V_r$  is the in-phase component voltage (V),
- $P_z$  is the power (W),
- $I$  is the current in excited winding (A).

For more information on equations, see Clause 17.



**Text in figures can be all uppercase or initial caps.**

**Figure 1—Source statements counts**

**See Clause 16 for more information on figures. Note that figure titles are positioned below the figure and that the figures are numbered consecutively within the standard.**

### 4.3 Using the software

The objective is to identify both good and bad aspects of the software acquisition and to perform necessary corrective action.

**NOTES**

- 1—An analysis should be conducted on the software acquisition contract to evaluate contracting practices, evaluate user satisfaction with the product, and evaluate supplier performance.
- 2—Other types of contracts should be examined.

**This is an example of plural notes. For more information on notes, see Clause 18.**

For more information on annexes, see 10.6.

## Annex A

(informative)

### Example annex

This line indicates whether the annex is informative or normative. For more information, see 10.6.

#### A.1 Example table in an annex

In annexes, tables are numbered alphanumerically. The letter stands for the letter of the annex. (When there is only one annex in a standard, use the letter A.) Immediately following the letter is a period and a number starting from one. For more information, see 15.2.

Table A.1—Software engineering standards

Step	Standard	Role
All	IEEE Std 610.12-1990	Terminology
1	IEEE Std 730-1989 IEEE Std 1042-1987	Description of Quality Assurance Process Description of Configuration Management Process
2	IEEE Std 1058.1-1987	Description of Project Management Process
3	IEEE Std 830-1993 ISO/IEC 9126:1991	Format and Content of Software Requirements Specification Definition of Quality Characteristics
4	IEEE Std 1209-1992	Description of Software Evaluation Process

Below is an example annex footnote.<sup>3</sup>

#### A.2 Example figure in an annex

Unlike annex table and figure titles, footnotes in an annex are numbered continuously from the standard. For more information, see 18.2.

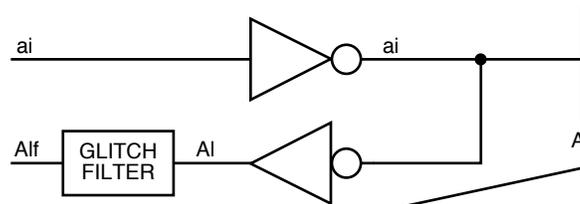


Figure A.1—Signal conventions

In annexes, figures are numbered alphanumerically. The letter stands for the letter of the annex. (When there is only one annex in a standard, use the letter A.) Immediately following the letter is a period and a number starting from one. For more information, see 16.2.

<sup>3</sup>This is for example purposes only.

**The bibliography shall contain publications that are for purposes of information or documentation only. For more information, see Clause 19.**

**The Bibliography is always informative.**

## **Annex B**

(informative)

**Since EPRI standards are not readily available to the public, they cannot be used as references and therefore must be referenced in the bibliography.**

### **Example bibliography**

[B1] Bridges, J. E., Vainberg, M., and Willis, M. C., "Impact of Recent Developments in Biological Electrical Shock Safety Criteria," *IEEE Transactions on Power Delivery*, vol. PWRD-2, no. 1, pp. 238–248, Jan. 1987.

[B2] 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.

[B3] IEEE Std 1045-1992, IEEE Standard for Software Productivity Metrics.

[B4] Willis, R., and Deutsch, M., *Software Quality Engineering*. Englewood Cliffs, NJ: Prentice Hall, 1988.

[B5] Yau, S.S. and Collofello, S., "Some stability measures for software maintenance," *IEEE Transactions on Software Engineering*, vol. SE-6, no. 6, pp. 545–552, Nov. 1980.

*This article proposes logical stability metrics for software maintenance such as those that result in propagation of change within modules and across module boundaries.*

**In general, publications other than standards (journal articles, magazine articles, books) should be placed in the bibliography. For exceptions, see 10.3 and Clause 19.**

**For annotated bibliographies, indent the explanatory notes and set them in italics. For more information, see 19.4.1.**

**Bibliographic entries should be listed in alphanumeric order. For more information, see Clause 19.**

## **Annex C**

(informative)

### **Example amendment**

The following pages contain an example amendment. It contains the body of the amendment only. Please follow the instructions in Annex B for the title page, copyright information, and foreword.

# Amendment to IEEE Standard for Device Communications—Physical Layer Interface

NOTE—The editing instructions contained in this amendment define how to merge the material contained herein 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 small corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~strike through~~ (to remove old material) and underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make large changes in existing text, subclauses, tables, or figures by removing existing material and replacing it with new material. Editorial notes will not be carried over into future editions because the changes will be incorporated into the base standard.

## 2. References

***Change the following reference in Clause 2:***

IEC 60601-1-2 (1993-04), ~~Medical electrical equipment—Part 1: General requirements for safety. 2. Collateral Standard: Electromechanical Compatibility—Requirements and Tests. Collateral Standard: Electromagnetic Compatibility—Requirements and tests.~~

***Delete the following reference and its corresponding footnote in Clause 2.***

EIA-485 (1983), Standard for Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems.<sup>3</sup>

***Insert the following references alphabetically as they should appear in Clause 2 .***

CENELEC HD21.1, Polyvinylchloride insulated cable of rated voltage up to and including 450/750 V Part 1—General Requirements.

ISO/IEC 8482:1993, Information Technology—Telecommunications and information exchange between systems — Twisted pair multipoint interconnections.

*Replace 6.3 with the following text:*

**6.3 DCC port**

The DCC port is the interface for each device into the BCC at the bedside. All connections are initiated by the DCC.

**7.1.6 End of received frame indication**

*Change the last paragraph in 7.1.6 to the following:*

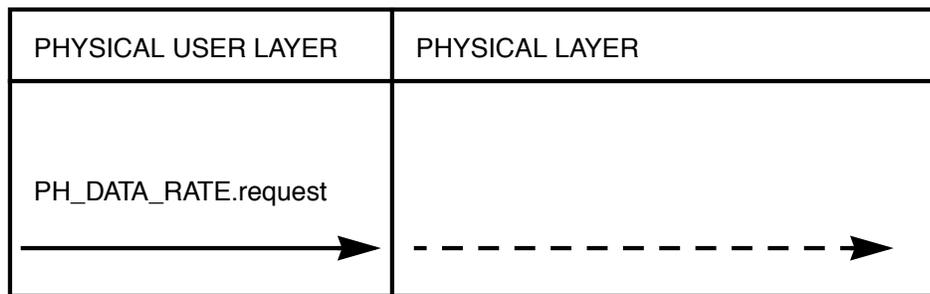
PH\_PULSE\_ERROR.indication is issued to the MAC Physical User layer system management entity to indicate that an incorrect pulse width was received on the special function input signal.

*Insert the following subclause after 7.1.6 and renumber the remaining subclauses as 7.1.8 through 7.1.11:*

**7.1.7 Data transfer**

The PH\_DATA.request primitive is passed to the Physical layer to request that a Physical layer service data unit (PhSDU) be transmitted. The PH\_DATA.indication is passed from the Physical layer to indicate the arrival of a PhSDU.

*Replace Figure 3 with the following:*



**Figure 3—Timing sequence for data rate designation primitive**

## Annex D

(informative)

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