

Manual of Style for NFPA Technical Committee Documents

April 2000 Edition



National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

Manual of Style
Major Changes from 1986 Edition to April 2000 Edition

(1) Restructuring of Chapters 1, 2, and 3

Chapter 1 — Administrative (1.6.1)

Chapter 2 — Mandatory References (1.6.2)

Chapter 3 — Definitions (1.6.3)

(2) Dash vs. Decimal

Change the existing “-” to a “.” in the paragraph numbering system (e.g., 5-4.3 to 5.4.3).

(3) Performance-Based Initiative (Section 1.3)

Guidance is given to the technical committee to reference the NFPA performance-based primers and to follow the *Manual of Style* where the integrity of the performance-based process will be maintained.

(4) Retroactivity Options (1.6.1.5)

Guidance is given in Chapter 1 for retroactivity.

(5) Equivalency Statement (1.6.1.6)

A revised equivalency statement is provided in Chapter 1. This new statement provides guidance to the users and enforcers as to how and when to determine equivalency to the requirements contained within the document.

(6) Code Adoption (1.6.1.8)

Based on NFPA regional input, all NFPA codes are required to contain code adoption language in Chapter 1, to assist jurisdictions in the adoption of NFPA codes. This applies to NFPA codes only. Additional Annex material illustrates sample requirements and legislation language.

(7) Change Appendix to Annex (Section 1.8)

(8) Exception (2.3.5)

The use of exceptions is discouraged and specific guidance is given on where they can be used and where and why they should not be used.

(9) Internationalization of NFPA Documents (Section 2.5)

Guidance is given to staff and committee members in Chapter 2 to assist them in developing internationally accepted documents.

(10) Updates to Non-NFPA References (3.6.7.1.2)

(11) Vertical Rule and Bullet (Section 3.9)

Guidance is given to staff as to the use of the vertical rule for indicating change. Additionally, a bullet will indicate where an identifiable portion of text has been deleted (i.e., a single paragraph or section).

(12) SI as Primary (4.1.1)

SI will be the primary unit and the inch-pound value will follow in parentheses.

(13) SI Conversions (4.1.2)

Guidance is given to staff and volunteers as to proper conversion systems including annex (Annex B) material dealing with direct conversions that could affect the requirements of the document.

(14) Revisions to *Manual of Style*

A proposal-type form is provided to all staff to ensure that necessary modifications will be made to the *Manual of Style*. This will allow changes for new issues as well as current issues that can be addressed in a better way.

Copyright © 2000 NFPA, All Rights Reserved

Manual of Style

for

NFPA Technical Committee Documents

April 2000 Edition

This edition of the *Manual of Style* was prepared by NFPA staff and approved by the Standards Council on July 20–22, 1999, with an effective date of January 1, 2000. This edition of the *Manual of Style* represents a complete rewrite and reorganization of the previous edition. The April 2000 edition of the *Manual of Style* supersedes all previous editions.

Origin and Development of the April 2000 Edition of the *Manual of Style*

The first edition of the *Manual of Style* was issued in 1972 and was based primarily upon the *Chicago Manual of Style*. The second edition, published in 1986, was an update and expansion of the 1972 edition, and again it was primarily based upon the *Chicago Manual of Style*. The 2000 edition of the *Manual of Style* is based upon the ANSI/SES *Recommended Practice for Standards Designation and Organization*. The April 2000 edition of the *Manual of Style* incorporates several changes which correct editorial errors and further clarifies the requirements for definitions (2.3.2) and notes (2.3.6).

The following is a chronological summary of Manual of Style Editions:

1st Edition — January 2000

2nd Edition — April 2000

Contents

Chapter 1 Document Structure	MOS- 4		
1.1 General	MOS- 4	2.3.5 Exceptions	MOS- 8
1.2 Document Types	MOS- 4	2.3.6 Notes	MOS- 8
1.2.1 Codes and Standards	MOS- 4	2.3.7 Footnotes	MOS- 8
1.2.2 Recommended Practices	MOS- 4	2.3.8 Caution and Warning Statements	MOS- 8
1.2.3 Guides	MOS- 4	2.3.9 Cross-References	MOS- 8
1.3 Performance-Based Documents	MOS- 4	2.4 Rules for Nonmandatory Documents	MOS- 8
1.4 Document Division	MOS- 4	2.4.1 Recommended Practices	MOS- 8
1.4.1 Chapters and Annexes	MOS- 4	2.4.2 Guides	MOS- 8
1.4.2 Arrangement	MOS- 4	2.5 Internationalization of Documents	MOS- 9
1.4.3 Division Numbering	MOS- 4	2.5.1 General	MOS- 9
1.5 Front Matter	MOS- 4	2.5.2 Word Clarity	MOS- 9
1.5.1 Order of Contents	MOS- 4	2.5.3 Multiple Meanings	MOS- 9
1.5.2 Cover	MOS- 4	2.6 Extracts	MOS- 9
1.5.3 Title Page	MOS- 4	2.6.1 Extract Requirements	MOS- 9
1.5.4 Committee List	MOS- 4	2.6.2 Extracted Material	MOS- 9
1.5.5 Table of Contents	MOS- 5	2.6.3 Exception, Caution, and Warning Statements	MOS- 9
1.5.6 Introductory Information	MOS- 5	2.6.4 Notes and Related Annexes	MOS- 9
1.6 Administrative Chapters	MOS- 5	2.6.5 Paragraph Numbering	MOS- 9
1.6.1 Chapter 1 Administration	MOS- 5	2.7 References	MOS- 9
1.6.2 Chapter 2 Referenced Publications	MOS- 5		
1.6.3 Chapter 3 Definitions	MOS- 6	Chapter 3 Editorial Style	MOS- 10
1.7 Numbering System	MOS- 6	3.1 General	MOS- 10
1.7.1 Chapters	MOS- 6	3.2 Text Editorial Rules	MOS- 10
1.7.2 Sections	MOS- 6	3.2.1 General	MOS- 10
1.7.3 Subsections	MOS- 6	3.2.2 Spelling	MOS- 10
1.7.4 Paragraphs and Subparagraphs	MOS- 6	3.2.3 Capitalization	MOS- 10
1.7.5 Minimum Number of Subdivisions	MOS- 6	3.2.4 Definitions	MOS- 10
1.8 Annexes	MOS- 6	3.2.5 Numbers	MOS- 10
1.8.1 Annex Purpose	MOS- 6	3.2.6 Abbreviations	MOS- 10
1.8.2 Additional Annexes (if necessary)	MOS- 6	3.2.7 Punctuation	MOS- 10
1.9 Index	MOS- 6	3.3 Document Structure Editorial Rules	MOS- 11
1.10 Codes and Standards Pages	MOS- 6	3.3.1 Listed Items	MOS- 11
		3.3.2 Figures	MOS- 11
		3.3.3 Tables	MOS- 11
		3.4 Material from Other Organizations	MOS- 11
		3.4.1 Permission to Use	MOS- 11
		3.4.2 Staff Responsibility	MOS- 11
		3.4.3 Credit Line	MOS- 11
		3.5 Explanatory Information	MOS- 11
		3.6 References	MOS- 11
		3.6.1 Cross-References	MOS- 11
		3.6.2 Cross-References to Entire Chapters or Parts of Chapters	MOS- 11
		3.6.3 Cross-References to Subsections and Paragraphs	MOS- 12
		3.6.4 Cross-References to Figures and Tables	MOS- 12
		3.6.5 Unneeded Cross-References	MOS- 12
		3.6.6 References to Publications	MOS- 12
		3.6.7 Reference Lists	MOS- 12
Chapter 2 Technical Style	MOS- 6		
2.1 General	MOS- 6		
2.2 Technical Rules	MOS- 6		
2.2.1 Permissive or Alternative Terms	MOS- 6		
2.2.2 Unenforceable Terms	MOS- 7		
2.2.3 Choices of Levels of Safety	MOS- 7		
2.2.4 Expressing Maximum and Minimum Limits	MOS- 7		
2.2.5 Maintenance	MOS- 7		
2.2.6 Product Standards	MOS- 7		
2.2.7 Related Hazards	MOS- 7		
2.3 Rules for Mandatory Documents	MOS- 7		
2.3.1 Codes and Standards	MOS- 7		
2.3.2 Definitions	MOS- 7		
2.3.3 Mandatory Requirements	MOS- 8		
2.3.4 Annexes	MOS- 8		

3.7 Special Elements	MOS-12	3.9 Vertical Rules and Bullets	MOS-14
3.7.1 Figures	MOS-12	3.10 Presentation of Final Manuscript	MOS-14
3.7.2 Tables	MOS-13	Chapter 4 Units of Measurement	MOS-14
3.7.3 Formulas and Equations	MOS-13	4.1 Policy on Units of Measurement	MOS-14
3.7.4 Letter Symbols and Variables	MOS-14	4.1.1 Measurement System Preference	MOS-14
3.7.5 Reference Lists	MOS-14	4.1.2 Fundamental Approach	MOS-14
3.8 Annexes	MOS-14	4.1.3 Reference Publication	MOS-15
3.8.1 General	MOS-14	4.2 Units and Conversion Guidance	MOS-15
3.8.2 Annex A	MOS-14	Annex A Explanatory Material	MOS-15
3.8.3 Additional Annexes	MOS-14	Annex B SI Units and Conversions	MOS-20
3.8.4 Last Annex	MOS-14		

Manual of Style
for
NFPA Technical Committee Documents
2000 Edition

Chapter 1 Document Structure

1.1 General. Chapter 1 of the *Manual of Style* shall address the structure of NFPA Technical Committee documents in an outline arrangement and shall include the physical layout of the documents, numbering system, and chapter sequences.

1.2 Document Types.

1.2.1 Codes and Standards.

1.2.1.1 The text of a code or standard shall consist of all mandatory requirements.

1.2.1.2 All nonmandatory or informational text shall appear either in Annex A or as a separate annex in the case of specialized information.

1.2.2 Recommended Practices.

1.2.2.1 The main text of recommended practices shall consist of all recommendations.

1.2.2.2 All informational text shall appear either in Annex A or as a separate annex in the case of specialized information.

1.2.3 Guides. Guides shall be permitted to mix recommendations and explanatory material in the body of the main text.

1.3 Performance-Based Documents. Performance-based documents that incorporate performance-based options in accordance with approaches outlined in *NFPA Primers for Performance-Based Documents* shall adhere to the requirements of the *Manual of Style* where applicable while maintaining the integrity of the performance-based approaches.

1.4 Document Division.

1.4.1 Chapters and Annexes. Documents shall consist of several distinct chapters and annexes, which shall be further subdivided as required.

1.4.2 Arrangement. The document shall be arranged, in order of descending importance, into chapters, sections, subsections, paragraphs, and subparagraphs.

1.4.3 Division Numbering. All division shall be numbered in Arabic sequence, 1, 2, 3. . .

1.5 Front Matter. Document front matter shall only include objective, nontechnical information about the document and shall be prepared by NFPA staff independent of the consensus development process.

1.5.1 Order of Contents. NFPA documents shall contain the front matter components in the following order: cover, title page, committee list, table of contents, and introductory information.

1.5.2 Cover.

1.5.2.1 The front cover shall carry the NFPA numeric designation for the document; the title of the document — for example, *Standard for . . .*; the edition date; the NFPA logo; the words “National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA USA, 02269-9101”; and the phrase “An International Codes and Standards Organization.”

1.5.2.2 The inside of the front cover shall carry a general statement of where to obtain information on the document and a statement of the copyright and republishing rights.

1.5.3 Title Page. The title page shall carry the copyright notice and date, the full title of the document, the edition date, the date of action by the Association, the date of issue by the Standards Council, the effective date of the document, and an indication that it supersedes all previous editions. Documents that are approved by the American National Standards Institute (ANSI) shall have a statement to this effect with the date of approval.

1.5.3.1 The title page shall also contain an origin and development statement. This statement shall be a comprehensive history of the document from its first edition, including the purposes, major changes in the various editions through the years, and any changes in the committee structure during these periods. All NFPA Technical Committee documents shall have an origin and development statement prepared by NFPA, independent of the consensus development process.

1.5.3.2* A final sentence or paragraph shall be added to the origin and development statement outlining changes in the latest edition. The statement shall be modified as necessary in subsequent years in order to add new information.

1.5.4 Committee List. The page following the title page shall provide the committee list. The technical committee name shall be listed at the top of the page.

1.5.4.1 The committee list shall include the names of all the persons who were committee members at the time of the final committee balloting of the specific edition of the document. This list shall include only those persons who were members of the technical committee at the time of balloting. It shall be the list published in the *Report on Comments (ROC)*. If there is no ROC, it shall be the list published in the *Report on Proposals (ROP)*.

1.5.4.2 The list shall be organized by committee officers (chair and secretary); principal members and alternate members, with the principal listed with each alternate’s name; and nonvoting members. This list shall include all member’s companies and, if applicable, the organizations they represent, both of which shall be spelled out in full. The states or countries where the members reside and the designations of their committee membership classification as defined by NFPA shall be shown.

1.5.4.3 When more than one technical committee is responsible for the document, all committees concerned shall be listed with an indication of the portion of the document for which each technical committee is responsible.

1.5.4.4 Technical correlating committees shall be listed before the technical committee(s).

1.5.4.5 The NFPA staff liaison assigned to the Technical Committee shall be included at the end of the list.

1.5.4.6 The committee list shall be followed by a note that reads as follows:

This list represents the membership at the time the Committee was balanced on the final text of this edition. Since that time, changes in the membership may have occurred. A key to committee membership classifications is found at the back of the document.

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

1.5.4.7* The technical committee scope shall be printed following the note shown in 1.5.4.6.

1.5.5 Table of Contents.

1.5.5.1 The table of contents shall start on the page following the committee list page(s).

1.5.5.2 The table of contents shall itemize all chapter titles and section headings appearing in the document and the page on which they start.

1.5.5.3 To facilitate the compilation of the table of contents, the committee shall title each main (two-digit) section.

1.5.6 Introductory Information.

1.5.6.1 The first page of the document shall begin on the next full page following the end of the table of contents.

1.5.6.2 The following information shall form the heading prior to Chapter 1, at the top of the first page, and shall appear in the following order:

- (a) Document number
- (b) Complete title
- (c) Edition of document
- (d) Notice regarding asterisk as follows:

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates explanatory material on the paragraph can be found in Annex A.

(e) *Notice regarding vertical rule and bullets, where applicable, as follows:

NOTICE: Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraph(s) has been deleted, the deletion is indicated by a bullet in the margin between the paragraphs that remain.

(f) *Notice regarding extracts, where applicable, as follows:

NOTICE: A reference in parentheses () following a section or paragraph indicates material that has been extracted from another NFPA document. The complete title and edition of the document the material is extracted from is found in Chapter 2. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the appropriate technical committee.

(g) Notice regarding referenced publications as follows:

NOTICE: Information on referenced publications can be found in Chapter 2 and Annex XX.

1.6 Administrative Chapters. The first three chapters of any document shall contain only administrative text. The first

three chapters of any document shall be in the following order:

- Chapter 1 Administration (See 1.6.1.)
- Chapter 2 Mandatory References (See 1.6.2.)
- Chapter 3 Definitions (See 1.6.3.)

1.6.1 Chapter 1 Administration.

1.6.1.1 General. Chapter 1 shall include the following sections, in this order, where applicable:

- Document Scope (See 1.6.1.2.)
- Document Purpose (See 1.6.1.3.)
- Application (See 1.6.1.4.)
- Retroactivity (See 1.6.1.5.)
- Equivalency (See 1.6.1.6.)
- Units and Formulas (See 1.6.1.7.)
- Code Adoption Requirements (See 1.6.1.8.)

1.6.1.2* Document Scope.

1.6.1.2.1 The text of a document shall start with a statement of the document's scope, which shall be within the scope of the committee as approved by the Standards Council in accordance with the *Regulations Governing Committee Projects*.

1.6.1.2.2 The document scope shall describe in general terms what the document covers and shall include sufficient details to indicate the range or limits of what is covered.

1.6.1.2.3 The document scope shall be permitted to include subsections on application and nonapplication.

1.6.1.3 Document Purpose.

1.6.1.3.1 The document purpose shall describe the goal of the document.

1.6.1.3.2 The document purpose shall also describe the objective(s) of the document or what it was created to accomplish.

1.6.1.4 Application. The application shall indicate how and to what the requirements of the document shall apply.

1.6.1.5* Retroactivity. Retroactivity statements shall be used as applicable.

1.6.1.6* Equivalency. Equivalency statements shall be used as applicable.

1.6.1.7 Units and Formulas. An additional administrative section shall be permitted to be included and shall contain additional sections on units, formulas, and other specialized mathematical notations that apply to the (document).

1.6.1.8 Code Adoption Requirements.

1.6.1.8.1* NFPA codes shall have the following wording within Chapter 1 to assist authorities in the adoption of the code.

This code shall be administered and enforced by the authority having jurisdiction designated by the governing authority. (See Annex XX for sample wording for enabling legislation.)

1.6.1.8.2 Code enforcement requirements shall be included in NFPA codes.

1.6.2 Chapter 2 Referenced Publications.

1.6.2.1 Chapter 2 shall only contain the referenced publications that apply to the document.

1.6.2.2 Chapter 2 shall contain only mandatory referenced publications in codes and standards.

1.6.2.3 Chapter 2 shall contain all references in recommended practices and guides.

1.6.2.4 Any references that are not mandatory but apply to the document shall be included in the last annex in codes and standards.

1.6.3 Chapter 3 Definitions.

1.6.3.1 Chapter 3 shall contain only definitions.

1.6.3.2 Chapter 3 shall include only terms used within the document.

1.6.3.3 All definitions shall be numbered individually within Chapter 3. (*See 3.2.4.3.4.*)

1.7 Numbering System.

1.7.1 Chapters. Mandatory text shall be divided into chapters that are numbered consecutively with Arabic numbers.

1.7.2 Sections. Chapters shall be further subdivided into main topics called sections. Sections are numbered consecutively by adding a period (.) and an Arabic number after the chapter number (for example, sections in Chapter 1 shall be numbered 1.1, 1.2, 1.3, and so forth). All sections shall be titled.

1.7.3 Subsections. Sections containing subtopics shall be subdivided into subsections, which shall be further subdivided into paragraphs of text. Subsections are numbered consecutively by adding a period and an Arabic number to the section number (for example, subsections in Section 1.1 shall be numbered 1.1.1, 1.1.2, 1.1.3, and so forth). The use of titles for subsections shall be optional but consistent. If one subsection within a section is to be titled, all subsections in that section shall also be titled.

1.7.4 Paragraphs and Subparagraphs. Multiple requirements within subsections shall be treated as numbered paragraphs and subparagraphs. Paragraphs shall be numbered by adding an additional period and consecutive Arabic numbers to the subsection number (e.g., 1.1.1.1, 1.1.1.2, 1.1.1.3, and so forth). Subparagraphs shall be numbered by adding an additional period and consecutive Arabic numbers to the paragraph number (e.g., 1.1.1.1.1, 1.1.1.1.2, 1.1.1.1.3, and so forth). Where numbering of sub-subparagraphs by adding additional digits (e.g., 1.1.1.1.2.1) to the numbering scheme is necessary, the total number of digits, including the chapter number designator, shall not exceed six digits. The preferred treatment for sub-subparagraphs, however, shall be as lettered paragraphs, identified by lowercase letters in parentheses.

1.7.5 Minimum Number of Subdivisions. All subdivisions shall contain at least two subdivisions (i.e., 3.1, 3.2 or 4.1.1, 4.1.2).

1.8 Annexes.

1.8.1 Annex Purpose.

1.8.1.1 Annexes are provided for clarification, illustration, and general information. Their relation to the document shall, therefore, be clearly set forth.

1.8.1.2 Nonmandatory text shall be divided into annexes, beginning with Annex A Explanatory Material and ending

with a final annex reserved for Nonmandatory Referenced Publications.

1.8.1.3 Annexes shall be permitted to be added to a document to facilitate the use of the document.

1.8.1.4 Annexes shall be within the scope of the project under which the document was developed, and they shall not be inconsistent with the document itself.

1.8.1.5 An annex is part of a document and shall be processed in accordance with the *Regulations Governing Committee Projects*.

1.8.1.6 The editorial statement prefacing each annex containing explanatory material shall consist of the following: *This annex is not part of the (requirements, recommendations) of this document but is included for informational purposes only.*

1.8.1.7 An annex listing bibliographical, informative publications, and nonmandatory references shall start with the following statement: *This annex is not part of the requirements (recommendations) of this NFPA document but is included for informational purposes only.*

1.8.1.8 Each annex shall begin with its own designation, title, and so forth.

1.8.2 Additional Annexes (if necessary). Additional annexes shall be permitted to be added to a document to facilitate the use of the document. Additional annexes shall be completed in accordance with Section 1.7.

1.9 Index. All NFPA technical committee documents shall have an index that shall be prepared by NFPA independent of the consensus development process.

1.10* Codes and Standards Pages. NFPA codes and standards development process information sheets shall be included at the end of the document when appropriate.

Chapter 2 Technical Style

2.1* General. Chapter 2 of this document addresses the technical style of the document. Chapter 2 includes the following:

- (1) Technical rules
- (2) Rules for mandatory documents
- (3) Rules for nonmandatory documents
- (4) Internationalization

2.2 Technical Rules.

2.2.1 Permissive or Alternative Terms.

2.2.1.1 The terms *may* and *may not* shall not be used in any portion of codes, standards, or recommended practices.

2.2.1.2 The phrase *shall be permitted (to be)* shall be used to state a permitted use or an alternative to a specified requirement within codes and standards.

2.2.1.3 The phrase *should be permitted (to be)* shall be used to state a recommended permitted use or a recommended alternative to a recommendation within recommended practices.

2.2.1.4 The phrase *provided that* shall be permitted to be used as part of a permitted use or an alternative requirement within codes and standards or used as part of a recommendation within recommended practices.

2.2.2* Unenforceable Terms.

2.2.2.1* The main text of codes and standards shall not contain references or requirements that are unenforceable and vague. (See 2.3.4.)

2.2.2.2 Unenforceable terms shall be allowed in recommended practices and guides.

2.2.2.3* The terms contained in Table 2.2.2.3 shall be reviewed in context, and if the resulting requirement is unenforceable or vague, they shall not be used within the body of codes or standards.

Table 2.2.2.3 Possible Unenforceable and Vague Terms

Acceptable	Frequent(ly)	Practices
Adequate(ly)	Firmly	Prefer(red)
Appreciable	Generally	Proper(ly)
Appropriate	Good	Ready(ily)
Approximate(ly)	Lightly	Reasonable(ly)
Available	Likely	Safe(ly) (ty)
Avoid(ed)	Legible(ly)	Satisfactory
Can	Many	Secure(ly)
Care	May	Several
Careful(ly)	Maybe	Significant
Consider(ed) (ation)	Might	Similar
Could	Most(ly)	Substantial(ly)
Desirable	Near(ly)	Sufficient(ly)
Easy(ily)	Neat(ly)	Suitable
Equivalent(ly)	Normal(ly)	Usual(ly)
Familiar	Note	Workmanlike
Feasible	Periodic(ally)	
Few	Practical(ly)	

2.2.2.4 The list of terms contained in Table 2.2.2.3 shall not be considered all-inclusive. All mandatory language shall be reviewed for usability, adoptability, and enforceability.

2.2.3 Choices of Levels of Safety.

2.2.3.1* Codes and standards shall state specific criteria that minimize the judgment required by the users.

2.2.3.2* Multiple levels of safety shall not be used in any code or standard.

2.2.4 Expressing Maximum and Minimum Limits. Maximum and minimum limits shall be expressed with the following type of phraseology:

- (1) Shall not exceed 300 V to ground . . .
- (2) Shall have a clearance of not less than 5 cm . . .
- (3) Shall be supported at intervals not exceeding 1.5 m . . .

2.2.5 Maintenance. Where maintenance provisions are within the scope of a document, maintenance requirements shall be located in a separate section or chapter at the end of the main text of the document, independent of requirements for a new installation.

2.2.6* Product Standards.

2.2.6.1* Product standards shall be written such that the product can be evaluated and tested for compliance with minimal or no judgmental decisions.

2.2.6.2* Product standards shall always be separate documents from documents that contain user requirements.

2.2.6.3 Product standards shall be written such that the product can be evaluated for compliance without judgmental decisions.

2.2.7 Related Hazards.

2.2.7.1 When to Include Related Hazards. In the event that a technical committee finds it necessary to include in a standard subjects that do not directly involve fire safety (e.g., chemical exposure, radiological exposures, various environmental or health considerations) the following shall be permitted to be included:

- (1) Subjects other than fire safety necessary for continuity of the contents of the standard and in concert with its scope
- (2) Where, for the application and enforcement of the code or standard, the technical committee is not able to separate material pertaining to related non-fire hazards from those specific hazards covered by the code or standard

2.2.7.2* NFPA Technical Advisory Committees. When NFPA technical advisory committees (TACs) have been established or assigned for specific areas of expertise, advice shall be sought from the appropriate TAC.

2.3 Rules for Mandatory Documents.

2.3.1* Codes and Standards.

2.3.1.1 Chapter 1 shall be written in mandatory language.

2.3.1.2* Chapter 2 shall be written in mandatory language, shall include all mandatory referenced publications, and shall include the following as the first section:

2.1 The following documents or portions thereof are referenced within this (*document type*) and shall be considered part of the requirements of this document.

2.3.1.3* Chapter 3 shall be written in mandatory language and shall include the following as the first section:

3.1 The definitions contained in Chapter 3 shall apply to the terms used in this (*document type*). Where terms are not included in Chapter 3, common usage of the term shall apply.

2.3.2 Definitions.

2.3.2.1 A definition shall only describe the term being defined.

2.3.2.2 Definitions shall not contain requirements.

2.3.2.3* References to other documents or sections of a document, notes, footnotes, cautions, warnings, or figures shall not be permitted in definitions.

2.3.2.4 Annex material shall be permitted for any definition.

2.3.2.5* Existing official definitions contained in the *Regulations Governing Committee Projects* shall be used where applicable.

2.3.2.6 Existing general definitions contained in the NFPA *Glossary of Terms* shall be used where technically accurate and correct.

2.3.2.7 Modifications to official definitions appearing in the Regulations Governing Committee Projects, shall be submitted to the Standards Council.

2.3.2.8 Modifications to terms appearing in the Glossary of Terms shall be submitted as a proposal processed in accordance with the Regulations Governing Committee Projects.

2.3.2.9 Where an existing definition is taken from another document or from the *Glossary of Terms*, the source document shall be referenced in parentheses at the end of the definition to indicate that the definition has been extracted from that document. (See 2.6.2.2.)

2.3.3 Mandatory Requirements.

2.3.3.1 Where a sentence in a code or standard does not contain a mandatory requirement, it shall be re-written to include a mandatory requirement or the sentence shall be moved to the Annex or deleted.

2.3.3.2 The terms *shall* and *shall not* shall be used to indicate mandatory requirements.

2.3.4 Annexes

2.3.4.1 The annexes of codes and standards shall be used for advisory text, explanatory material, and supplementary information and shall not be used for mandatory requirements.

2.3.4.2 All nonmandatory or informational text shall either appear in Annex A or be presented as a separate annex in the case of specialized information.

2.3.4.3 The term *shall* shall not be used in the annexes, since its use would indicate a mandatory action or requirement.

2.3.4.4 Use of the terms *should*, *can*, *could*, and *might* shall be permitted to be used in the annexes.

2.3.5 Exceptions.

2.3.5.1 Exceptions shall be permitted only where the exception represents an allowance or required alternate procedure to a general rule when limited, specified conditions apply.

2.3.5.2* Where the rewording of exceptions as requirements or removal of exceptions will not change the technical requirements of the document, exceptions shall be reworded as requirements or removed.

2.3.5.3 Exceptions shall not be permitted to be used in place of several multiple requirements where the intent is to break up long sentences that incorporate a single rule that applies generally.

2.3.5.4 Exceptions shall not be permitted to be used where the exception covers the predominate use or application and would more appropriately be addressed as a requirement.

2.3.5.5* Exceptions shall not be used where there is a long list of exceptions indicating that the basic rule is often inapplicable.

2.3.6 Notes.

2.3.6.1 Notes shall not be permitted to be used in the mandatory text sections of a document.

2.3.6.2 Notes shall only be permitted to be used in tables and figures.

2.3.6.3 Notes shall not include requirements.

2.3.7 Footnotes.

2.3.7.1 Footnotes shall not be permitted to be used in the mandatory text sections of a document.

2.3.7.2 Footnotes shall only be permitted to be used as table footnotes.

2.3.8* Caution and Warning Statements.

2.3.8.1 Caution and warning statements shall be provided to prevent injuries, damage, or other direct hazards to the user or exposures.

2.3.8.2 Caution and warning statements shall only be permitted to be used within the mandatory text sections where a distinct hazard to the user, building, property, exposures, etc. exists.

2.3.9 Cross-References.

2.3.9.1* Mandatory cross-references shall be to specific mandatory requirements in other sections of the document and shall be stated in mandatory language.

2.3.9.2* Nonmandatory cross-references to other sections, annexes, tables, or figures shall be permitted within mandatory text, but shall only be permitted where the cross-reference is to other portions of the document.

2.3.9.3 Cross-references to other documents shall be permitted only within the mandatory text of a document when the cross-referenced document is written in mandatory language.

2.3.9.4 Nonmandatory cross-references to other documents shall only be permitted within annexes.

2.4 Rules for Nonmandatory Documents.

2.4.1* Recommended Practices.

2.4.1.1 A document that is a recommended practice shall include only recommendations throughout the text.

2.4.1.2 Where a sentence does not contain a recommendation, it shall be rewritten to include a recommendation or the sentence shall be moved to the annex.

2.4.1.3 Mandatory language shall not be used in recommended practices.

2.4.1.4 Chapter 2 shall include all referenced publications and shall include the following first section:

2.1 The following documents or portions thereof are referenced within this recommended practice and should be considered part of the recommendations of this document.

2.4.1.5 Chapter 3 of recommended practices shall have the following as the first section:

3.1 The definitions contained in Chapter 3 apply to the terms used in this recommended practice. Where terms are not included in Chapter 3, common usage of the term applies.

2.4.1.6 All informational text shall either appear in Annex A or be presented as a separate annex in the case of specialized information.

2.4.2* Guides.

2.4.2.1 A document that is a guide shall be permitted to mix recommendations and explanatory material throughout the text.

2.4.2.2 The term *shall* shall not be used in guides.

2.4.2.3 Chapter 2 shall include all referenced publications and shall include the following first section:

2.1 The following documents or portions thereof are referenced within this guide and should be considered part of the recommendations of this document.

2.4.2.4 Chapter 3 of guides shall have the following as the first section:

3.1 The definitions contained in Chapter 3 apply to the terms used in this guide. Where terms are not included in Chapter 3, common usage of the term applies.

2.4.2.5 Terms such as *can*, *could*, and *might* shall be permitted to be used in the text and in the annexes of guides in place of or in addition to the term *should*.

2.5 Internationalization of Documents.

2.5.1 General.

2.5.1.1* Documents shall be written to enhance their international acceptability and adoptability.

2.5.1.2 International (SI) units, often referenced as metric units, shall be used as the standard units in all NFPA documents.

2.5.1.2.1 Quantities and dimensions shall express the practical value used in the international community and shall not be simply a conversion from an inch-pound unit. (*See 4.1.2.1.*)

2.5.1.2.2 Where presented, inch-pound units shall be in parentheses following the SI unit.

2.5.1.3* Conversion directly from an inch-pound unit to an SI unit shall be completed in accordance with Chapter 4, Units of Measurement, and shall be reviewed to confirm that the new SI unit is accurate, enforceable, and correct.

2.5.1.4 Soft or hard conversion to inch-pound units for user-friendly assistance shall be permitted. (*See A.4.1.2.1 and A.4.1.2.2.*)

2.5.1.5 Inch-pound units shall not be the mandatory requirement.

2.5.1.6* Where documents reference other codes, standards, or test methods, the referenced document, when available, shall be international.

2.5.2 Word Clarity. Words and terms used in NFPA documents shall be selected for specificity and clarity in meaning and use of jargon, limited-use, industrial-specific terms, or colloquial language that is difficult to understand or interpret shall be avoided.

2.5.3 Multiple Meanings. All words and terms used in NFPA documents that could be used, understood, or interpreted in more than one way shall be defined in the definitions section.

2.6* Extracts.

2.6.1 Extract Requirements. To extract material from another NFPA document, all of the following items shall be required:

- (1) There shall be specific technical reasons for the extracts.
- (2) There shall be clear indication, with the extracted text, of the number, title, and edition of the document from which the extracts are taken and that requests for inter-

pretations or proposed revisions of the text shall be referred to the committee responsible for the source document.

- (3) Any editing of the extracted text shall be confined only to making the style consistent with that of the document containing the extract and then only with the concurrence of the committee responsible for the source document.

- (4) The extracted text shall be kept current with that of the source document in a timely, appropriate manner.

2.6.2 Extracted Material.

2.6.2.1 A section or paragraph being extracted from another document shall represent a specific thought and shall be entirely extracted. The context of the original extracted material shall not be compromised or violated.

2.6.2.2* Any extracted materials shall be followed by a reference in parentheses indicating that the material has been extracted from another NFPA document. The parentheses shall contain the document number in bold type followed by a colon and the reference section from the originating NFPA document [e.g., **(10:2.3.2.5)**].

2.6.2.3 A boilerplate paragraph shall be added at the beginning of the document, or at the beginning of a specific chapter if only one chapter contains extracted material, to explain that material has been extracted from the document referenced in parentheses at the end of a paragraph or section. [*See 1.5.6.2(f).*]

2.6.2.4 When material is extracted from another NFPA document, the complete title and the current edition of the source document shall be referenced in Chapter 2.

2.6.3 Exception, Caution, and Warning Statements. Text shall not be extracted without including any exception(s) associated with the extracted text. Similarly, caution and warning statements shall also be included. Exception and caution statements are part of the requirements of the associated paragraph.

2.6.4 Notes and Related Annexes. Notes and annexes are intended as advisory, supplementary information, and thus they may or may not be included along with an extracted paragraph. If the extracted text contains notes in the parent document or annexes associated with the parent section, the committee shall review the notes and annexes. If the committee chooses not to extract the note or related annex section, they shall ensure that the paragraph cannot be misinterpreted based on the absence of this supplemental information.

2.6.5* Paragraph Numbering.

2.6.5.1 Committees shall not change the relationship of paragraphs to each other in the way they renumber extracted text.

2.6.5.2 The committee taking the extract shall not take part of a section or paragraph and skip another part of this same section or paragraph without a valid technical reason. The family of paragraphs that state a set of requirements shall be kept together to ensure both documents are consistent in stated requirements.

2.7 References. Where extracted material references another paragraph in the document from where the material is extracted, the committee shall try to extract the referenced paragraph as well so its document is more complete and user-friendly.

Chapter 3 Editorial Style

3.1* General. Editorial style shall focus on the grammatical format used throughout the document.

3.2 Text Editorial Rules.

3.2.1 General.

3.2.1.1 Style, including grammar, punctuation, and conventional presentation of text, shall generally conform to the recommendations of *The Chicago Manual of Style*, 14th edition.

3.2.1.2 Spelling and definitions of general words and terms shall follow *Webster's Collegiate Dictionary*, 10th edition.

3.2.2 Spelling.

3.2.2.1* When a choice of spelling is given in *Webster's*, the simpler form shall be used in NFPA documents.

3.2.2.2 Specific fire-related terminology shall have the spellings and meanings as set forth in the NFPA *Glossary of Terms*.

3.2.2.3 When a standard definition is needed, Webster's shall be utilized where the meaning is correct and accurate as used in NFPA documents.

3.2.3 Capitalization.

3.2.3.1 General. Capitalization shall follow conventional usage, including the capitalization of proper names.

3.2.3.2* Titles. The first letter of *chapter*, *section*, *figure*, and similar designations shall be capitalized only when the reference is specific.

3.2.3.3* Terms. Terms such as *grade*, *class*, *specimen*, and *type* shall also be capitalized when the reference is specific.

3.2.3.4 Captions. Only the first letter of the first word of a figure caption shall be capitalized.

3.2.3.5 Art Labels.

3.2.3.5.1 Only the first letter of the first word of labels within the figure shall be capitalized.

3.2.3.5.2* Where labels begin with a unit of measure, no capitalization shall be used.

3.2.3.6 Text Headings.

3.2.3.6.1 The first letter of each word in text headings shall be capitalized. In these headings, prepositions (with, from), articles (an, the), and coordinating conjunctions (and, but) shall be lowercased unless it is the first word.

3.2.3.6.2 The first letter of both parts of a hyphenated word shall be capitalized.

3.2.4 Definitions.

3.2.4.1 General. Only terms used within the document shall appear in the definition chapter (Chapter 3).

3.2.4.2 Listings of Existing Definitions. Existing boilerplate terms and definitions shall be found in 3.3.6.1 of the *Regulations Governing Committee Projects*, and existing general terms and definitions shall be found in the NFPA *Glossary of Terms*.

3.2.4.3 Style of Definitions.

3.2.4.3.1 All definitions shall appear in Chapter 3.

3.2.4.3.2 All NFPA official definitions shall be listed in Section 3.2 under the heading Official NFPA Definitions.

3.2.4.3.3 All other definitions shall be listed in Section 3.3 under the heading General Definitions. If additional specialized groupings of definitions are needed, these groupings shall be in subsequent sections (i.e., Section 3.4, Section 3.5).

3.2.4.3.4 All definitions shall be arranged in alphabetical order within each section, according to the word-by-word system.

3.2.4.3.5 All definitions shall be listed according to the term or a primary noun in the term being defined, not according to modifiers that precede the primary term (e.g., *maximum pressure* is listed as *pressure*, *maximum*, and *gas-fired burner* is listed as *burner*, *gas-fired*).

3.2.4.3.6* All definition main entries shall be numbered consecutively by adding a period and consecutive Arabic numbers. Definition subentries shall be numbered by adding a period and an additional Arabic number to the main definition number.

3.2.5 Numbers.

3.2.5.1 Numbers at the beginning of sentences shall be expressed in word form.

3.2.5.2 Numbers within a sentence shall be expressed as numerals for 10 and above.

3.2.5.3 The numbers one through nine shall be spelled out unless used with a unit of measure, in which case the number shall be expressed as a numeral.

3.2.5.4 Where two numbers are written in a sequence that would be confusing to the reader, the first number shall be expressed in word form and the following number shall be expressed as a numeral.

3.2.6 Abbreviations. Accepted editorial practices of specialized publications in the specific technical field shall be used as a guide to abbreviations.

3.2.6.1 Acronyms and Uncommon Abbreviations. All acronyms and any abbreviations that are not in common use shall be spelled out with the acronym or abbreviation following in parentheses for the first use of the term in the document. Each subsequent use shall be the acronym or abbreviation only.

3.2.6.2 Units of Measure. When accompanied by a specific quantity, all units of measure shall be abbreviated, except for units of time, which shall be spelled out.

3.2.6.2.1 Conventional signs for abbreviations shall not be used.

3.2.6.2.2 Where, because of space limitations, units of measure given in tables or labels in figures cannot be arranged properly, units of measure shall be indicated in column or row headings.

3.2.7 Punctuation. Punctuation shall follow conventional usage as set forth in *The Chicago Manual of Style*.

3.2.7.1 Use of Periods with Titles, Headings, and Captions. Periods shall not be used after the main title of a document or at the end of figure captions and table titles.

3.2.7.2 Use of Periods with Section Headings. Periods shall be used at the end of each section heading.

3.2.7.3 Use of Periods with Abbreviations. Periods shall not be used in abbreviations of units of measure. Where the omission of the period could cause confusion (e.g., in. not in for inch) the abbreviation shall be written with a period.

3.3 Document Structure Editorial Rules.

3.3.1 Listed Items.

3.3.1.1 List Parity. All items within a list shall be either all single words, all phrases, or all full sentences.

3.3.1.2 List Placement.

3.3.1.2.1* Lists within the middle of a sentence shall not be permitted.

3.3.1.2.2 Sentences shall be phrased so as to have listings at the end, or the sentence shall be split into more than one sentence.

3.3.1.3 Types of Lists. Within any subdivision, groupings of items shall be treated as lettered paragraphs or as numbered lists. The items in a lettered paragraph grouping shall all contain one or more full sentences. The items in a numbered list shall all be full sentences, all phrases, or all individual words. Lettered paragraphs can serve as a subdivision of numbered sections or paragraphs. A numbered list can serve as a subdivision of numbered sections or lettered paragraph items. A numbered list can be further subdivided into sub-list items designated by lowercase letters followed by a period.

3.3.1.4 Numbering. A list containing two or more items within any subdivision shall be lettered parenthetically with lowercase letters. If further breakdown of the list is necessary, items shall be identified by Arabic numbers and then lowercase letters, as follows:

- (a)
 - (1)
 - (2)
- (b)
 - (1)
 - a.
 - b.
 - (2)

3.3.1.5 Unnumbered Lists. A simple single-column tabulation shall be permitted to be considered an unnumbered list and shall not be required to be identified with letters or numbers.

3.3.1.6 Style of Lists. The three types of list groupings shall be lettered/numbered as follows:

(a) **Lettered paragraphs.* This grouping is a series of lettered paragraphs. The items are made of paragraphs consisting of multiple sentences. Each paragraph in the grouping is identified by a lowercase letter in parentheses.

(b) **Numbered lists.* This grouping is an actual list of numbered items. The items can be individual words, phrases, or single sentences. Each item in the list is identified by an Arabic number enclosed in parentheses. These lists are subdivisions of numbered sections or lettered paragraph lists.

(c) **Sublists.* This grouping is a list that serves as a subset of a numbered list item. The items can be individual words, phrases, or single sentences. The sublist items are identified by a lowercase letter followed by a period (no parentheses).

3.3.2 Figures.

3.3.2.1 All figures shall be numbered and cross-referenced within the appropriate subdivision of text.

3.3.2.2 Numbering shall correspond to the subdivision in which the figure is cross-referenced (e.g., Figure 3.3.2.2).

3.3.3 Tables.

3.3.3.1 Tables shall be numbered and cross-referenced within the appropriate subdivision of text.

3.3.3.2 Numbering shall correspond to the subdivision in which the table is cross-referenced (e.g., Table 3.3.3.2).

3.4 Material from Other Organizations.

3.4.1 Permission to Use. To use material from other organizations in the text of an NFPA document, NFPA shall have written permission of the organization from which the material was obtained.

3.4.2* Staff Responsibility. The NFPA staff liaison shall be responsible for obtaining written permission for use of materials from other organizations.

3.4.3 Credit Line. A credit line within the text and a reference citation in the appropriate chapter or annex shall be provided to acknowledge the owner/copyright holder of the material.

3.5 Explanatory Information. Explanatory statements that do not contain requirements shall not be used in the main text. Such material shall be located in an annex.

3.6 References.

3.6.1* Cross-References. Cross-references to other sections within the document shall be specific. Only those requirements that are relevant and specific shall be cross-referenced. A cross-reference shall be placed where it is most relevant in the paragraph.

3.6.1.1* The appropriate wording for a cross-reference to a chapter or section shall include the word Chapter or Section in the text. It shall not be required to say "of this standard." Further subdivisions within a section shall be referred to by number only without the word subsection or paragraph.

3.6.1.2* Nonmandatory cross-references to other sections, annexes, tables, or figures within a document shall be separated from the mandatory text by parentheses and shall be set in italic type.

3.6.1.3* References to other documents within the mandatory text of a code or standard shall be mandatory.

3.6.1.4 Nonmandatory references to other documents in the recommendation areas of the document shall only be permitted in recommended practices, guides, and annexes.

3.6.2 Cross-References to Entire Chapters or Parts of Chapters. A cross-reference shall not be made to an entire chapter unless a cross-reference to one or more sections would not be complete. A cross-reference shall be made to an entire section, where all of the cross-referenced section is applicable and relevant. The appropriate wording for a cross-reference to a chapter or section shall include the word *Chapter* or *Section* in the text.

3.6.3 Cross-References to Subsections and Paragraphs.

3.6.3.1 Where a cross-referenced section is divided into two or more subsections, such as 2.6.1, 2.6.2, and so forth, and paragraphs, such as 2.6.1.1, 2.6.1.2, and so forth, and where, for example, only 2.6.1.1 is relevant, the cross-reference shall be to 2.6.1.1 only.

3.6.3.2 Such cross-references shall clearly indicate which subsections, paragraphs, or both are intended, such as 2.6.2 and 2.6.4 or 2.6.1.1 and 2.6.1.2.

3.6.3.3 The form 2.6.1 . . . shall not be used in the reference.

3.6.4 Cross-References to Figures and Tables. Cross-references to figures and tables shall be made by the applicable number prefaced by the word *Figure* or *Table*.

3.6.5* Unneeded Cross-References. Cross-references shall not be used where additional words serve the same purpose.

3.6.6 References to Publications. References to publications in the text shall be for the purpose of supplementing requirements, recommendations, and guidance (as in guides). Bibliographical and informative references shall be included only in explanatory material, such as in an annex or in a table footnote. The specific identification of such references and their source shall be included in the last annex.

3.6.6.1 References to Other NFPA Codes and Standards. All references to other NFPA codes and standards shall begin with the NFPA designation followed by a comma and the full title of the document in italics, (e.g., “. . . as required by NFPA 13, *Standard for the Installation of Sprinkler Systems*”). The edition shall not be designated in the text, but in Chapter 2.

3.6.6.2* References to Proprietary Documents of Other Organizations. All references to documents published by other organizations, including government entities, shall carry that organization’s designation and the full publication title (e.g., “. . . in accordance with API 2510, *Design and Construction of LP-Gas Installations*”).

3.6.6.3 References to Books, Reports, and Articles in Periodicals. All references to books shall be made using the author-date method of citation (e.g., the author’s last name, or publishing organization if no author is given, and the year of publication enclosed in parentheses at the end of a sentence.)

3.6.7 Reference Lists. The specific identification of such references and their source shall be included in the list of mandatory referenced publications or in the nonmandatory references given in the last annex.

3.6.7.1 NFPA Codes and Standards and Proprietary Documents of Other Organizations. References shall include the identification number, title, and the paragraph, section, or clause referenced, when possible.

3.6.7.1.1 The current, approved edition of the referenced document shall be included in Chapter 2, Referenced Publications, for mandatory references or in the last annex, Nonmandatory Referenced Publications, for informative references.

3.6.7.1.2 Updates of references to non-NFPA documents shall be completed by the appropriate technical committee and shall be processed in accordance with the *Regulations Governing Committee Projects*.

3.6.7.1.3 A committee proposal (CP) shall be developed to update non-NFPA references at the ROP stage.

3.6.7.1.4 The reference shall contain the identification number if any, title, year of current edition, and name and address of the organization issuing the referenced document.

3.6.7.1.5 The edition indicated for each reference shall be the current edition as of the date of the NFPA issuance of the document.

3.6.7.1.6 The references shall be listed separately to facilitate updating to the latest edition by the user.

3.6.7.2 Books, Reports, and Articles in Periodicals.

3.6.7.2.1 Citations for books, reports, and periodicals shall include the author’s name (or publishing organization if no author is identified), full title of the work, year published, full name of publisher, and the publisher’s city.

3.6.7.2.2 The style for citations for books, reports, and periodicals shall conform to *The Chicago Manual of Style*, 14th edition.

3.7 Special Elements.

3.7.1 Figures.

3.7.1.1 General.

3.7.1.1.1 Figures in the text of the document shall portray mandatory requirements.

3.7.1.1.2 Drawings, charts, or graphs used to illustrate only a typical situation and not a mandatory requirement shall be segregated from the requirements of the document in an annex.

3.7.1.2 Preparation. Drawings, charts, and graphs shall be prepared by NFPA from drawings submitted by the technical committee.

3.7.1.3 Identification.

3.7.1.3.1 Each drawing, chart, or graph shall be identified by a figure number and caption.

3.7.1.3.2 All figures shall be referenced in the text and the figure number shall be the same number as the subdivision where it is referenced in the text.

3.7.1.3.3 If more than one figure is related to a single subdivision, letters in parentheses shall be used as a suffix to the paragraph number.

3.7.1.3.4 The caption of the figure shall appear above the figure.

3.7.1.4 Figure Position in Text. When used in the text, a figure shall be placed as near to its first reference in the text as convenient.

3.7.1.5 Figure Labels.

3.7.1.5.1 All significant elements in a figure shall be labeled with terminology that matches the text discussion.

3.7.1.5.2 All dimensions shall be indicated with SI units.

3.7.1.5.3 Conversions shall be permitted when space permits. Otherwise, the conversion factor(s) shall be given in a figure note.

3.7.1.6 Figure Legends or Notes. Symbols in complex figures shall be identified in a legend or note.

3.7.1.7* Credit Lines. Photos and artwork obtained from outside sources shall be identified by a credit line in parentheses following the caption.

3.7.2 Tables.

3.7.2.1 Titles.

3.7.2.1.1 The first letter of each word in table titles shall be capitalized.

3.7.2.1.2 In these titles, prepositions, articles, and coordinating conjunctions shall be lowercased unless it is the first word.

3.7.2.2 Column Headings.

3.7.2.2.1 The first letter of each word in column headings shall be capitalized.

3.7.2.2.2 In these titles, prepositions, articles, and coordinating conjunctions shall be lowercased unless it is the first word.

3.7.2.2.3 Abbreviated units of measure in column headings shall be lowercased and enclosed in parentheses.

3.7.2.2.4 The first letter of every word in sub-headings shall be capitalized except for any dimensional heading at the top of each column.

3.7.2.3 **Column Entries.** Only the first letter of the first word of individual table entries shall be capitalized.

3.7.2.4 Identification.

3.7.2.4.1 Each table shall be identified by a number and a title.

3.7.2.4.2 All tables shall be referenced in the text and the table number shall be the same number as the subdivision where it is referenced in the text.

3.7.2.4.3 If more than one table is related to a single subdivision, letters in parentheses shall be used as a suffix to the subdivision number.

3.7.2.5 **Abbreviations and Letter Symbols.** Abbreviations and letter symbols for units, when the intent and meaning are clear, shall be permitted to be used in headings and in the body of the table.

3.7.2.6 Units of Measure.

3.7.2.6.1 Units of measure shall always be given either in the title, column headings, or table footnote as needed.

3.7.2.6.2 The same unit of measure shall be used throughout each column.

3.7.2.6.3 Units of measure shall be given in parentheses in column headings.

3.7.2.7* Informal Tables.

3.7.2.7.1 A simple tabulation that can be set to fit in a single column shall be considered an informal table.

3.7.2.7.2 No table number or title shall be required for the tabulation.

3.7.2.8 **Vacant Cells.** A dash (—) shall be used to indicate a vacant cell.

3.7.2.9 Table Notes.

3.7.2.9.1 Notes shall only be permitted as table notes.

3.7.2.9.2 Notes shall be indicated consecutively, with a superscript number or letter, beginning with the title, proceeding through the column headings from left to right, and then moving down the table.

3.7.2.9.3 The table note shall appear directly beneath the table and not at the foot of the page.

3.7.2.10 Numerical Columns.

3.7.2.10.1 Tabular material shall be centered in each column for columns with inclusive numbers and entries in mixed word/number columns.

3.7.2.10.2 All numbers shall be aligned on the decimal point and zeroes shall be placed before the decimal point in numbers less than one.

3.7.2.10.3 Decimal indications shall be used in tabular work unless fractions are commonly used in the field.

3.7.2.11 Reading Columns.

3.7.2.11.1 Reading columns (i.e., columns in which words appear) shall be aligned on the left.

3.7.2.11.2 Runover lines shall be indented under the line to which they apply.

3.7.2.11.3 Grammatical parallelism shall be maintained throughout the entries of a reading column.

3.7.2.11.4 A concluding period shall not be used unless the entry is one or more complete sentences.

3.7.2.12 Breaking.

3.7.2.12.1 Tables shall be organized to fit vertically on a single page.

3.7.2.12.2 When a table carries over for more than one page, the complete heading shall be repeated at the heads of the successive pages unless the table runs contiguously through two successive pages and data run vertically on the page.

3.7.2.12.3 The fact that the material is continued shall be indicated both at the bottom of the page from which the material is continued and at the top of the page to which it is continued.

3.7.2.13 Table Footnotes.

3.7.2.13.1 Footnotes shall only be permitted for tables.

3.7.2.13.2 For numbered tables, letters shall be used to identify footnotes.

3.7.2.13.3 For word tables, numbers shall be used to identify footnotes.

3.7.3* Formulas and Equations.

3.7.3.1 Equations shall be numbered only when necessary for cross-referencing purposes.

3.7.3.2 When equations are numbered, all equations in a given section shall be numbered even if only one of the equations is cross-referenced.

3.7.3.3* Equations shall be numbered consecutively within a chapter, using the chapter number, a period, and the equation number in parentheses.

3.7.3.4 Punctuation shall be inserted following equations as grammatically necessary for sentence flow.

3.7.3.5 Explanation of terms shall appear under the formula or equation introduced by the word *where*.

3.7.3.6 The explanatory material shall be permitted to be omitted if symbols and letters are explained in a table of symbols elsewhere in the document.

3.7.3.7 Fractions shall be single case (e.g., $\frac{7}{8}$ rather than 7/8).

3.7.4 Letter Symbols and Variables.

3.7.4.1* Where applicable and possible, the appropriate symbols from ANSI Y10, *American National Standards Institute Series on Letter Symbols*, shall be used.

3.7.4.2 The letter symbols and variables shall be printed in italics.

3.7.4.3* The intent of the subscripts shall be made clear in a “where” list.

3.7.4.4 The subscript or superscript shall be italicized when a letter symbol or variable. Sub- and superscripts consisting of numbers or mathematical functions shall be roman.

3.7.4.5 The symbol for degree shall be included in expressing the temperature scales C, F, and R (e.g., 69°C is the acceptable abbreviation for 69 degrees Celsius).

3.7.4.6 The symbol for degree (temperature) shall not be used without the use of the appropriate letter symbol.

3.7.4.7 The degree symbol shall not be required for absolute temperature scale of kelvin (K).

3.7.5 Reference Lists. All reference lists shall conform to *The Chicago Manual of Style*, 14th edition.

3.8 Annexes.

3.8.1 General. Annexes shall be identified by means of consecutive letters (e.g., the first annex in a document shall be Annex A; the second, Annex B). All annexes shall be titled.

3.8.2 Annex A.

3.8.2.1 The first (or only) annex shall be used for explanatory or informative material on the text of the document, and it shall carry the title Annex A Explanatory Material.

3.8.2.2 Each subdivision within this annex shall carry the same number as the subdivision in the document to which it applies, preceded by the letter A and a period (e.g., A.1.2, A.1.2.1).

3.8.2.3 An asterisk shall be inserted after the subdivision number in the text of the body of the document to indicate that explanatory material on that subdivision can be found in the annex.

3.8.3 Additional Annexes.

3.8.3.1 All subdivisions within an annex shall be numbered in the form used for the chapters within the main text of the document.

3.8.3.2* The annex letter followed by a period shall be used as the prefix for all subdivision numbers within the annex.

3.8.3.3 Figures and tables shall also be identified by the annex letter and section number (e.g., Figure B.1.2.2 is found in Annex B).

3.8.4 Last Annex.

3.8.4.1 Where nonmandatory references are used, they shall be listed in the last annex.

3.8.4.2 The annex for nonmandatory references shall be titled Nonmandatory Referenced Publications.

3.9 Vertical Rules and Bullets.

3.9.1 Vertical rules and bullets shall be used in the left margin to indicate revisions to text, figures and tables.

3.9.2 Vertical rules (|) shall indicate where a change, addition, or partial deletion has occurred to a line of text.

3.9.3 Bullets (•) shall indicate where one or more complete paragraphs have been deleted. Bullets shall appear between the current existing paragraphs to indicate the deletion.

3.9.4* Vertical rules and bullets shall only be required for partial revisions of documents.

3.10 Presentation of Final Manuscript.

3.10.1 Whether prepared as hard copy or submitted as an electronic file, all manuscripts shall be double spaced.

3.10.2 All pages of the manuscript shall be numbered with the document numerical designation followed by the page number (e.g., 58.1, 58.2, 58.3).

Chapter 4 Units of Measurement

4.1 Policy on Units of Measurement.

4.1.1* Measurement System Preference. The system of measurement required for all NFPA codes, standards, recommended practices, and guides (hereafter called documents) shall be the International System of Units, commonly known as SI or metric, and other units that are commonly acceptable for use with the SI system.

4.1.2 Fundamental Approach.

4.1.2.1* Dual System of Units. Throughout a document, SI units shall be used alone, or SI units shall be permitted to be used with inch-pound units, which shall be given in parentheses. When a document uses both systems of measure, they shall exist throughout the entire document and shall be based on hard conversions except as indicated in 4.1.2.2.

4.1.2.2* Soft Conversions. The following cases shall not be required to use hard conversions and shall be permitted to use soft conversions:

(a) *Trade Sizes.* Where the actual measured size of a product is not the same as the nominal size, trade size designators shall be used rather than dimensions. Trade practices shall be followed in all cases.

(b) *Extracted Material.* Where material in inch-pound units only is extracted from another standard, SI units shall be added for informational purposes. The SI units shall be equivalent to the inch-pound units shown and shall be in parentheses following the inch-pound units.

(c) *Industry Practice.* Where industry practice is to express units in inch-pound units, the inclusion of SI units shall not be required.

(d) *Safety or Compliance.* Where hard conversions to SI would impact safety or compliance, they shall not be required.

4.1.2.3 Document Format. When both SI and inch-pound units are used in a document, the SI units shall be the primary units and the inch-pound units shall immediately follow in parentheses.

4.1.2.4 Conversion Preference. All conversions shall be made such that the values are accurate and correct in the units presented.

4.1.2.5 Units of Measure. A statement shall be included in Chapter 1 establishing the units of measure. (See 1.6.1.7.)

4.1.3 Reference Publication. As a supplement to the criteria contained within these guidelines and for items not addressed herein, the reference document on which all SI conversions are to be based shall be IEEE/ASTM SI 10, *Standard for Use of the International System of Units (SI): the Modern Metric System*, 1997.

4.2 Units and Conversion Guidance. For guidance for conversions and unit selection see Annex B, SI Units and Conversions.

Annex A Explanatory Material

A.1.5.3.2 The origin and development statement provides the user of the document with a quick overview of the history of the document and the development of the technical requirements within the document, including the major changes from the latest revision.

A.1.5.4.7 The technical committee scope should not be confused with the scope of the document (see A.1.6.1.2). The technical committee scope is provided by the Standards Council to outline the area(s) in which the technical committee can develop a technical document(s).

A.1.5.6.2(e) Vertical rules and marginal bullets aid the user in identifying where changes have been made to the document during the latest revision.

A.1.5.6.2(f) The parenthetical reference following extracted text [e.g., (101:2.3.4.5)] indicates the source document (i.e., NFPA 101) and the source paragraph (i.e., 2.3.4.5).

A.1.6.1.2 The scope of the document should not be confused with the scope of the technical committee (see A.1.5.4.7). The scope of the document is developed by the technical committee to establish what the document is intended to cover.

A.1.6.1.5 The following is suggested as wording that might be included in a code or standard to cover the subject of retroactivity if it is determined by the committee that a retroactivity state is needed. The insertion of (*document type*) refers to the type of document that the technical committee is developing (i.e., code, standard, recommended practice, or guide).

Retroactivity. The provisions of this (*document type*) reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this (*document type*) at the time the (*document type*) was issued.

Unless otherwise specified, the provisions of this (*document type*) shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the (*document type*). Where specified, the provisions of this (*document type*) shall be retroactive.

In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this (*document type*) deemed appropriate.

The retroactive requirements of this (*document type*) shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction, and only where it is clearly evident that a reasonable degree of safety is provided.

A.1.6.1.6 The following is suggested uniform wording on equivalency for use by those NFPA committees desiring an equivalency statement. The insertion of (*document type*) refers to the type of document that the technical committee is developing (i.e., code, standard, recommended practice, or guide).

Equivalency. Nothing in this (*document type*) is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this (*document type*). Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency. The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

A.1.6.1.8.1 The following sample ordinance is provided to assist a jurisdiction in the adoption of this code and is not part of this code.

ORDINANCE NO. _____

An ordinance of the [*jurisdiction*] adopting the [*year*] edition of NFPA [*document number*], [*complete document title*] documents listed in Chapter 2 of that code; prescribing regulations governing conditions hazardous to life and property from fire or explosion; providing for the issuance of permits and collection of fees; repealing Ordinance No. _____ of the [*jurisdiction*] and all other ordinances and parts of ordinances in conflict therewith; providing a penalty; providing a severability clause; and providing for publication; and providing an effective date.

BE IT ORDAINED BY THE [*governing body*] OF THE [*jurisdiction*]:

SECTION 1 That the [*complete document title*] and documents adopted by Chapter 2, three (3) copies of which are on file and are open to inspection by the public in the office of the [*jurisdiction's keeper of records*] of the [*jurisdiction*], are hereby adopted and incorporated into this ordinance as fully as if set out at length herein, and from the date on which this ordinance shall take effect, the provisions thereof shall be controlling within the limits of the [*jurisdiction*]. The same are hereby adopted as the code of the [*jurisdiction*] for the purpose of prescribing regulations governing conditions hazardous to life and property from fire or explosion and providing for issuance of permits and collection of fees.

SECTION 2 Any person who shall violate any provision of this code or standard hereby adopted or fail to comply therewith; or who shall violate or fail to comply with any order made thereunder; or who shall build in violation of any detailed statement of specifications or plans submitted and approved thereunder; or failed to operate in accordance with any certificate or permit issued thereunder; and from which no appeal has been taken; or who shall fail to comply with such an order as affirmed or modified by or by a court of competent jurisdiction, within the time fixed herein, shall severally for each and every such violation and noncompliance, respectively, be guilty of a misdemeanor, punishable by a fine of not less than \$ _____ nor more than \$ _____ or by imprisonment for not less than _____ days nor more than _____ days or by both such fine and imprisonment. The imposition of one penalty for any violation shall not excuse the violation or permit it to continue; and all such persons shall be required

to correct or remedy such violations or defects within a reasonable time; and when not otherwise specified the application of the above penalty shall not be held to prevent the enforced removal of prohibited conditions. Each day that prohibited conditions are maintained shall constitute a separate offense.

SECTION 3 Additions, insertions, and changes — that the [year] edition of NFPA [document number], [complete document title] is amended and changed in the following respects:

List Amendments

SECTION 4 That ordinance No. _____ of [jurisdiction] entitled [fill in the title of the ordinance or ordinances in effect at the present time] and all other ordinances or parts of ordinances in conflict herewith are hereby repealed.

SECTION 5 That if any section, subsection, sentence, clause, or phrase of this ordinance is, for any reason, held to be invalid or unconstitutional, such decision shall not affect the validity or constitutionality of the remaining portions of this ordinance. The [governing body] hereby declares that it would have passed this ordinance, and each section, subsection, clause, or phrase hereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses, and phrases be declared unconstitutional.

SECTION 6 That the [jurisdiction's keeper of records] is hereby ordered and directed to cause this ordinance to be published. [NOTE: An additional provision may be required to direct the number of times the ordinance is to be published and to specify that it is to be in a newspaper in general circulation. Posting may also be required.]

SECTION 7 That this ordinance and the rules, regulations, provisions, requirements, orders, and matters established and adopted hereby shall take effect and be in full force and effect [time period] from and after the date of its final passage and adoption.

A.1.10 The development process information sheets include the following:

- (1) Codes and standards development process outline
- (2) Guide to committee member classifications
- (3) Example of completed proposal form
- (4) Blank proposal form

A.2.1 *Technical style* is how the technical requirements are presented to the user. Chapter 2 addresses how the technical committee should write the technical requirements of the document. Technical style is separate from editorial style, in which the technical wording is modified to ensure that the presentation is grammatically accurate and understandable.

A.2.2.2 The technical committee should review all wording within its code(s) or standard(s) to ensure that the requirements and its respective wording is not vague or unenforceable. When terms are vague or unenforceable, the requirements can often be misapplied or misinterpreted.

A.2.2.2.1 Examples of unenforceable language are as follows:

- (1) Portable fire extinguishers shall be located to consider the occupants' *safety*.
- (2) A manual pull station shall be located *near* each exit.

Examples of enforceable language are as follows:

- (1) All flammable liquids shall be stored in listed *safety* cans.
- (2) A manual pull station shall be located *within 1 m* of each exit.

A.2.2.2.3 The terms contained in Table 2.2.2.3 are not prohibited from use within NFPA documents. However, these terms, if used incorrectly, can be unenforceable or vague. Table 2.2.2.3 is provided to highlight terms that the technical committee should review to ensure that in context they are not unenforceable or vague. Terms listed in Table 2.2.2.3 are appropriate if used in the proper context.

A.2.2.3.1 Technical committees should retain only those judgmental items that clearly depend on local field conditions or where complete information on hazards, protection methods, or safety measures is not available to specify actual requirements.

A.2.2.3.2 An example of multiple levels of safety (not permitted) is as follows:

Fire protection in a single-family residence shall be based on one of the following levels of protection:

Option 1. A single station smoke detector shall be installed outside each sleeping area.

Option 2. A single station smoke detector shall be installed on every level of the home.

Option 3. A single station smoke detector shall be installed on every level of the home and in each sleeping room.

Each option provides a different level of safety for a single application. The use of differing requirements for new and existing situations or *trade-offs* for other protection arrangements should not be considered multiple levels of safety.

A.2.2.6 Some standards are product standards as opposed to performance, use, or installation standards. One example of a product standard is NFPA 1150, *Standard on Fire-Fighting Foam Chemicals for Class A Fuels in Rural, Suburban, and Vegetated Areas*. The scope of NFPA 1150 reads: "This standard specifies requirements and test procedures for foam chemicals used on Class A fuels." NFPA 1150 only contains requirements on Class A foam characteristics and test procedures. The use of Class A foams is not covered in this standard.

A.2.2.6.1 Because product standards should be written, to the extent possible, as performance requirements with specific pass/fail requirements and a designated test method to evaluate the performance, an equivalency statement (*see 1.6.1.6*) should be included in the standard.

A.2.2.6.2 Product standards are considered to contain performance, testing, and third-party certification requirements for products. They can contain design requirements as well.

Third-party certification includes the requirements for the testing, labeling, listing, follow-up, and quality assurance programs by which a product is certified as being compliant with a specific standard from a certification organization.

"User requirements" are those that apply to users of the product and specify when/where/how a product is used. Where product standards need to make reference to where user requirements can be found, or provide helpful general information for user consideration or user understanding of the standard's requirements, such material should be placed in the annex of the product standard.

A.2.2.7.2 The NFPA Board of Directors approves TACs when necessary. For a current list of NFPA TACs contact the NFPA Standards Council.

A.2.3.1 Codes and Standards.

Code. A standard that is an extensive compilation of provisions covering broad subject matter or that is suitable for adoption into law independently of other codes and standards.

NOTE: The decision to designate a standard as a “code” is based on such factors as the size and scope of the document, its intended use and form of adoption, and whether it contains substantial enforcement and administrative portions.

Standard. A document, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

A.2.3.1.2 The insertion of (*document type*) refers to the type of document that the technical committee is developing (i.e., code or standard).

A.2.3.1.3 The insertion of (*document type*) refers to the type of document that the technical committee is developing (i.e., code or standard).

A.2.3.2.3 An example of an inappropriate reference in a definition is as follows:

Air Connector. A conduit for transferring air between an air duct or plenum and an air terminal unit or an air inlet or an air outlet. (For limitations on use of air connectors, see 2.3.2.1.)

A.2.3.2.5 Existing official definitions from the *Regulations Governing Committee Projects* are as follows:

- Approved
- Authority Having Jurisdiction
- Code
- Consensus
- Guide
- Labeled
- Listed
- Recommended Practice
- Shall
- Should
- Standard

A.2.3.5.2 Exceptions can often be avoided by rewording the main rule. An example of a rule and exception that have been rewritten to eliminate the exception is as follows:

Rule:

3.2.4.2.4 Where joist channels are wider than 0.6 m (2 ft), more than one discharge device shall be required per channel.

Exception: If a single discharge device being used is listed for the width of the joist channel being protected.

Rewritten to eliminate the exception:

3.2.4.2.4 Unless the single discharge device being used is listed for the width of the joist channel, more than one discharge device shall be required per joist channel if joist channels are wider than 0.6 m (2 ft).

A.2.3.5.5 An example of an improper list of exceptions indicating that the basic rule is inapplicable is as follows:

4.13.1.1 All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers.

Exception No. 1: Concealed spaces formed by studs or joists with less than 152 mm (6 in.) between the inside or near edges of the studs or joists. (See Figure 4.6.4.1.4.)

Exception No. 2: Concealed spaces formed by ceilings attached directly to or within 152 mm (6 in.) of wood joist construction.

Exception No. 3: Concealed spaces formed by ceilings attached directly to the underside of composite wood joist construction, provided the joist channels are firestopped into volumes each not exceeding 4.53 m³ (170 ft³) using materials equivalent to the web construction.

Exception No. 4: Concealed spaces entirely filled with noncombustible insulation.

Exception No. 5: Concealed spaces within wood joist construction and composite wood joist construction having noncombustible insulation filling the space from the ceiling up to the bottom edge of the joist of the roof or floor deck, provided that in composite wood joist construction the joist channels are firestopped into volumes each not exceeding 4.53 m³ (160 ft³). The joists shall be firestopped to the full depth of the joist with material equivalent to the web construction.

Exception No. 6: Concealed spaces over isolated small rooms not exceeding 4.6 m² (55 ft²) in area.

Exception No. 7: Where rigid materials are used and the exposed surfaces have a flame spread rating of 25 or less and the materials have been demonstrated not to propagate fire in the form in which they are installed in the space.

Exception No. 8: Concealed spaces in which the exposed materials are constructed entirely of fire-retardant treated wood as defined by NFPA 703, Standard for Fire Retardant Impregnated Wood and Fire Retardant Coatings for Building Materials.

Exception No. 9: Noncombustible concealed spaces having exposed combustible insulation where the heat content of the facing and substrate of the insulation material does not exceed 11,356 kJ/m² (1000 Btu per ft²).

A.2.3.8 An example of a cautionary statement is as follows:

CAUTION

It is undesirable to attempt to extinguish this type of fire unless there is reasonable assurance that the source of fuel can be promptly shut off.

A.2.3.9.1 An example of a mandatory cross-reference is as follows:

12.4.1.2.1 Ventilation of anesthetizing locations shall conform to 5.4.1.

A.2.3.9.2 An example of a nonmandatory cross-reference is as follows:

16.3.4.1 A single alarm panel, as described in 4.3.1.2.1, shall be mounted in an area of continuous surveillance while the facility is in operation.

A.2.4.1 Recommended Practices.

Recommended Practice. A document that is similar in content and structure to a code or standard but that contains only nonmandatory provisions using the word “should” to indicate recommendations in the body of the text.

A.2.4.2 Guides.

Guide. A document that is advisory or informative in nature and that contains only nonmandatory provisions. A guide may contain mandatory statements such as when a guide can be used, but the document as a whole is not suitable for adoption into law.

A-2.5.1.1 An example of a requirement that should be denationalized is as follows:

7.3.4 Special Equipment for Emergency Personnel. Self-contained breathing apparatus (SCBA) using full-face, positive-pressure masks approved by the National Institute for Occupational Safety and Health (NIOSH) shall be provided for fire brigade and control room personnel.

A.2.5.1.3 Additional guidance on SI units and conversions can be found in Annex B, SI Units and Conversions.

A.2.5.1.6 Some examples of international referenced documents are ASTM, ASME, BSI, CSA, ISO, IEC, and NFPA.

A.2.6 Extracting provides an advantage to using multiple references to requirements contained within other NFPA documents. Extracting has the disadvantage of creating a situation where the text of the source document and the user document are not identical due to the timing of each document's revision cycle.

A.2.6.2.2 The following is an example of the proper reference used for an extract:

8.4.1 The branch-circuit conductors supplying one or more units of a data processing system shall have an ampacity not less than 125 percent of the total connected load. (70:645.5)

A.2.6.5 Example of Changing the Relationship of Paragraphs. If a paragraph with two subparagraphs is renumbered as three separate and distinct paragraphs, does that change the relationship of paragraph two and three to the original paragraph one? Many times subparagraphs refine requirements in the host paragraph and renumbering changes that emphasis and possibly compromises that relationship.

Incorrect renumbering:

Parent Document	Document Extracting
7.5.1 Paragraph	8.2.3.1 Paragraph
7.5.1.1 Subparagraph	8.2.3.2 Paragraph
7.5.1.2 Subparagraph	8.2.3.3 Paragraph
7.5.2 Paragraph	8.2.3.4 Paragraph

Correct renumbering:

Parent Document	Document Extracting
7.5.1 Paragraph	8.2.3 Paragraph
7.5.1.1 Subparagraph	8.2.3.1 Subparagraph
7.5.1.2 Subparagraph	8.2.3.2 Subparagraph
7.5.2 Paragraph	8.2.4 Paragraph

A.3.1 Editorial style addresses how the technical requirements appear in the final text format.

A-3.2.2.1 Examples of simpler spelling are as follows:

gage instead of gauge
catalog instead of catalogue

The following is a list of preferred spelling and punctuation for troublesome "fire" words that frequently appear in NFPA documents.

Rule of Thumb: Except for noun-noun compounds, such as firehouse, that are treated as one word per Webster's Dictionary, noun-noun compounds are treated as two words (no hyphenation) as nouns and as adjectives before another noun per the examples given here.

Noun-Noun Compounds: Always Two Words (noun and adjective forms)

fire alarm, fire alarm system
fire apparatus, fire apparatus driver
fire area, fire area management
fire attack, fire attack method
fire barrier, fire barrier assembly
fire command, fire command center
fire control, fire control plans
fire curtain
fire damage, fire damage control
fire damper
fire department, fire department vehicle
fire detection, fire detection device
fire detector, fire detector device
fire door, fire door assembly
fire drill, fire drill procedures
fire escape, fire escape route
fire endurance, fire endurance rating, fire endurance test,
fire endurance classification
fire exposure, fire exposure conditions, fire exposure test
fire extinguisher
fire fighter, fire fighter injuries
fire flow, fire flow test
fire growth, fire growth potential
fire hazard, fire hazard properties
fire hose, fire hose nozzles
fire incident, fire incident report
fire load
fire loss, fire loss prevention
fire point
fire prevention, fire prevention system
fire protection, fire protection plan
fire resistance rating, 1-hour fire resistance rating
fire training, fire training center
fire responder, fire responder task
fire risk, fire risk assessment
fire safety, fire safety education
fire service, fire service personnel
fire screen
fire spread, fire spread rating
fire storm, fire storm area
fire suppression, fire suppression system
fire stream, fire stream spray
fire tower, fire tower training
fire wall, fire wall assemblies
fire water
fire zone

Noun-Noun Compounds: Always One Word (noun and adjective forms)

fireboat
 firebomb
 firebox
 firebreak
 firebrick
 firecracker
 fireground, fireground management
 fireguard
 firehouse
 fireplace
 fireplug
 fireproof, fireproofing
 firestop, firestopped, firestopping
 firetrap
 fireworks

Hyphenated Compounds (adjective form before the noun)

fire-activated system
 fire-blocking cushions
 fire-caused failure
 fire-damaged equipment
 fire-detecting device
 fire-extinguishing equipment
 fire-fighting equipment,
 fire-fighting foam chemicals
 fire-fighting operations
 fire-preventive steps
 fire-protective systems
 fire-rated equipment
 fire-reporting systems
 fire-resistant material
 fire-resistive coating, fire-resistive-rated elements
 fire-retardant resins, fire-retardant-treated wood,
 fire-retardant-impregnated wood
 fire-safe building
 fire-signaling equipment
 fire-suppressing device
 fire-training center
 fire-warning equipment

Miscellaneous Hyphenated Compounds

fire-gas (n)
 fire-protect (v) (to fire-protect steel)
 fire-fight (v)

Notes:

- (1) Compounds made up of nouns and participles are hyphenated as adjective forms before the noun, but not as predicate adjectives coming after the noun.

Examples:

fire-rated materials shall be used . . .
 but
 materials shall be fire rated . . .
 and
 materials are fire rated . . .

- (2) Compounds made of nouns and gerunds are treated as open compounds when used as nouns, but hyphenated as adjective forms before the noun.

Examples:

fire training (n)

fire-training center (adj form)

- (3) When open noun-noun compounds, such as fire service, are joined with other words to form compounds that are ordinarily hyphenated, use an en dash rather than a hyphen to create the link.

Examples:

fire service–related injury
 non–fire service personnel

- (4) Avoid use of the expression “fire situation”; a fire is a fire . . .

A.3.2.3.2 Examples of capitalization for titles are as follows:

Section 4.1
 Figure 4.2.3
 Annex A

A.3.2.3.3 Examples of specific terms requiring capitalization are as follows:

Type M cable
 Level A responder

A.3.2.3.5.2 Examples of labels associated with units of measure are as follows:

50-mm stainless steel rod
 250 g of product

A.3.2.4.3.6 An example of numbering main and subdefinitions is as follows:

3.2 General Definitions.**3.2.12 Pressure.****3.2.12.1 Pressure, Maximum.****3.2.12.2 Pressure, Minimum.**

A.3.3.1.2.1 Sentences with lists in the middle are ambiguous and open to misinterpretation.

A.3.3.1.6(a) An example of a lettered paragraph is as follows:

Operation of bulk delivery vehicles shall comply with the following requirements:

(a) Vehicles transporting blasting agents shall be driven only by those drivers who are at least 21 years old and who possess a valid motor vehicle operator’s license. Drivers shall be familiar with applicable federal and state regulations pertaining to explosive materials.

(b) Vehicle operators shall be trained in the safe operation of the vehicle. Operators shall be familiar with the commodities being delivered and the procedures for handling emergencies.

(c) No person shall smoke, carry matches or any flame-producing device . . .

A.3.3.1.6(b) An example of a numbered list is as follows:

The manuals shall include the following if applicable:

- (1) Illustrations that show location of controls
- (2) Explanation of the function of each control
- (3) Step-by-step procedure for proper use of the controls
- (4) Safety considerations in servicing

A.3.3.1.6(c) An example of a sublist is as follows:

The information shall include, but not necessarily be limited to, the following:

- (1) Patients
 - a. Number
 - b. Condition
 - c. Disposition

- (2) Hazardous materials response personnel
- a. Number screened
 - b. Adverse reactions noted
 - c. Disposition

A.3.4.2 The NFPA staff liaison should work with the submitting organization and NFPA legal counsel to ensure that all parties are properly referenced and credited for their materials.

A.3.6.1 Examples of mandatory cross-references are as follows:

Valves shall be installed in accordance with Section 3.4.
Ducts shall be cleaned in accordance with the requirements of Chapter 6.

A.3.6.1.1 Examples of correct cross-references within a document are as follows:

Sprinklers shall meet the requirements of Chapter 2.
Hangers shall be installed in accordance with Section 2.6.

A.3.6.1.2 Examples of nonmandatory cross-references within a document are as follows:

(See Section 2.3)

(For additional information on valves, see Annex D.)

Technical committees should review each nonmandatory cross-reference to ensure that the intent of the cross-reference is nonmandatory. If the intent of the technical committee is to require the user to follow the cross-referenced requirements, then a mandatory cross-reference should be used.

A.3.6.1.3 Examples of references to other documents within the mandatory text are as follows:

Where sprinklers are required, they shall be installed in accordance with the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*.

Pumps used to meet the water supply requirements of 4.5.6 shall be installed in accordance with the requirements of NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*.

A.3.6.5 Unneeded Cross-References. An example of an unneeded cross-reference is as follows:

Sprinklers used in water spray systems shall meet the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*, Section 4.5.

If NFPA 13, Section 4.5 states “Sprinklers shall be listed” then the cross-reference is not needed and the wording could be changed to read as follows:

Sprinklers used in water spray systems shall be listed.

A.3.6.6.2 References to proprietary documents of other organizations is particularly important in codes and standards that become regulations because the mandatory references become part of the regulations.

A.3.7.1.7 Examples of credit lines are as follows:

(Courtesy of ABC Company)

(Photo by John Smith, XYZ Inc.)

A.3.7.2.7 An example of an informal table is as follows:

Relay or Device

Level

Flow

Speed

A.3.7.3 An example of an equation is as follows:

The exposure variables, expressed in arithmetic form, are related by the following equation:

$$SRR = \left(\frac{OD}{l}\right)\left(\frac{T_p}{T_s}\right)V_s \quad (1.1)$$

SRR = smoke release rate (m²/sec)

OD = optical density (calculated as described in 8.1.1)

l = path length for smoke measurement (duct diameter, m)

T_p = temperature at the photoelectric cell (K)

T_s = temperature at the bidirectional probe (K)

V_s = volumetric flow rate (m³/sec)

A.3.7.3.3 For example, equations in Chapter 4 should be numbered (4.1), (4.2), and so forth.

A.3.7.4.1 ANSI Y10 defines a letter symbol as “a single letter, specified as to general form or type for use within a mathematical expression.” It continues, “the primary symbol may be modified by subscript or superscript. In a published work, the same primary letter symbol shall appear throughout for the same generic physical quantity, regardless of the units employed, and of special values assigned.”

A.3.7.4.3 A limiting literal subscript or superscript is part of the symbol itself even though it can actually be an abbreviation such as max or min.

A.3.8.3.2 The following is an example of annex numbering

B.1.2 Test Specimens.

B.1.2.1 Handling.

B.2.2 Equipment.

A.3.9.4 When documents undergo a complete revision, changes are made to so many paragraphs that the document would require vertical rules and bullets throughout the entire document. If vertical rules and bullets would assist the user for a document that was completely revised, then the technical committee and/or staff liaison should consider their use.

A.4.1.1 Additional information on SI units and conversions is contained in Annex B, SI Units and Conversions.

A.4.1.2.1 A “hard” conversion is not a direct mathematical conversion, but is considered a change in dimensions or properties of an item into new sizes that might or might not be interchangeable with the sizes used in the original measurement.

A.4.1.2.2 A “soft” conversion is considered a direct mathematical conversion and involves a change in the description of an existing measurement but not in the actual dimension.

Annex B SI Units and Conversions

B.1 Base Units and Derived Units. The SI system consists of two classes of units: base and derived.

B.1.1 SI Base Units. Base units are the basis of the SI system and consist of seven dimensionally independent units that

measure seven fundamental physical quantities. The SI base units are given in Table B.1.1.

Table B. 1 . 1SI Base Units

Quantity	Unit	Symbol
Length	meter	m
Mass	kilogram	kg
Time	second	s ¹
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Amount of a substance	mole	mol
Luminous intensity	candela	cd

¹ Where confusion might result, the symbol “sec” can be used.

B.1.2 SI Derived Units All other units are “derived units” that are formed by combining the base units and units derived from them according to specific algebraic relations. Some derived units are provided with their own names, such as the unit for force, the “newton.” Others are named according to the units from which they are derived, such as the unit for velocity, “meter per second.” Table B.1.2(a) lists derived quantities that are provided with specially named SI units. Table B.1.2(b) lists those quantities without special names.

Table B.1.2(a) SI Derived Units with Special Names

Quantity	Unit	Symbol Expressed in Terms of Other Units	
Absorbed dose	gray	Gy	J/kg
Activity (of radionuclide)	becquerel	Bq	1/s
Angle, plane	radian	rad	m/m = 1
Angle, solid	steradian	sr	m ² /m ² = 1
Celsius temperature	degree Celsius	°C	K
Dose equivalent	sievert	Sv	J/kg
Electrical capacitance	farad	F	C/V
Electrical charge, quantity of electricity	coulomb	C	A · s
Electrical conductance	siemens	S	A/V
Electrical inductance	henry	H	Wb/A
Electric potential difference	volt	V	W/A
Electromotive force, electrical resistance	ohm	W	V/A
Energy, work, quantity of heat	joule	J	N · m
Force	newton	N	kg · m/s ²

Table B.1.2(a) SI Derived Units with Special Names (continued)

Quantity	Unit	Symbol Expressed in Terms of Other Units	
Frequency	hertz	Hz	1/s
Illuminance	lux	lx	lm/m ²
Luminous flux	lumen	lm	cd · sr
Magnetic flux	weber	Wb	V · s
Magnetic flux density	tesla	T	Wb/m ²
Power, radiant flux	watt	W	J/s
Pressure, stress	pascal	Pa	N/m ²

Table B.1.2(b) Other SI Derived Units

Quantity	Name	Symbol
Absorbed dose rate	gray per second	Gy/s
Acceleration	meter per second squared	m/s ²
Angular acceleration	radian per second squared	rad/s ²
Angular velocity	radian per second	rad/s
Area	square meter	m ²
Concentration	mole per cubic meter	mol/m ³
Current density	ampere per square meter	A/m ²
Density, mass	kilogram per cubic meter	kg/m ³
Electric charge density	coulomb per cubic meter	C/m ³
Electric field strength	volt per meter	V/m
Electric flux density	coulomb per square meter	C/m ²
Energy density	joule per cubic meter	J/m ³
Entropy	joule per kelvin	J/K
Exposure (x and gamma rays)	coulomb per kilogram	C/kg
Heat capacity	joule per kelvin	J/K
Heat flux density irradiance	watt per square meter	W/m ²
Luminance	candela per square meter	cd/m ²
Magnetic field strength	ampere per meter	A/m
Magnetic permeability	henry per meter	H/m
Molar energy	joule per mole	J/mol
Molar entropy	joule per mole kelvin	J/mol-K
Molar heat capacity	joule per mole kelvin	J/mol-K
Moment of force	newton meter	N · m

(continues)

Table B.1.2(b) Other SI Derived Units (continued)

Quantity	Name	Symbol
Permittivity	farad per meter	F/m
Power density	watt per square meter	W/m ²
Radiance	watt per square meter steradian	W/m ² -sr
Radiant intensity	watt per steradian	W/sr
Specific energy	joule per kilogram	J/kg
Specific entropy	joule per kilogram kelvin	J/kg-K
Specific heat capacity	joule per kilogram kelvin	J/kg-K
Specific volume	cubic meter per kilogram	m ³ /kg
Surface tension	newton per meter	N/m
Thermal conductivity	watt per meter kelvin	W/m-K
Velocity	meter per second	m/s
Viscosity, dynamic	pascal second	Pa · s
Viscosity, kinematic	square meter per second	m ² /s
Volume	cubic meter	m ³
Wave number	1 per meter	1/m

B.1.3 Units Used with SI. The units given in Table B.1.3 are acceptable for use as SI units.

Table B.1.3 Acceptable Units

Quantity	Unit	Symbol	Value in SI Units
Time	minute	min	60 s
	hour	hr	3600 s
	day	d	86,400 s
Plane angle	degree	°	1° = (π/180) rad
	minute	'	1' = (1/60)° = (π/10,800) rad
	second	"	1" = (1/60)' = (π/648,000) rad
Volume (liquid)	liter	L	10 ⁻³ m ³
Mass	metric ton or tonne	t	10 ³ kg
Activity (radio-nuclide)	becquerel	Bq	1/s
Energy	electron volt	eV	1.602 177 33 × 10 ⁻¹⁹ J
Mass	unified atomic mass unit	u	1.660 540 2 × 10 ⁻²⁷ kg

B.2 Energy. The SI unit of energy is the joule (J).

B.3 Area. The SI unit for area is the square meter (m²). Large areas, such as measurement of land, can be expressed in hectares (ha), a special name for the hectometer, or in square kilometers (km²).

B.4 Temperature Scales. The SI unit for thermodynamic temperature is the kelvin (K). The degree Celsius (°C), which is equal to a kelvin in magnitude but used more extensively, should be used to express temperatures or temperature intervals in NFPA documents. Flash points of flammable liquids are commonly given in degrees Celsius (°C), as are the operating temperatures of sprinklers.

The relationship between °C and K is

$$K = °C + 273.15$$

Thus the boiling point of water is 100°C or 373 K.

A similar relationship exists between the measured temperature in degrees Fahrenheit (°F) and the thermodynamic temperature in degrees Rankine (°R) in U.S. customary units:

$$°R = °F + 459.7$$

The formulas for converting between °C and °F are as follows:

$$°F = °C \cdot (1.8) + 32$$

$$°C = \frac{(°F - 32)}{1.8}$$

Example No. 1: Under international transportation rules, flammable liquids are those whose flash points do not exceed 60.5°C. To convert to °F,

$$°F = (60.5)(1.8) + 32 = 140.9, \text{ usually rounded to } 141°F$$

Example No. 2: A sprinkler whose operating temperature is 286°F will fuse at a Celsius temperature of

$$°C = \frac{(286 - 32)}{1.8} = \frac{254}{1.8} = 141°C$$

Note that these two conversions apply to measured temperatures, not temperature differences.

To convert a temperature difference, the following formulas are used:

$$\Delta°F = \Delta°C \cdot (1.8)$$

$$\Delta°C = \frac{\Delta°F}{1.8}$$

Example No. 3: There are 100 Celsius degrees between the freezing and boiling points of water. On the Fahrenheit scale, there are

$$\Delta°F = 100(1.8) = 180, \text{ or } 212 - 32$$

Example No. 4: A fire door must limit the temperature of the side not exposed to fire to not more than 250°F above ambient. In Celsius,

$$\Delta°C = \frac{250}{1.8} = 138.8°C, \text{ or } 139°C \text{ (rounded)}$$

B.5 Force and Mass. The SI system uses two different units to express force and mass: kilogram (kg) for mass and newton (N) for force. It is important to distinguish whether one is converting a mass of material to the equivalent number of kilograms or a force to the equivalent value in newtons.

Mass: $1 \text{ lb} = 0.45325 \text{ kg}$ gForce: $1 \text{ lb}_f = 4.448 \text{ N}$

The newton, not the kilogram, appears in force-related terms such as pressure (N/m^2), energy ($\text{N} \cdot \text{m} = \text{J}$), and power ($\text{N} \cdot \text{m}/\text{s} = \text{J}/\text{s} = \text{W}$).

In commercial and common use, *weight* will be expressed as a synonym for *mass*. In this sense, *to weigh* means *to have a mass of*. For example, a typical box of breakfast cereal “weighs” 0.283 kg (10 oz).

A mass of 1 kg at the earth’s surface experiences a gravitational force of about 9.8 N. On the lunar surface, where the pull of gravity is $1/6$ that of earth, the same 1-kg mass will experience a gravitational force of only about 1.6 N and would “weigh” only $1/6$ of a kilogram.

In the U.S. customary system, a body with a mass of 20 *pounds* (a unit of mass) experiences a gravitational force of very nearly 20 *pound-force*. Because the numerical values and the unit names are so close, the distinction between the two units is not often appreciated. Indeed, although the unit “pound” appears in both terms, the unit “pound-force,” symbol “lb_f,” is more accurate for the latter.

B.6 Pressure. The U.S. customary system expresses pressure in either gage or absolute units, depending on whether the measurement is made relative to standard atmospheric pressure or to an absolute vacuum. These measures are identified by the familiar acronyms psig and psia for pounds per square inch, gage and pounds per square inch, absolute, respectively. (Properly, pressure in U.S. customary units should be given as “*x* pounds force per square inch.”) No such conventions are allowed in the SI system.

For expressing a pressure differential, use of the unit kPa is sufficient. But where necessary to specify that a pressure measurement is relative to a standard atmosphere or to absolute vacuum, the measurement is qualified as follows:

... at a gage pressure of 17.7 kPa

or

... at an absolute pressure of 1.4 kPa

Similarly, when metric equivalents are provided for U.S. customary units, the acronyms psig and psia should not be used, and the measurements should be stated as follows:

... at a gage pressure of *xx* psi (*xx* kPa)

... at an absolute pressure of *xx* psi (*xx* kPa)

For example, in noting the difference between two pressure measurements, it is correct to state, “The pressures differ by 2.5 kPa.” This expression assumes that *both* measurements are relative to the same datum, either vacuum or atmospheric pressure. When stating the measurement of a particular gage and it is not readily apparent whether the measurement is relative to vacuum or to atmospheric pressure, the datum should be stated as shown in the preceding examples.

B.7 Prefixes.

B.7.1 Prefix Use. Standard prefixes are used to express SI units as multiples or submultiples of 10. In general, a prefix that limits the numerical value to a number between 0.1 and 1000 is used. For example, 28,000 meters is written 28 kilometers; 0.0017 grams is written 1.7 milligrams. However, excep-

tions to this general rule are given in Section B.8. Accepted SI prefixes are shown in Table B.7.1.

Table B.7.1 Numerical Prefixes

Multiplication Factors	Symbol	Prefix
10^{24}	yotta	Y
10^{21}	zetta	Z
10^{18}	exa	E
10^{15}	peta	P
10^{12}	tera	T
10^9	giga	G
10^6	mega	M
$10^3 = 1000$	kilo	k
$10^2 = 100$	hecto	h
$10^1 = 10$	deka	da
$10^0 = 1$		
$10^{-1} = 0.1$	deci	d
$10^{-2} = 0.01$	centi	c
$10^{-3} = 0.001$	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a
10^{-21}	zepto	z
10^{-24}	yocto	y

B.7.2 Prefix Conventions.

B.7.2.1 In a table or in a discussion, the same multiple or magnitude of each unit should be used throughout. For example, millimeters and meters should not be mixed, or one or the other should be used.

B.7.2.2 Millimeters (mm) should be used for linear dimensions instead of centimeters and when the accuracy of the measurement warrants its use, rather than fractions of a meter.

For example, “The bottom of the inlet shall be not more than 300 mm from the floor,” rather than “. . . not more than 0.3 m from the floor.”

B.7.2.3 Centimeters should be used only for measurements of the human body or for clothing sizes.

B.7.2.4 In forming a multiple of a compound unit (derived unit expressed in terms of two or more units), only the prefix, in the numerator, should be used.

For example kV/m is preferable to V/mm. Likewise, kg/m is preferable to g/cm³.

B.7.2.5 Two or more prefixes should never be combined.

For example, 27_pF (picafarads), *not* 27 μμF (micromicrofarads), is correct.

B.8 Deviations from Strict SI.

B.8.1 Spelling. One departure from strict SI usage has been to use the spellings meter and liter instead of the internationally accepted metre and litre. The former terms are more commonly used and identified in certain parts of the world.

B.8.2 Minute Versus Second. A second difference is the use of liter per minute (L/min) and cubic meter per minute (m³/min) instead of the internationally accepted liter per second (L/s) and cubic meter per second (m³/s), particularly for measurements in hydraulics and water supply analysis. The minute was chosen over the second because L/min and m³/min more nearly equate to gallons per minute, an easier quantity to use in fire protection engineering calculations.

Example: 1 gal/min = 3.8 L/min
1 m³/min = 1000 L/min

B.8.3 Accuracy (Significant Figures) of Conversions. In converting from U.S. customary units to SI units, the precision of the original measurement should be retained. For example, a measurement of 8 miles mathematically converts to 12.875 kilometers, but the conversion should be expressed as 13 kilometers, because the degree of precision implied by such an exact conversion is not present in the original measurement. All conversions must properly reflect the precision of the original measurement.

An example: 12 feet of sprinkler piping converts to 3.8 meters, if the piping is measured to the nearest inch. If measured to the nearest foot, then the appropriate conversion is 4 meters.

B.8.4 Nominal Dimensions. Some dimensions used to identify commercial products are so-called nominal values. For

example, lumber is identified by nominal dimensions: 2 × 6 joists are not actually 2 in. by 6 in. This practice is in contrast with other trade sizes that are precise measurements, such as sizes of bolts and screw threads. The former should be converted only to SI equivalents that have been accepted in the industry or trade. The latter cannot be converted to SI equivalents.

B.8.5 Units Unique to Fire Protection. The following units are unique to fire protection.

Sprinkler Discharge Density. Use liter per minute per square meter (L/min · m²) in place of gallons per minute per square foot.

$$1 \text{ gpm/ft}^2 = 40.746 \text{ mm}^3/\text{min} = 40.746 \text{ (L/mm)}^3/\text{m}^2$$

B.9 Conversion Factors. Two sets of multiplication factors that can assist in converting between U.S. customary units and SI units are shown in Tables B.9(a) and B.9(b). These tables, taken from the *SFPE Handbook of Fire Protection Engineering*, second edition, include a list of units arranged alphabetically, in Table B.9(a), and a list arranged by physical quantity, in Table B.9(b) — that is, area, length, and so on. In the alphabetical list, the first two digits of each conversion factor represent the power of 10 by which the conversion factor must be multiplied. An asterisk indicates that the conversion factor is exact. All other conversion factors are either approximate or the result of physical measurements. The physical quantity list includes only those frequently used conversion factors. Additional conversion factors for many specialized units can be found in *Lange's Handbook of Chemistry*, fourteenth edition.

Table B.9(a) Conversion Factors Listed Alphabetically

To Convert from	to	Multiply by
abampere	ampere	+01 1.00*
abcoulomb	coulomb	+01 1.00*
abfarad	farad	+09 1.00*
abhenry	henry	-09 1.00*
abmho	siemens	+09 1.00*
abohm	ohm	-09 1.00*
abvolt	volt	-08 1.00*
acre	meter ²	+03 4.046 856 422 4*
angstrom	meter	-10 1.00*
are	meter ²	+02 1.00*
astronomical unit (IAU)	meter	+11 1.496 00
astronomical unit (radio)	meter	+11 1.495 978 9
atmosphere	newton/meter ²	+05 1.013 25*
bar	newton/meter ²	+05 1.00*
barn	meter ²	-28 1.00*
barrel (petroleum, 42 gallons)	meter ³	-01 1.589 873
barye	newton/meter ²	-01 1.00*
board foot (1' × 1' × 1")	meter ³	-03 2.359 737 216*
British thermal unit:		
(IST before 1956)	joule	+03 1.055 04
(IST after 1956)	joule	+03 1.055 056
British thermal unit (mean)	joule	+03 1.055 87
British thermal unit (thermochemical)	joule	+03 1.054 350
British thermal unit (39°F)	joule	+03 1.059 67
British thermal unit (60°F)	joule	+03 1.054 68
bushel (U.S.)	meter ³	-02 3.523 907 016 688*
cable	meter	+02 2.194 56*

*Source: E.A. Mechty, "The International System of Units, Physical Constants and Conversion Factors," 2nd revision, National Aeronautics and Space Administration, Washington, DC (1973).

Table B.9(a) Conversion Factors Listed Alphabetically (Continued)

To Convert from	to	Multiply by
caliber	meter	-04 2.54*
calorie (International Steam Table)	joule	+00 4.1868
calorie (mean)	joule	+00 4.190 02
calorie (thermochemical)	joule	+00 4.184*
calorie (15°C)	joule	+00 4.185 80
calorie (20°C)	joule	+00 4.181 90
calorie (kilogram, International Steam Table)	joule	+03 4.1868
calorie (kilogram, mean)	joule	+03 4.190 02
calorie (kilogram, thermochemical)	joule	+03 4.184*
carat (metric)	kilogram	-04 2.00*
Celsius (temperature)	kelvin	$t_K = t_C + 273.15$
centimeter of mercury (0°C)	newton/meter ²	+03 1.333 22
centimeter of water (4°C)	newton/meter ²	+01 9.806 38
chain (engineer or ramden)	meter	+01 3.048*
chain (surveyor or gunter)	meter	+01 2.011 68*
circular mil	meter ²	-10 5.067 074 8
cord	meter ³	+00 3.624 556 3
cubit	meter	-01 4.572*
cup	meter ³	-04 2.365 882 365*
curie	disintegration/second	+10 3.70*
day (mean solar)	second (mean solar)	+04 8.64*
day (sidereal)	second (mean solar)	+04 8.616 409 0
degree (angle)	radian	-02 1.745 329 251 994 3
denier (international)	kilogram/meter	-07 1.00*
dram (avoirdupois)	kilogram	-03 1.771 845 195 312 5*
dram (troy or apothecary)	kilogram	-03 3.887 934 6*
dram (U.S. fluid)	meter ³	-06 3.696 691 195 312 5*
dyne	newton	-05 1.00*
electron volt	joule	-19 1.602 191 7
erg	joule	-07 1.00*
Fahrenheit (temperature)	kelvin	$t_K = (5/9)(t_F + 459.67)$
Fahrenheit (temperature)	Celsius	$t_C = (5/9)(t_F - 32)$
faraday (based on carbon 12)	coulomb	+04 9.68 70
faraday (chemical)	coulomb	+04 9.649 57
faraday (physical)	coulomb	+04 9.652 19
fathom	meter	+00 1.828 8*
fermi (femtometer)	meter	+15 1.00*
fluid ounce (U.S.)	meter ³	-05 2.957 352 956 25*
foot	meter	-01 3.048*
foot (U.S. survey)	meter	+00 1200/3937*
foot (U.S. survey)	meter	-01 3.048 006 096
foot of water (39.2°F)	newton/meter ²	+03 2.988 98
footcandle	lumen/meter ²	+01 1.076 391 0
footlambert	candela/meter ²	+00 3.426 259
free fall, standard	meter/second ²	+00 9.806 65*
furlong	meter	+02 2.011 68*
gal (galileo)	meter/second ²	-02 1.00*
gallon (U.K. liquid)	meter ³	-03 4.546 087
gallon (U.S. dry)	meter ³	-03 4.404 883 770 86*
gallon (U.S. liquid)	meter ³	-03 3.785 411 784*
gamma	tesla	-09 1.00*
gauss	tesla	-04 1.00*
gilbert	ampere turn	-01 7.957 747 2
gill (U.S.)	meter ³	-04 1.182 941 2
gill (U.K.)	meter ³	-04 1.420 652
grad	degree (angular)	-01 9.00*

(continues)

Table B.9(a) Conversion Factors Listed Alphabetically (Continued)

To Convert from	to	Multiply by
grad	radian	-02 1.570 796 3
grain	kilogram	-05 6.479 891*
gram	kilogram	-03 1.00*
hand	meter	-01 1.016*
hectare	meter ³	+04 1.00*
hogshead (U.S.)	meter ³	-01 2.384 809 423 92*
horsepower (550 foot lbf/second)	watt	+02 7.456 998 7
horsepower (boiler)	watt	+03 9.809 50
horsepower (electric)	watt	+02 7.46*
horsepower (metric)	watt	+02 7.354 99
horsepower (U.K.)	watt	+02 7.457
horsepower (water)	watt	+02 7.460 43
hour (mean solar)	second (mean solar)	+03 3.60*
hour (sidereal)	second (mean solar)	+03 3.590 170 4
hundredweight (long)	kilogram	+01 5.080 234 544*
hundredweight (short)	kilogram	+01 4.535 923 7*
inch	meter	-02 2.54*
inch of mercury (32°F)	newton/meter ²	+03 3.386 389
inch of mercury (60°F)	newton/meter ²	+03 3.376 85
inch of water (39.2°F)	newton/meter ²	+02 2.490 82
inch of water (60°F)	newton/meter ²	+02 2.4884
kayser	1/meter	+02 1.00*
kilocalorie (International Steam Table)	joule	+03 4.186 8
kilocalorie (mean)	joule	+03 4.190 02
kilocalorie (thermochemical)	joule	+03 4.184*
kilogram mass	kilogram	+00 1.00*
kilogram force (kgf)	newton	+00 9.806 65*
kilopound force	newton	+00 9.806 65*
kip	newton	+03 4.448 221 615 260 5*
knot (international)	meter/second	-01 5.144 444 444
lambert	candela/meter ²	+04 1/π*
lambert	candela/meter ²	+03 3.183 098 8
langley	joule/meter ²	+04 4.184*
lbf (pound force, avoirdupois)	newton	+00 4.448 221 615 260 5*
lbm (pound mass, avoirdupois)	kilogram	-01 4.535 923 7*
league (U.K. nautical)	meter	+03 5.559 552*
league (international nautical)	meter	+03 5.556*
league (statute)	meter	+03 4.828 032*
light year	meter	+15 9.460 55
link (engineer or ramden)	meter	-01 3.048*
link (surveyor or gunter)	meter	-01 2.011 68*
liter	meter ³	-03 1.00*
lux	lumen/meter ²	+00 1.00*
maxwell	weber	-08 1.00*
meter	wavelengths Kr 86	+06 1.650 763 73*
micron	meter	-06 1.00*
mil	meter	-05 2.54*
mile (U.S. statute)	meter	+03 1.609 344*
mile (U.K. nautical)	meter	+03 1.853 184*
mile (international nautical)	meter	+03 1.852*
mile (U.S. nautical)	meter	+03 1.852*
millibar	newton/meter ²	+02 1.00*
millimeter of mercury (0°C)	newton/meter ²	+02 1.333 224
minute (angle)	radian	-04 2.908 882 086 66
minute (mean solar)	second (mean solar)	+01 6.00*
minute (sidereal)	second (mean solar)	+01 5.983 617 4
month (mean calendar)	second (mean solar)	+06 2.628*
nautical mile (international)	meter	+03 1.852*

Table B.9(a) Conversion Factors Listed Alphabetically (Continued)

To Convert from	to	Multiply by
nautical mile (U.S.)	meter	+03 1.852*
nautical mile (U.K.)	meter	+03 1.853 184*
oersted	ampere/meter	+01 7.957 747 2
ounce force (avoirdupois)	newton	-01 2.780 138 5
ounce mass (avoirdupois)	kilogram	-02 2.834 952 312 5*
ounce mass (troy or apothecary)	kilogram	-02 3.110 347 68*
ounce (U.S. fluid)	meter ³	-05 2.957 352 956 25*
pace	meter	-01 7.62*
parsec (IAU)	meter	+16 3.085 7
pascal	newton/meter ²	+00 1.00*
peck (U.S.)	meter ³	-03 8.809 767 541 72*
pennyweight	kilogram	-03 1.555 173 84*
perch	meter	+00 5.0292*
phot	lumen/meter ²	+04 1.00
pica (printers)	meter	-03 4.217 517 6*
pint (U.S. dry)	meter ³	-04 5.506 104 713 575*
pint (U.S. liquid)	meter ³	-04 4.731 764 73*
point (printers)	meter	-04 3.514 598*
poise	newton second/meter ²	-01 1.00*
pole	meter	+00 5.0292*
pound force (lbf avoirdupois)	newton	+00 4.448 221 615 260 5*
pound mass (lbm avoirdupois)	kilogram	-01 4.535 923 7*
pound mass (troy or apothecary)	kilogram	-01 3.732 417 216*
poundal	newton	-01 1.382 549 543 76*
quart (U.S. dry)	meter ³	-03 1.101 220 942 715*
quart (U.S. liquid)	meter ³	-04 9.463 592 5
rad (radiation dose absorbed)	joule/kilogram	-02 1.00*
Rankine (temperature)	kelvin	$t_K = 3(5/9) t_R$
rayleigh (rate of photon emission)	1/second meter ²	+10 1.00*
rhe	meter ² /newton second	+01 1.00*
rod	meter	+00 5.0292*
roentgen	coulomb/kilogram	-04 2.579 76*
rutherford	disintegration/second	+06 1.00*
second (angle)	radian	+06 4.848 136 811
second (ephemeris)	second	+00 1.000 000 000
second (mean solar)	second (ephemeris)	Consult American Ephemeris and Nautical Almanac
second (sidereal)	second (mean solar)	-01 9.972 695 7
section	meter ²	+06 2.589 988 110 336*
scruple (apothecary)	kilogram	-03 1.295 978 2*
shake	second	-08 1.00
skein	meter	+02 1.097 28*
slug	kilogram	+01 1.459 390 29
span	meter	-01 2.286*
statampere	ampere	-10 3.335 640
statcoulomb	coulomb	-10 3.335 640
statfarad	farad	-12 1.112 650
stathenry	henry	+11 8.987 554
statohm	ohm	+11 8.987 554
statute mile (U.S.)	meter	+03 1.609 344*
statvolt	volt	+02 2.997 925
stere	meter	+00 1.00*
stilb	candela/meter ²	+04 1.00
stoke	meter ² /second	-04 1.00*
tablespoon	meter ³	-05 1.478 676 478 125*
teaspoon	meter ³	-06 4.928 921 593 75*
ton (assay)	kilogram	-02 2.196 666 6

(continues)

Table B.9(a) Conversion Factors Listed Alphabetically (Continued)

To Convert from	to	Multiply by
ton (long)	kilogram	+03 1.016 046 908 8*
ton (metric)	kilogram	+03 1.00*
ton (nuclear equivalent of TNT)	joule	+09 4.20
ton (register)	meter ³	+00 2.831 684 659 2*
ton (short, 2000 pound)	kilogram	+02 9.071 847 4*
tonne	kilogram	+03 1.00*
torr (0°C)	newton/meter ²	+02 1.333 22
township	meter ²	+07 9.323 957 2
unit pole	weber	-07 1.256 637
yard	meter	-01 9.144*
year (calendar)	second (mean solar)	+07 3.1536*
year (sidereal)	second (mean solar)	+07 3.155 815 0
year (tropical)	second (mean solar)	+07 3.155 692 6
year 1900, tropical, Jan., day 0, hour 12	second (ephemeris)	+07 3.155 692 597 47*
year 1900, tropical, Jan., day 0, hour 12	second	+07 3.155 692 597 47

Table B.9(b) Conversion Factors Listed by Physical Quantity

To Convert from	to	Multiply by
ACCELERATION		
foot/second ²	meter/second ²	-01 3.048*
free fall, standard	meter/second ²	+00 9.806 65*
gal (galileo)	meter/second ²	-02 1.00*
inch/second ²	meter/second ²	-02 2.54*
AREA		
acre	meter ²	+03 4.046 856 422 4*
are	meter ²	+02 1.00*
barn	meter ²	-28 1.00*
circular mil	meter ²	-10 5.067 074 8
foot ²	meter ²	-02 9.290 304*
hectare	meter ²	+04 1.00*
inch ²	meter ²	-04 6.4516*
mile ² (U.S. statute)	meter ²	+06 2.589 988 110 336*
section	meter ²	+06 2.589 988 110 336*
township	meter ²	+07 9.323 957 2
yard ²	meter ²	-01 8.361 273 6*
DENSITY		
gram/centimeter ³	kilogram/meter ³	-03 1.00*
lbm/inch ³	kilogram/meter ³	+04 2.767 990 5
lbm/foot ³	kilogram/meter ³	+01 1.601 846 3
slug/foot ³	kilogram/meter ³	+02 5.153 79
ENERGY		
British thermal unit: (IST before 1956)	joule	+03 1.055 04
(IST after 1956)	joule	+03 1.055 056
British thermal unit (mean)	joule	+03 1.055 87
British thermal unit (thermochemical)	joule	+03 1.054 350
British thermal unit (39°F)	joule	+03 1.059 67
British thermal unit (60°F)	joule	+03 1.054 68
calorie (International Steam Table)	joule	+00 4.1868
calorie (mean)	joule	+00 4.190 02
calorie (thermochemical)	joule	+00 4.184*
calorie (15°C)	joule	+00 4.185 80
calorie (27°C)	joule	+00 4.181 90
calorie (kilogram, International Steam Table)	joule	+03 4.1868
calorie (kilogram, mean)	joule	+03 4.190 02
calorie (kilogram, thermochemical)	joule	+03 4.184*

Table B.9(b) Conversion Factors Listed by Physical Quantity (continued)

To Convert from	to	Multiply by
ENERGY (continued)		
electron volt	joule	-19 1.602 191 7
erg	joule	-07 1.00*
foot lbf	joule	+03 1.355 817 9
foot poundal	joule	-02 4.214 011 0
joule (international of 1948)	joule	+00 1.000 165
kilocalorie (International Steam Table)	joule	+03 4.1868
kilocalorie (mean)	joule	+03 4.190 02
kilocalorie (thermochemical)	joule	+03 4.184*
kilowatt hour	joule	+06 3.60*
kilowatt hour (international of 1948)	joule	+06 3.600 59
ton (nuclear equivalent of TNT)	joule	+09 4.20
watt hour	joule	+03 3.60*
ENERGY/AREA TIME		
Btu (thermochemical)/foot ² second	watt/meter ²	+04 1.134 893 1
Btu (thermochemical)/foot ² minute	watt/meter ²	+02 1.891 488 5
Btu (thermochemical)/foot ² hour	watt/meter ²	+00 3.152 480 8
Btu (thermochemical)/inch ² second	watt/meter ²	+06 1.634 246 2
calorie (thermochemical)/cm ² minute	watt/meter ²	+02 6.973 333 3
erg/centimeter ² second	watt/meter ²	-03 1.00*
watt/centimeter ²	watt/meter ²	+04 1.00*
FORCE		
dyne	newton	-05 1.00*
kilogram force (kgf)	newton	+00 9.806 65*
kilopound force	newton	+00 9.806 65*
kip	newton	+03 4.448 221 615 260 5*
lbf (pound force, avoirdupois)	newton	+00 4.448 221 615 260 5*
ounce force (avoirdupois)	newton	+01 2.780 138 5
pound force, lbf (avoirdupois)	newton	+00 4.448 221 615 260 5*
poundal	newton	-01 1.382 549 543 76*
LENGTH		
angstrom	meter	-10 1.00*
astronomical unit (IAU)	meter	+11 1.496 00
astronomical unit (radio)	meter	+11 1.495 978 9
cable	meter	+02 2.194 56*
caliber	meter	-04 2.54*
chain (surveyor or gunter)	meter	+01 2.011 68*
chain (engineer or ramden)	meter	+01 3.048*
cubit	meter	-01 4.572*
fathom	meter	+00 1.8288*
fermi (femtometer)	meter	+15 1.00*
foot	meter	-01 3.048*
foot (U.S. survey)	meter	+00 1200/3937*
foot (U.S. survey)	meter	-01 3.048 006 096
furlong	meter	+02 2.011 68*
hand	meter	-01 1.016*
inch	meter	-02 2.54*
league (U.K. nautical)	meter	+03 5.559 552*
league (international nautical)	meter	+03 5.556*
league (statute)	meter	+03 4.828 032*
light year	meter	+15 9.460 55
link (engineer or ramden)	meter	-01 3.048*
link (surveyor or gunter)	meter	-01 2.011 68*
meter	wavelengths Kr 86	+06 1.650 763 73*
micron	meter	-06 1.00*
mil	meter	-05 2.54*
mile (U.S. statute)	meter	+03 1.609 344*
mile (U.K. nautical)	meter	+03 1.853 184*

(continues)

Table B.9(b) Conversion Factors Listed by Physical Q u a n t i t y (continued)

To Convert from	to	Multiply by
LENGTH (continued)		
mile (international nautical)	meter	+03 1.852*
mile (U.S. nautical)	meter	+03 1.852*
nautical mile (U.K.)	meter	+03 1.853 184*
nautical mile (international)	meter	+03 1.852*
nautical mile (U.S.)	meter	+03 1.852*
pace	meter	-01 7.62*
parsec (IAU)	meter	+16 3.085 7
perch	meter	+00 5.0292*
pica (printers)	meter	-03 4.217 517 6*
point (printers)	meter	-04 3.514 598*
pole	meter	+00 5.0292*
rod	meter	+00 5.0292*
skein	meter	+02 1.097 28*
span	meter	-01 2.286*
statute mile (U.S.)	meter	+03 1.609 344*
yard	meter	-01 9.144*
MASS		
carat (metric)	kilogram	-04 2.00*
gram (avoirdupois)	kilogram	-03 1.771 845 195 312 5*
gram (troy or apothecary)	kilogram	-03 3.887 934 6*
grain	kilogram	-05 6.479 891*
gram	kilogram	-03 1.00*
hundredweight (long)	kilogram	+01 5.080 234 544*
hundredweight (short)	kilogram	+01 4.535 923 7*
kgf second ² meter (mass)	kilogram	+00 9.806 65*
kilogram mass	kilogram	+00 1.00*
lbm (pound mass, avoirdupois)	kilogram	-01 4.535 923 7*
ounce mass (avoirdupois)	kilogram	-02 2.834 952 312 5*
ounce mass (troy or apothecary)	kilogram	-02 3.110 347 68*
pennyweight	kilogram	-03 1.555 173 84*
pound mass, lbm (avoirdupois)	kilogram	-01 4.535 923 7*
pound mass (troy or apothecary)	kilogram	-01 3.732 417 216*
scruple (apothecary)	kilogram	-03 1.295 978 2*
slug	kilogram	+01 1.459 390 29
ton (assay)	kilogram	-02 2.196 666 6
ton (long)	kilogram	+03 1.016 046 908 8*
ton (metric)	kilogram	+03 1.00*
ton (short, 2000 pound)	kilogram	+02 9.071 847 4*
tonne	kilogram	+03 1.00*
POWER		
Btu (thermochemical)/second	watt	+03 1.054 350 264 488
Btu (thermochemical)/minute	watt	+01 1.757 250 4
calorie (thermochemical)/second	watt	+00 4.184*
calorie (thermochemical)/minute	watt	-02 6.973 333 3
foot lbf/hour	watt	-04 3.766 161 0
foot lbf/minute	watt	-02 2.259 696 6
foot lbf/second	watt	+00 1.355 817 9
horsepower (550 foot lbf/second)	watt	+02 7.456 998 7
horsepower (boiler)	watt	+03 9.809 50
horsepower (electric)	watt	+02 7.46*
horsepower (metric)	watt	+02 7.354 99
horsepower (U.K.)	watt	+02 7.457
horsepower (water)	watt	+02 7.460 43
kilocalorie (thermochemical)/minute	watt	+01 6.973 333 3
kilocalorie (thermochemical)/second	watt	+03 4.184*
watt (international of 1948)	watt	+00 1.000 165

Table B.9(b) Conversion Factors Listed by Physical Q u a n (continued)

To Convert from	to	Multiply by
PRESSURE		
atmosphere	newton/meter ²	+05 1.013 25*
bar	newton/meter ²	+05 1.00*
barye	newton/meter ²	-01 1.00*
centimeter of mercury (0°C)	newton/meter ²	+03 1.333 22
centimeter of water (4°C)	newton/meter ²	+01 9.806 38
dyne/centimeter ²	newton/meter ²	-01 1.00*
foot of water (39.2°F)	newton/meter ²	+03 2.988 98
inch of mercury (32°F)	newton/meter ²	+03 3.386 389
inch of mercury (60°F)	newton/meter ²	+03 3.376 85
inch of water (39.2°F)	newton/meter ²	+02 2.480 82
inch of water (60°F)	newton/meter ²	+02 2.4884
kgf/centimeter ²	newton/meter ²	+04 9.806 65*
kgf/meter ²	newton/meter ²	+00 9.806 65*
lbf/foot ²	newton/meter ²	+01 4.788 025 8
lbf/inch ² (psi)	newton/meter ²	+03 6.894 757 2
millibar	newton/meter ²	+02 1.00*
millimeter of mercury (0°C)	newton/meter ²	+02 1.333 224
pascal	newton/meter ²	+00 1.00*
psi (lbf/inch ²)	newton/meter ²	+03 6.894 757 2
torr (0°C)	newton/meter ²	+02 1.333 22
SPEED		
foot/hour	meter/second	-05 8.466 666 6
foot/minute	meter/second	-03 5.08*
foot/second	meter/second	-01 3.048*
inch/second	meter/second	-02 2.54*
kilometer/hour	meter/second	-01 2.777 777 8
knot (international)	meter/second	-01 5.144 444 444
mile/hour (U.S. statute)	meter/second	-01 4.4704*
mile/minute (U.S. statute)	meter/second	+01 2.682 24*
mile/second (U.S. statute)	meter/second	+03 1.609 344*
TEMPERATURE		
Celsius	kelvin	$t_K = t_C + 273.15$
Fahrenheit	kelvin	$t_K = (5/9)(t_F + 459.67)$
Fahrenheit	Celsius	$t_C = (5/9)(t_F - 32)$
Rankine	kelvin	$t_K = (5/9)t_R$
TIME		
day (mean solar)	second (mean solar)	+04 8.64*
day (sidereal)	second (mean solar)	+04 8.616 409 0
hour (mean solar)	second (mean solar)	+03 3.60*
hour (sidereal)	second (mean solar)	+03 3.590 170 4
minute (mean solar)	second (mean solar)	+01 6.00*
minute (sidereal)	second (mean solar)	+01 5.983 617 4
month (mean calendar)	second (mean solar)	+06 2.628*
second (ephemeris)	second	+00 1.000 000 000
second (sidereal)	second (mean solar)	-01 9.972 695 7
year (calendar)	second (mean solar)	+07 3.1536*
year (sidereal)	second (mean solar)	+07 3.155 815 0
year (tropical)	second (mean solar)	+07 3.155 692 6
year 1900, tropical, Jan., day 0, hour 12	second (ephemeris)	+07 3.155 692 597 47*
year 1900, tropical, Jan., day 0, hour 12	second	+07 3.155 692 597 47
VISCOSITY		
centistoke	meter ² /second	-06 1.00*
stoke	meter ² /second	-04 1.00*
foot ² /second	meter ² /second	-02 9.290 304*
centipoise	newton second/meter ²	-03 1.00*

(continues)

Table B.9(b) Conversion Factors Listed by Physical Q u a n t i t y (continued)

To Convert from	to	Multiply by
VISCOSITY (continued)		
lbm/foot second	newton second/meter ²	+00 1.488 163 9
lbf second/foot ²	newton second/meter ²	+01 4.788 025 8
poise	newton second/meter ²	-01 1.00*
poundal second/foot ²	newton second/meter ²	+00 1.488 163 9
slug/foot second	newton second/meter ²	+01 4.788 025 8
rhe	meter ² /newton second	+01 1.00*
VOLUME		
acre foot	meter ³	+03 1.233 481 837 547 52*
barrel (petroleum, 42 gallons)	meter ³	-01 1.589 873
board foot	meter ³	-03 2.359 737 216*
bushel (U.S.)	meter ³	-02 3.523 907 016 688*
cord	meter ³	+00 3.624 556 3
cup	meter ³	-04 2.365 882 365*
dram (U.S. fluid)	meter ³	-06 3.696 691 195 312 5*
fluid ounce (U.S.)	meter ³	-05 2.957 352 956 25*
foot ³	meter ³	-02 2.831 684 659 2*
gallon (U.K. liquid)	meter ³	-03 4.546 087
gallon (U.S. dry)	meter ³	-03 4.404 883 770 86*
gallon (U.S. liquid)	meter ³	-03 3.785 411 784*
gill (U.K.)	meter ³	-04 1.420 652
gill (U.S.)	meter ³	-04 1.182 941 2
hogshead (U.S.)	meter ³	-01 2.384 809 423 92*
inch ³	meter ³	-05 1.638 706 4*
liter	meter ³	-03 1.00*
ounce (U.S. fluid)	meter ³	-05 2.957 352 956 25*
peck (U.S.)	meter ³	-03 8.809 767 541 72*
pint (U.S. dry)	meter ³	-04 5.506 104 713 575*
pint (U.S. liquid)	meter ³	-04 4.731 764 73*
quart (U.S. dry)	meter ³	-03 1.101 220 942 715*
quart (U.S. liquid)	meter ³	-04 9.463 592 5
stere	meter ³	+00 1.00*
tablespoon	meter ³	-05 1.478 676 478 125*
teaspoon	meter ³	-06 4.928 921 593 75*
ton (register)	meter ³	+00 2.831 684 659 2*
yard ³	meter ³	-01 7.645 548 579 84*

B.10 Units of Measure in Figures.**B.10.1 Editorial Conventions.**

The following general editorial conventions apply to figures:

- (a) Symbols for units of measure should be in roman, not italic, type.
- (b) Do not follow symbols with a period except at the end of a sentence.
- (c) Insert a space between the numerical value and the symbol — for example, 3 kg; 35°C.
- (d) Do not insert a space between the numerical value and the symbol for measurements of plane angles (degree, minute, second).
- (e) Do not insert a space between prefix and unit symbols — for example, kg, not k g.
- (f) Do not use abbreviations for units; use the unit symbol — for example, use A, not amp, for ampere.
- (g) Use unit symbols instead of unit names, especially for complex mathematical expressions. Spell out unit names in text where confusion might result. For example, “min” could be interpreted as “minimum” rather than “minute.”
- (h) Do not mix unit symbols and unit names in the same expression or sentence.

B.10.2 Units Formed by Multiplication and Division.

B.10.2.1 Product. Use a space or a hyphen for unit names — for example, newton meter or newton-meter. The space is preferred.

Use a dot (·) for the unit symbol — for example, N·m.

B.10.2.2 Quotient. Use the word *per* for unit names — for example, meters per second.

Use a slash (/) or the appropriate power for unit symbols — for example, m/s or m · s⁻¹.

B.10.2.3 Multiple Quotient. Use a dot (·) instead of second slash for multiple quotients — for example, L/min · m² instead of L/min/m².

B.10.3 Decimal Marker. In most other countries, the comma is used as the decimal marker. In the United States, the customary symbol is a dot or period, and the comma is used to separate digits into groups of three.

B.10.4 Billion. In the United States, “billion” means thousand million (giga). In most other countries, it means million million (tera). Do not use this term. Use powers of 10 instead.

B.10.5 Roman Numerals. Do not use roman numerals, because they might be misinterpreted as SI prefixes.

**NFPA MANUAL OF STYLE
FORM FOR CHANGES OR REVISIONS**

1. a) Submitted By _____ Tel. No. _____

b) Technical Committee _____

c) Section/Paragraph _____ Edition _____

2. Change Recommends (check one): new text revised text deleted text

3. Change (include new or revised wording or identification of wording to be deleted)

Note: New text should be in legislative format — that is, use of underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~).

4. Statement of Problem and Substantiation for Change

Note: State the problem that will be resolved by your recommendation and give the specific reason for your change. If more than 200 words, it might be abstracted for publication.

WHEN COMPLETED RETURN TO

Christian Dubay
NFPA
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269

or E-mail: cdubay@nfpa.org

PLEASE USE A SEPARATE FORM FOR EACH CHANGE

**CHANGES TO
NFPA MANUAL OF STYLE
ONLY**