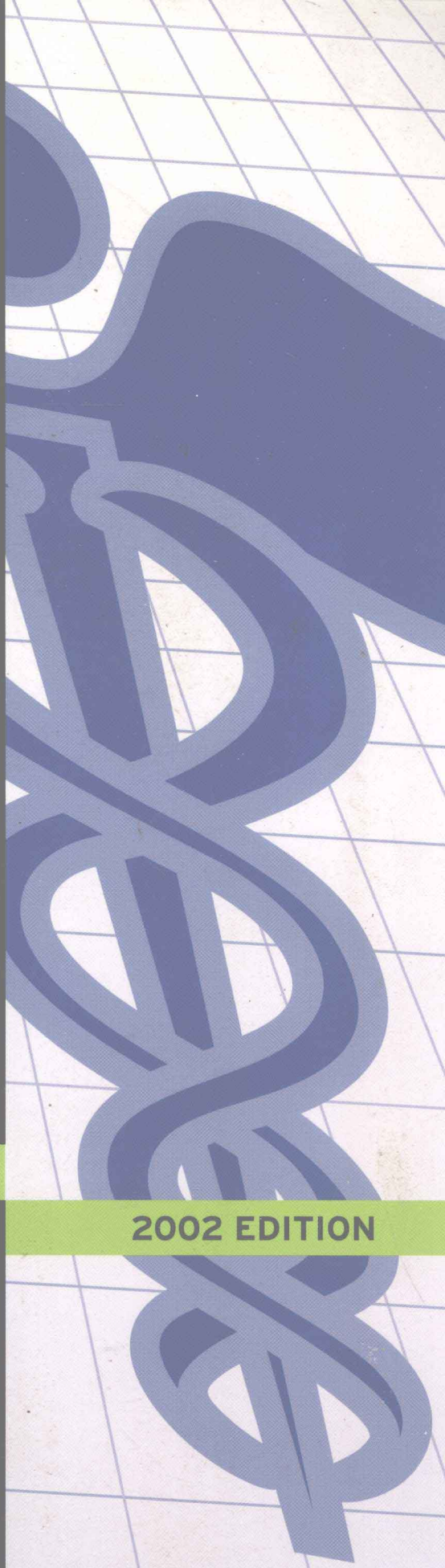
NFPA 99
Health Care Facilities



2002 EDITION

An International Codes and Standards Organization

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In recognition of those who suffered
from the tragedies of September 11, 2001,
this document is dedicated to all who
have given their lives in an effort
to make this world a safer place.

NFPA 99

Standard for

Health Care Facilities

2002 Edition

This edition of NFPA 99, *Standard for Health Care Facilities*, was prepared by the Technical Committees on Administration, Electrical Equipment, Electrical Systems, Gas Delivery Equipment, Health Care Emergency Preparedness and Disaster Planning, Hyperbaric and Hypobaric Facilities, and Piping Systems, released by the Technical Correlating Committee on Health Care Facilities and acted on by NFPA at its November Association Technical Meeting held November 10–14, 2001, in Dallas, TX. It was issued by the Standards Council on January 11, 2002, with an effective date of January 31, 2002, and supersedes all previous editions.

This edition of NFPA 99 was approved as an American National Standard on January 31, 2002.

Origin and Development of NFPA 99

The idea for this document grew as the number of documents under the original NFPA Committee on Hospitals grew. By the end of 1980, there existed 12 documents on a variety of subjects, 11 directly addressing fire-related problems in and about health care facilities. These documents covered health care emergency preparedness, inhalation anesthetics, respiratory therapy, laboratories in health-related institutions, hyperbaric facilities, hypobaric facilities, inhalation anesthetics in ambulatory care facilities, home use of respiratory therapy, medical–surgical vacuum systems in hospitals, essential electrical systems for health care facilities, safe use of electricity in patient care areas of health care facilities, and safe use of high-frequency electricity in health care facilities.

A history on the documents that covered these topics can be found in the "Origin and Development of NFPA 99" in the 1984 edition of NFPA 99.

What was then the Health Care Facilities Correlating Committee reviewed the matter beginning in late 1979 and concluded that combining all the documents under its jurisdiction would be beneficial to those who used those documents for the following reasons:

(1) The referenced documents were being revised independent of each other. Combining all the individual documents into one document would place all of them on the same revision cycle.
(2) It would place in one unit many documents that referenced each other.
(3) It would be an easier and more complete reference for the various users of the document (e.g., hospital engineers, medical personnel, designers and architects, and the various types of enforcing authorities).

To learn if this proposal was desired or desirable to users of the individual documents, the Committee issued a request for public comments in the spring of 1981, asking whether purchasers of the individual documents utilized more than one document in the course of their activities and whether combining these individual documents would be beneficial. Seventy-five percent of responses supported such a proposal, with 90 percent of health care facilities and organizations supportive of it. Based on this support, the Correlating Committee proceeded with plans to combine all the documents under its jurisdiction into one document.

In January, 1982, a compilation of the latest edition of each of the 12 individual documents under the jurisdiction of the Correlating Committee was published. It was designated NFPA 99, *Health Care Facilities Code*. The Correlating Committee also entered the document into the revision cycle reporting to the 1983 Fall Meeting for the purpose of formally adopting the document.

For the 1984 edition of NFPA 99, in addition to technical changes, administrative and organizational changes were made.

For the 1987 edition of NFPA 99, the third and final step in the process of combining the previous individual documents took place — that of integrating the content of these individual documents into a cohesive document. In addition, there were again technical changes made. The 1987 edition also saw the incorporation of NFPA 56F, *Standard on Nonflammable Medical Piped Gas Systems*, into NFPA 99.

For the 1990 edition of NFPA 99, some structural changes were made and some modifiers were added to make it easier to determine where requirements are applicable. Technical changes made included the following: correlation with NFPA *101®, Life Safety Code®*; changes for compressed medical air systems on the use of gas-powered medical devices operating at a gage pressure of 200 psi, and piped gas systems in general; changes in leakage current limits for patient care electrical appliances; clarification that patient care areas and wet locations are mutually exclusive; and further guidance on the effects of a disaster on staff.

For the 1993 edition of NFPA 99 there were further efforts to make the document more user friendly (e.g., placing all "recommended" guidance either in notes or in the appendix). Significant technical changes included the following: adding requirements and recommendations to further prevent or minimize fires in operating rooms; making major changes to requirements in Chapter 4 for installing, testing, inspecting, verifying, and maintaining nonflammable medical piped gas systems; adding new sections on dental compressed air and dental vacuum requirements in Chapter 4; changing leakage current limits of patient care–related electrical appliances to correlate more closely with an international document on the subject; revising laboratory requirements to correlate more closely with NFPA 45, *Standard for Laboratories Using Chemicals*; changing essential electrical system requirements in ambulatory health care clinics and medical/dental offices; and extensively revising hyperbaric chamber requirements (Chapter 19).

For the 1996 edition of NFPA 99, further changes to make the document more user friendly were made. These included restructuring Chapters 3 and 4 so that all requirements for a Type 1, 2, or 3 essential electrical system, or a Level 1, 2, 3, or 4 piped gas or vacuum system were contained in one section.

Other technical changes included the following:

(1) Moving requirements on flammable anesthetizing locations and the use of flammable inhalation anesthetics to a new Appendix 2
(2) Upgrading the subject of emergency preparedness from guidance to a new chapter containing requirements
(3) Adding a new chapter (Chapter 18) on home health care
(4) Revising Section 1-1 to reflect the intent that NFPA 99 applies only to facilities treating human beings
(5) In Chapter 3, revising load testing requirements for emergency generators to reference NFPA 110, *Standard for Emergency and Standby Power Systems*, and revising emergency lighting criteria for operating rooms
(6) In Chapter 4, revising requirements for medical compressed air systems, dental compressed air systems, waste anesthetic gas disposal systems, and dental piped gas/vacuum systems; adding a new section on "headwall units" ("manufactured assemblies"); and clarifying and moving requirements for transfilling containers of liquid oxygen to Chapter 8
(7) In Chapter 8, adding requirements for storage rooms containing cylinders and containers totaling less than 3000 ft^3
(8) In Chapters 12 to 17, revising criteria for gas and vacuum systems
(9) In Chapter 19, in addition to many technical changes, adding criteria for mobile hyperbaric facilities

For the 1999 edition, significant technical and structural changes included the following:

(1) Chapters 13, 14, and 15 (on ambulatory healthcare centers, clinics, and medical/dental offices, respectively) were replaced completely by new Chapter 13 covering health care facilities other than hospitals, nursing homes, and limited care facilities as defined in Chapter 2.
(2) Requirements for Level 2 gas and vacuum systems were developed (Section 4.4 in Chapter 4).
(3) Sections 12.3.4, 16.3.4, and 7.3.4 were revised to correlate with the two significant changes in (1) and (2).
(4) In Chapter 3, load testing requirements for emergency power supplies of the essential electrical system were changed through reference, and the testing interval ("monthly") was reworded to be more responsive to needs of health care facilities.
(5) Clarification of transfer switches and branches of the emergency system was made.
(6) Clarification on the use of emergency power supplies other than for emergency power was made in 3.4.1.1.5.
(7) Paragraph 4.3.1.2, Distribution Requirements for Level 1 Gas Systems, was completely revised and restructured.
(8) Chapter 4 was made more user friendly by reducing the number of internal cross-references between Sections 4.3 and 4.5.
(9) The order of installation and testing requirements for piped gas and vacuum systems was revised.
(10) Emphasis on emergency preparedness was made in Chapter 11 and its appendix material.
(11) Chapter 19, "Hyperbaric Facilities," was extensively revised in the areas of electrical wiring, air quality, ventilation lighting, equipment, communication, and safety management.
(12) A new chapter (Chapter 20) on freestanding birthing centers was added.

The 2002 edition includes format and technical revisions. The *Manual of Style for NFPA Technical Committee Documents*, April 2000 edition was applied to this document, resulting in changes to its structure and format. Introductory material in Chapter 1 has been formatted for consistency among all NFPA documents. Referenced publications that apply to the document have been relocated from the last chapter to Chapter 2, therefore resulting in the renumbering of chapters. Informational references remain in the last annex. Appendices are now designated as annexes. Definitions in Chapter 3 have been reviewed for consistency with definitions in other NFPA documents, are systematically aligned, and are individually numbered. Paragraph structuring has been revised with the intent of one mandatory requirement per section, subsection, or paragraph. Information that often accompanied many of the requirements was moved to Annex A, Explanatory Material. Exceptions have been deleted or rephrased in mandatory text, unless the exception represents an allowance or

required alternate procedure to a general rule when limited specified conditions exist. The format appearance and structure provide continuity among NFPA documents, clarity of mandatory text, and greater ease in locating specific mandatory text.

The document scope and individual chapter scopes defining the intent of each chapter and document as a whole are all in Chapter 1.

The occupancy Chapters 13–21 state what is required, while Chapters 4–12 prescribe how those requirements are achieved. Each chapter begins with a section explaining applicability. Information concerning the nature of hazards has been moved to Annex B. Annexes A and C retain explanatory information, and Annexes 1 and 2 are now D and E. Informational references are in Annex F.

The changes in Chapter 4, Electrical Systems, address electrical wiring, transfer switches, inspection, and application.

Chapter 5 on Piping Systems has been realigned so that Level 1 requirements are found in Section 5.1, and concurrently Level 2 in Section 5.2 and Level 3 in Section 5.3. Level 4 associated with laboratories was deleted, with requirements realigned in Chapter 11 on laboratories. Definitions were developed for vacuum systems and Levels 1, 2, and 3 gas systems in Chapter 3. Revisions were made to compressed gas cylinder identification and restraint; valve venting; ventilation of storage rooms; alarms; connection of the electrical supply for central supply systems with the essential electrical system; allowance of a three-way full port ball valve to isolate one branch or component; provisions for a monitored and audible low-content alarm on the surge gas while brazing; the allowance of medical air systems for application with human respiration; and deletion of 20-year-old appendix information.

Gas Delivery, Chapter 8, includes a new section on the storage of compressed gas cylinders in patient care areas.

Chapter 11, Laboratories, clarifies the structural protection of exits, and intent of portable fire extinguishers. Revisions were made concerning flammable and combustible liquids handling requirements.

An increased focus on the total process of maintaining services during a disaster, mitigating damage from a disaster, and recovery from a disaster is reflected in Chapter 12, Emergency Management. Annexed security program information has been expanded.

Chapter 20, Hyperbaric Facilities, contains revised emergency depressurization requirements, safety director responsibilities, and emergency procedure performance.

Technical Correlating Committee on Health Care Facilities (HEA-AAC)

John P. Swope, *Chair*
Shore Health System, MD [SE]

Constance Bobik, B&E Fire Safety Equipment Inc., FL [IM]
Jay Crowley, U.S. Department of Health and Human Services, MD [E]
Marvin J. Fischer, Monroe Township, NJ [U]
Thomas W. Gardner, Gage-Babcock & Associates, Inc., VA [U]
Rep. American Health Care Association
Stanley D. Kahn, Tri-City Electric Company, Inc., CA [IM]
Rep. National Electrical Contractors Association
William E. Koffel, Koffel Associates, Inc., MD [SE]
D. A McWhinnie, Jr., Mechanical Dynamics Associates, IL [SE]
Thomas A. Salamone, Health Care and Life Safety Concepts, NY [I]
Rep. Kemper Insurance Companies
Steven Werner, Marsh USA, Inc., WI [I]
Mayer D. Zimmerman, U.S. Department of Health and Human Services, MD [E]

Alternate

Sharon M. Stone, Koffel Associates, Inc., MD [SE]
(Alt. to W. E. Koffel)

Craig H. Kampmier, NFPA Staff Liaison

Committee Scope: This Committee shall have primary responsibility for documents that contain criteria for safeguarding patients and health care personnel in the delivery of health care services within health care facilities, as follows:

(1) From fire, explosion, electrical, and related hazards resulting either from the use of anesthetic agents, medical gas equipment, electrical apparatus, and high frequency electricity, or from internal or external incidents that disrupt normal patient care
(2) From fire and explosion hazards associated with laboratory practices
(3) In connection with the use of hyperbaric and hypobaric facilities (NFPA 99B) for medical purposes
(4) Through performance, maintenance, and testing criteria for electrical systems, both normal and essential
(5) Through performance, maintenance and testing, and installation criteria, as follows:
  (a) For vacuum systems for medical or surgical purposes
  (b) For medical gas systems

Technical Committee on Administration (HEA-ADM) (Chapters 1, 2, 3, and 7, and related paragraphs in Chapters 4–14, and 17–21)

Michael Crowley, *Chair*
The RJA Group, Inc., TX [SE]

James S. Davidson, Jr., Davidson Associates, DE [SE]
August F. DiManno, Jr., Fireman's Fund Insurance Company, NY [I]
William C. McPeck, State of Maine Employee Health & Safety, ME [E]
Thomas A. Salamone, Health Care and Life Safety Concepts, NY [I]
Rep. Kemper Insurance Companies

Craig H. Kampmier, NFPA Staff Liaison

Committee Scope: This Committee shall have primary responsibility for documents or portions of documents on the scope, application, and intended use of documents under the Health Care Facilities Project, as well as definitions not assigned to other committees in the Health Care Facilities Project.

Technical Committee on Electrical Equipment (HEA-ELE)
(Chapter 8, 10, and related paragraphs in Chapters 13, 14, 17, 18, 19, 21 and Annex D)

Lawrence S. Sandler, *Chair*
V.A. Medical Center, CA [U]

Saul Aronow, Waban, MA [SE]
Robert A. Carlson, Hubbell Inc., CT [M]
Rep. National Electrical Manufacturers Association
Yadin David, Texas Childrens Hospital, TX [U]
Albert G. Garlatti, Intertek Testing Services NA Inc., MN [RT]
Alan Lipschultz, Christiana Care-Health Services, DE [SE]
Rep. Association for the Advancement of Medical Instrumentation
James A. Meyer, Pettis Memorial VA Hospital, CA [C]
Rep. American Society of Anesthesiologists
Joseph P. Murnane, Underwriters Laboratories Inc., NY [RT]
Timothy Peglow, LaPorte Hospital, IN [U]
Rep. American Society for Healthcare Engineering
Mike Velvikis, High Voltage Maintenance Corporation, WI [IM]
Rep. International Electrical Testing Association, Inc.
Robert F. Willey, III, Siemens Medical Systems, Inc., NJ [M]
Rep. Health Industry Manufacturers Association

Alternate

Dale Woodin, American Society for Healthcare Engineering, IL [U]
(Alt. to T. Peglow)

Craig H. Kampmier, NFPA Staff Liaison

Committee Scope: This Committee shall have primary responsibility for documents or portions of documents covering the maintenance, performance, and testing of equipment for the purpose of safeguarding patients and staff within patient care areas of health care facilities from the hazards of fire, explosion, electricity, nonionizing radiation, heat, and electrical interference.

Technical Committee on Electrical Systems (HEA-ELS)
(Chapter 4 and related paragraphs in Chapters 13, 14, 17, 18, and 21)

Hugh O. Nash, Jr., *Chair*
Nash Lipsey Burch, LLC, TN [SE]

Robert A. Carlson, Hubbell Inc., CT [M]
Rep. National Electrical Manufacturers Association
Dan Chisholm, Motor and Generator Institute, Inc., FL [IM]
James H. Costley, Jr., Newcomb & Boyd Engineers, GA [SE]
Rep. NFPA Health Care Section
James L. Crawford, U.S. Department of Health and Human Services, WA [E]
Herbert Daugherty, Middlesex County Utilities Authority, NJ [U]
Rep. Electrical Generating Systems Association
Albert G. Garlatti, Intertek Testing Services NA Inc., MN [RT]
James W. Hillebrand, Byron Electric Company, KY [IM]
Rep. National Electrical Contractors Association
James R. Iverson, Onan Corporation, MN [M]
Edward A. Lobnitz, Tilden Lobnitz & Cooper Inc., FL [SE]
Alfred J. Longhitano, Gage-Babcock & Associates Inc., NY [U]
Rep. American Health Care Association
Joseph P. Murnane, Underwriters Laboratories Inc., NY [RT]
David K. Norton, U.S. Department of Veterans Affairs, DC [E]
Ronald M. Smidt, Carolinas HealthCare System, NC [U]
Rep. American Society for Healthcare Engineering
Howard Stickley, U.S. Army Corps of Engineers, DC [U]
Mike Velvikis, High Voltage Maintenance Corporation, WI [IM]
Rep. International Electrical Testing Association Inc.
Walter N. Vernon, IV, Mazzetti & Associates Inc., CA [SE]

Alternates

Lawrence A. Bey, Onan Corporation, MN [M]
(Alt. to J. R. Iverson)
Douglas S. Erickson, American Society for Healthcare Engineering, VI [U]
(Alt. to R. M. Smidt)
James Meade, U.S. Army Corps of Engineers, MD [U]
(Alt. to H. Stickley)
Jeffrey L. Steplowski, U.S. Department of Veterans Affairs, DC [E]
(Alt. to D. K. Norton)
Herbert V. Whitall, Electrical Generating Systems Association, FL [U]
(Alt. to H. Daugherty)

Craig H. Kampmier, NFPA Staff Liaison

Committee Scope: This Committee shall have primary responsibility for documents or portions of documents covering performance, maintenance, and testing of electrical systems for the purpose of safeguarding patients, staff, and visitors within health care facilities.

Technical Committee on Gas Delivery Equipment (HEA-GAS)
(Chapter 9, related paragraphs of Chapters 6, 13, 14, 17, 18, 19, and 21, and Annex E)

Gerald L. Wolf, *Chair*
SUNY/HCSB, Brooklyn, NY [C]
Rep. American Society of Anesthesiologists

M. Lee Bancroft, Beth Israel Deaconess Medical Center, MA [U]
Jay Crowley, U.S. Department of Health and Human Services, MD [E]
Yadin David, Texas Childrens Hospital, TX [U]
Gordon Earhart, HSB Professional Loss Control, TN [I]
Richard E. Hoffman, Hoffman & Associates, Inc., KS [M]
Rep. Compressed Gas Association
Alan Lipschultz, Christiana Care Health Services, DE [SE]
Rep. Association for the Advancement of Medical Instrumentation
George Mills, MM EC, Limited, IL [U]
Rep. American Society for Healthcare Engineering
Dwight R. (DAK) Quarles, Institute of Exercise & Environmental Medicine, TX [U]
Jay R. Sommers, Kimberly-Clark Corporation, GA [M]

Craig H. Kampmier, NFPA Staff Liaison

Committee Scope: This Committee shall have primary responsibility for documents or portions of documents on the performance and maintenance criteria for safeguarding patients and health care personnel from fire, explosion, electrical, and related hazards in anesthetizing locations involving the administration of both flammable and nonflammable anesthetics, including equipment and facilities ancillary thereto; and the performance, maintenance, and testing of patient-related gas equipment for the purpose of safeguarding patients and staff within health care facilities.

Technical Committee on Health Care Emergency Management (HEA-HCE)
(Chapter 12 and related paragraphs of Chapters 13, 14, 17, and 18)

Russell Phillips, *Chair*
Russell Phillips & Associates, Inc., NY [SE]

Pete Brewster, U.S. Dept. of Veterans Affairs-EMSHG, IN [U]
Steve Ennis, The Reciprocal Group, VA [I]
Curt Fogel, Vaaler Insurance, Inc., ND [I]
Joseph J. Gulinello, Integrated Security Solutions, NJ [SE]
John P. Jarrett, New Paltz Nursing Home, NY [U]
Rep. NFPA Health Care Section
Yvonne M. Keafer, Marsh USA, Inc., PA [I]
James C. Kendig, Jr., Health First, FL [U]
James W. Kerr, M. R. Inc., MD [SE]
David J. Kitchin, Milcare, AZ [M]
William C. McPeck, State of Maine Employee Health & Safety, ME [E]
Thomas A. Salamone, Health Care and Life Safety Concepts, NY [I]
Rep. Kemper Insurance Companies
W. Thomas Schipper, Kaiser Foundation Hospitals, CA [U]
Rep. American Society for Healthcare Engineering
Michael L. Sinsigalli, Windsor Locks Fire Department, CT [E]
Gregory E. Spahr, Loss Prevention Services, Inc., CA [SE]
Robert J. Stone, Acordia, OH [I]
Clevis T. Svetlik, Marsh USA, Inc., OH [I]
Steven Vargo, Raritan Bay Medical Center, NJ [U]
Ronald W. Woodfin, TetraTek, Inc., TX [SE]

Alternates

A. Richard Fasano, Russell Phillips & Associates, Inc., CA [SE]
(Alt. to R. Phillips)
Susan B. McLaughlin, SBM Consulting Limited, IL [U]
(Alt. to W. T. Schipper)
Richard C. Ryan, TetraTek, Inc., TN [SE]
(Alt. to R. W. Woodfin)

Craig H. Kampmier, NFPA Staff Liaison

Committee Scope: This Committee shall have primary responsibility for documents or portions of documents covering the performance of health care facilities for disaster preparedness, response, mitigation, and recovery.

Technical Committee on Hyperbaric and Hypobaric Facilities (HEA-HYP) (Chapter 20 and NFPA 99B)

Wilbur T. Workman, *Chair*
Workman Hyperbaric Services, Inc., TX [SE]

Peter Atkinson, Hyperbaric Technical & Nurses Association Inc., Australia [U]
Harold D. Beeson, NASA Johnson Space Center, NM [RT]
Dave DeAngelis, U.S. Navy — ESCECD, VA [E]
William H. L. Dornette, Kensington, MD [SE]
Christy Foreman, U.S. Department of Health and Human Services, MD [E]
William C. Gearhart, University of Pennsylvania, PA [U]
W. T. Gurnée, OxyHeal Health Group, CA [M]
Robert W. Hamilton, Hamilton Research Limited, NY [M]
Eric P. Kindwall, Medical College of Wisconsin, WI [U]
Carolyn Land, Curative Health Services, AZ [U]
Rep. Baromedical Nurses Association
Michael D. Martin, Ford Motor Company, MI [U]
Barry Newton, Wandell Hull & Associates, NM [SE]
Stephen D. Reimers, Reimers Systems, Inc., VA [M]
Thomas A. Salamone, Health Care and Life Safety Concepts, NY [I]
Rep. Kemper Insurance Companies
Robert F. Schumacher, Nth Systems Inc., NC [M]
J. Ronald Sechrist, Sechrist Industries, CA [M]
Paul J. Sheffield, International ATMO, Inc., TX [U]
John Steven Wood, Hyperbaric Oxygen, Inc., TX [SE]

Alternates

Greg Godfrey, Sechrist Industries, Inc., CA [M]
(Alt. to J. R. Sechrist)
Robert B. Sheffield, Wound Care Group, TX [U]
(Alt. to P. J. Sheffield)
Ellen C. Smithline, Baystate Medical Center, MA [C]
(Alt. to C. Land)
Joanna H. Weitershausen, U.S. Department of Health and Human Services, MD [E]
(Alt. to C. Foreman)
Harry T. Whelan, Medical College of Wisconsin, WI [U]
(Alt. to E. P. Kindwall)
Larry L. Wischhoefer, Reimers Systems, Inc., WA [M]
(Alt. to S. D. Reimers)

Craig H. Kampmier, NFPA Staff Liaison

Committee Scope: This Committee shall have primary responsibility for documents or portions of documents covering the construction, installation, testing, performance, and maintenance of hyperbaric and hypobaric facilities for safeguarding staff and occupants of chambers.

Technical Committee on Laboratories (HEA-LAB) (Chapter 11 and related paragraphs in Chapters 6, 13, 14, 17, and 18)

Susan B. McLaughlin, *Chair*
SBM Consulting, Limited, IL [U]
Rep. American Society for Healthcare Engineering

James F. Barth, FIREPRO, Inc., MA [SE]
John Francis Capron, III, The Cleveland Clinic Foundation, OH [U]
Ulrich M. Lindner, Earl Walls Associates, CA [SE]
John P. McCabe, National Institutes of Health, MD [E]
Thomas A. Salamone, Health Care and Life Safety Concepts, NY [I]
Rep. Kemper Insurance Companies
Josephine Simmons, The U.S. Health Care Financing Administration, MD [E]
James O. Wear, U.S. Department of Veterans Administration Medical Center, AR [U]
Rep. NFPA Health Care Section

Alternates

Carol Jacobson, Ohio State University Medical Center, OH [U]
(Alt. to S. B. McLaughlin)
Judith A. Yost, U.S. Department of Health and Human Services, MD [E]
(Alt. to J. Simmons)

Craig H. Kampmier, NFPA Staff Liaison

Committee Scope: This Committee shall have primary responsibility for documents or portions of documents covering the maintenance of equipment and environment for the purpose of safeguarding patients, visitors, and staff within laboratories in health care facilities.

Technical Committee on Piping Systems (HEA-PIP)
(Chapter 5 and related paragraphs of Chapters 13, 14, 17, 18 and 21) (Sections in Chapter 5 covering gas systems are submitted to the Technical Committee on Industrial and Medical Gases for concurrence before submittal to the Association for action)

Douglas S. Erickson, *Chair*
American Society for Healthcare Engineering, VI [U]
Rep. American Society for Healthcare Engineering

Mark W. Allen, Beacon Medical, NC [M]
M. Lee Bancroft, Beth Israel Deaconess Medical Center, MA [U]
David L. Brittain, PROVAC, OH [M]
Sidney L. Cavanaugh, United Association of Journeymen/Apprentices of Plumbing/Pipe Fitters, CA [L]
James S. Davidson, Jr., Davidson Associates, DE [SE]
Sharon Day, Pittsboro, NC [SE]
Rep. EnviroGuard
Peter Esherick, Patient Instrumentation Corporation, PA [RT]
P. L. Fan, American Dental Association, IL [U]
Michael Frankel, Utility Systems Consultants, NJ [SE]
Rep. American Society of Plumbing Engineers
Richard E. Hoffman, Hoffman & Associates, Inc., KS [M]
Rep. Compressed Gas Association
David Eric Lees, Georgetown University Medical Center, DC [C]
Rep. American Society of Anesthesiologists
Richard L. Miller, Medical Gas Technology Inc., SC [RT]
David Mohile, Medical Engineering Services, Inc., VA [RT]
Thomas J. Mraulak, Metro Detroit Plumbing Industry Training Center, MI [L]
Rep. American Society of Sanitary Engineering
Fred C. Quarnstrom, Seattle, WA [U]
Rep. American Dental Association
Ron Ridenour, National ITC Corporation, CA [L]
Rep. Piping Industry Progress and Education
E. Daniel Shoemaker, MDS Matrx, AZ [M]
Ronald M. Smidt, Carolinas HealthCare System, NC [U]
Rep. NFPA Health Care Section
Edward K. Stevenson, LMG Property Engineering, MA [I]
Rep. Alliance of American Insurers
J. Richard Wagner, Poole & Kent Company, MD [IM]
Rep. Mechanical Contractors Association of America, Inc.
Craig B. Williams, Hill-Rom, GA [M]
F. David Wyrick, Sr., Cambiare Ltd., NC [M]
Rep. International Analgesia Society

Alternates

Dale J. Dumbleton, National ITC Corporation, LA [L]
(Alt. to R. Ridenour)
David D. Eastman, Metro Detroit Plumbing Industry Training Center, MI [L]
(Alt. to T. J. Mraulak)
David Esherick, Patient Instrumentation Corporation, PA [RT]
(Alt. to P. Esherick)
Robert A. Ferdig, Nellcor/Puritan-Bennett Corporation, KS [M]
(Alt. to R. E. Hoffman)
Christopher R. Gossett, Squire-Cogswell Company, IL [M]
(Vot. Alt. Squire-Cogswell Rep.)
Michael J. Lynam, Porter Instrument Company, Inc., PA [M]
(Alt. to F. D. Wyrick, Sr.)
James A. Meyer, Pettis Memorial VA Hospital, CA [C]
(Alt. to D. E. Lees)
Sharon Stanford, American Dental Association, IL [U]
(Alt. to P. L. Fan)
Chris Swayze, The Sherman Engineering Company, PA [M]
(Alt. to M. W. Allen)
Dale Woodin, American Society for Healthcare Engineering, IL [U]
(Alt. to D. S. Erickson)

Craig H. Kampmier, NFPA Staff Liaison

Committee Scope: This Committee shall have primary responsibility for documents or portions of documents covering the performance, maintenance, installation, and testing of medical and dental related gas piping systems and medical and dental related vacuum piping systems

These lists represent the membership at the time the Committees were balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to 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.

Contents

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Standard for

Health Care Facilities

2002 Edition

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

Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet between the paragraphs that remain.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, Annex F lists the complete title and edition of the source documents for both mandatory and nonmandatory extracts. 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.

Information on referenced publications can be found in Chapter 2 and Annex F.

Further explanatory information on Chapters 1 through 20 can be found in Annex C.

Chapter 1 Administration

1.1 Scope.

1.1.1 The scope of this document is to establish criteria to minimize the hazards of fire, explosion, and electricity in health care facilities providing services to human beings.

1.1.2 Annex D covers principles of design and use of electrical and electronic appliances generating high-frequency currents for medical treatment in hospitals, clinics, ambulatory care facilities, and dental offices, whether fixed or mobile.

1.1.2.1 Areas Not Addressed. The following areas are not addressed:

(1) Communication equipment, resuscitation equipment (e.g., defibrillators), or physiological stimulators (e.g., used for anesthesia, acupuncture).
(2) Experimental or research apparatus built to order, or under development, provided such apparatus is used under qualified supervision and provided the builder demonstrates to the authority having jurisdiction that the apparatus has a degree of safety equivalent to that described in Annex D.

1.1.3 Annex E retains the established requirements that would be necessary for the safe use of flammable inhalation anesthetics should the use of this type of anesthetic be reinstituted.

1.1.4 Chapter 4, Electrical Systems, covers the performance, maintenance, and testing of electrical systems (both normal and essential) used within health care facilities.

1.1.4.1 Areas Not Addressed. The following areas are not addressed in NFPA 99, but are addressed in other NFPA documents:

(1) Specific requirements for wiring and installation on equipment are covered in NFPA 70, *National Electrical Code®*.
(2) Requirements for illumination and identification of means of egress in health care facilities are covered in NFPA *101®, Life Safety Code®*.
(3) Requirements for fire protection signaling systems.
(4) Requirements for fire pumps are covered in NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, except that the alternate source of power shall be permitted to be the essential electrical system.
(5) Requirements for the installation of stationary engines and gas turbines are covered in NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*.

1.1.5 Chapter 5, Gas and Vacuum Systems, covers the performance, maintenance, installation, and testing of the following:

(1) Nonflammable medical gas systems with operating pressures below a gage pressure of 2068 kPa (300 psi)
(2) Vacuum systems used within health care facilities
(3) Waste anesthetic gas disposal (WAGD) systems, also referred to as scavenging
(4) Manufactured assemblies that are intended for connection to the medical gas, vacuum, or WAGD systems (also referred to as scavenging)

1.1.5.1 Areas Not Addressed. Requirements for portable compressed gas systems are covered in Chapter 9, Gas Equipment.

1.1.6 Chapter 6, Environmental Systems, covers the performance, maintenance, and testing of the environmental systems used within health care facilities.

1.1.7 Chapter 7, Materials, covers the hazards associated with the use of flammable and combustible materials used within health care facilities.

1.1.8 Chapter 8, Electrical Equipment, covers the performance, maintenance, and testing of electrical equipment used within health care facilities.

1.1.9 Chapter 9, Gas Equipment, covers the performance, maintenance, and testing of gas equipment used within health care facilities.

1.1.10 Chapter 10, Manufacturer Requirements, covers the performance, maintenance, and testing, with regard to safety, required of manufacturers of equipment used within health care facilities.

1.1.11 Chapter 11, Laboratories, establishes criteria to minimize the hazards of fire and explosions in laboratories, as defined in Chapter 3.

1.1.11.1 Areas Not Addressed. Subsection 1.1.11 is not intended to cover hazards resulting from any of the following:

(1) Chemicals
(2) Radioactive materials
(3)*Biological materials that will not result in fires or explosions

1.1.12* Chapter 12, Health Care Emergency Management, establishes minimum criteria for health care facility emergency

management in the development of a program for effective disaster preparedness, response, mitigation, and recovery.

1.1.13 Chapter 13, Hospital Requirements, addresses safety requirements of hospitals.

1.1.14 Chapter 14, Other Health Care Facilities, addresses safety requirements for facilities, or portions thereof, that provide diagnostic and treatment services to patients in health care facilities. Requirements for specific health care facilities are addressed in the following chapters:

(1) Hospitals — Chapter 13
(2) Nursing homes — Chapter 17
(3) Limited care facilities — Chapter 18

1.1.15 Reserved

1.1.16 Reserved

1.1.17 Chapter 17, Nursing Home Requirements, addresses safety requirements of nursing homes.

1.1.18 Chapter 18, Limited Care Facility Requirements, covers safety requirements of limited care facilities.

1.1.19 Chapter 19, Electrical and Gas Equipment for Home Care, addresses the requirements for the safe use of electrical and gas equipment used for home care medical treatment.

1.1.20* Chapter 20, Hyperbaric Facilities, covers the recognition of and protection against hazards of an electrical, explosive, or implosive nature, as well as fire hazards associated with hyperbaric chambers and associated facilities that are used, or intended to be used, for medical applications and experimental procedures at gage pressures from 0 to 690 kPa (0 to 100 psi). Chapter 20 applies to both single- and multiple-occupancy hyperbaric chambers, to animal chambers the size of which precludes human occupancy, and to those in which the chamber atmosphere contains an oxygen partial pressure greater than an absolute pressure of 21.3 kPa (3.09 psi) (0.21 atmospheres).

1.1.21 Chapter 21, Freestanding Birthing Centers, addresses the requirements for the safe use of electrical and gas equipment, and for electrical, gas, and vacuum systems used for the delivery and care of infants in freestanding birthing centers.

1.2 Purpose.

1.2.1 The purpose of this standard is to provide minimum requirements for the performance, maintenance, testing, and safe practices for facilities, material, equipment, and appliances, including other hazards associated with the primary hazards.

1.3 Application.

1.3.1 This document shall apply to all health care facilities.

1.3.2 Construction and equipment requirements shall be applied only to new construction and new equipment, except as modified in individual chapters. Only the altered, renovated, or modernized portion of an existing system or individual component shall be required to meet the installation and equipment requirements stated in this standard. If the alteration, renovation, or modernization adversely impacts existing performance requirements of a system or component, additional upgrading shall be required.

1.3.3 Chapters 13 through 19 specify the conditions under which the requirements of Chapters 4 through 12 shall apply in Chapters 13 through 19.

1.3.4 This document is intended for use by those persons involved in the design, construction, inspection, and operation of health care facilities and in the design, manufacture, and testing of appliances and equipment used in patient care areas of health care facilities. Nonflammable piped medical gases covered by this document include, but are not limited to, oxygen, nitrogen, nitrous oxide, medical air, carbon dioxide, and helium.

1.4 Equivalency.

1.4.1 The authority having jurisdiction for the enforcement of this document shall be permitted to grant exceptions to its requirements.

1.4.2 Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety to those prescribed by this standard. 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.

1.5 Units and Formulas.

1.5.1* Primary units will be trade units, secondary will be the conversion. Although it is common practice for medical appliances to have metric units on their dials, gages, and controls, many components of systems within the scope of this document, which are manufactured and used in the United States, employ nonmetric dimensions. Since these dimensions (such as nominal pipe sizes) are not established by the National Fire Protection Association, the now Technical Correlating Committee on Health Care Facilities cannot independently change them. Accordingly, this document uses dimensions that are presently in common use by the building trades in the United States.

1.6 Code Adoption Requirements.

1.6.1 The effective date of application of any provision of this document is not determined by the National Fire Protection Association. All questions related to applicability shall be directed to the authority having jurisdiction.

1.6.2* Enforcement. This code shall be administered and enforced by the authority having jurisdiction designated by the governing authority.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers,* 1998 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 1999 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* 2000 edition.

NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*, 2002 edition.

NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*, 2000 edition.

NFPA 50, *Standard for Bulk Oxygen Systems at Consumer Sites*, 2001 edition.

NFPA 51, *Standard for the Design and Installation of Oxygen–Fuel Gas Systems for Welding, Cutting, and Allied Processes*, 2002 edition.

NFPA 54, *National Fuel Gas Code*, 1999 edition.

NFPA 58, *Liquefied Petroleum Gas Code*, 2001 edition.

NFPA 70, *National Electrical Code®*, 2002 edition.

NFPA 72®, National Fire Alarm Code®, 1999 edition.

NFPA 99B, *Standard for Hypobaric Facilities*, 2002 edition.

NFPA *101®, Life Safety Code®*, 2000 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems*, 2002 edition.

NFPA 220, *Standard on Types of Building Construction*, 1999 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, 2000 edition.

NFPA 326, *Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair*, 1999 edition.

NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*, 1999 edition.

NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*, 2001 edition.

NFPA 1600, *Standard on Disaster/Emergency Management and Business Continuity Programs*, 2000 edition.

2.3 Other Publications.

2.3.1 ANSI Publications. American National Standards Institute, Inc., 11 West 42nd Street, 13th floor, New York, NY 10036.

ANSI/ASME B-40.1, *Gages, Pressure Indicating Dial-Type, Elastic Element*, 1991.

ANSI/ASSE Series 6000, *Professional Qualifications Standard for Medical Gas Systems Installers, Inspectors, and Verifiers.*

ANSI B16.22, *Wrought Copper and Copper Alloy Solder - Joint Pressure Fittings*, 1995.

ANSI B57.1 (See CGA V-1.)

ANSI C84.1, *Electric Power Systems and Equipment — Voltage Ratings*, 1995.

ANSI C-4 (See CGA C-4.)

ANSI G-7.1 (See CGA G-7.1.)

2.3.2 ASHRAE Publication. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., 1791 Tullie Circle, NE, Atlanta, GA 30329-2305.

ASHRAE *Handbook of Fundamentals*—1985, Chapter 24.

2.3.3 ASME Publications. American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

ANSI/ASME PVHO-1-1990, *Safety Standard for Pressure Vessels for Human Occupancy.*

ASME *Boiler and Pressure Vessel Code*, 1990.

2.3.4 ASTM Publications. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM A 53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*, 1994.

ASTM B 32, *Standard Specification for Solder Metal*, 1996.

ASTM B 88, *Standard Specification for Seamless Copper Water Tube*, 1996.

ASTM B 280, *Standard Specification for Seamless Copper Tubing for Air Conditioning and Refrigeration Field Service*, 1997.

ASTM B 819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, 1995.

ASTM B 828, *Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings*, 1998.

ASTM D 5, *Standard Test Method for Penetration of Bituminous Materials*, 1997.

ASTM D 2863, *Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-like Combustion of Plastics (Oxygen Index)* (ANSI D2863), 1997.

ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 1998.

2.3.5 AWS Publications. American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

ANSI/AWS A5.8, *Specification for Filler Metals for Brazing and Braze Welding*, 1992.

AWS B2.2, *Standard for Brazing Procedure and Performance Qualification*, 1991.

2.3.6 CGA Publications. Compressed Gas Association, 1725 Jefferson Davis Highway, Arlington, VA 22202-4100.

Pamphlet C-7, *Guide to the Preparation for Cautionary Labeling and Marking for Compressed Gas Containers*, 2000.

Pamphlet C-9, *Standard Color Marking of Compressed Gas Containers Intended for Medical Use*, 1988.

Pamphlet G-4, *Oxygen*, 1996.

Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service*, 1996.

Pamphlet G-7.1, *Commodity Specification for Air* (ANSI Z86.1), 1997.

Pamphlet G-8.1, *Standard for Nitrous Oxide Systems at Consumer Sites*, 1990.

Pamphlet G-10.1, *Commodity Specification for Nitrogen*, 1997.

Pamphlet P-2, *Characteristics and Safe Handling of Medical Gases*, 1996.

Pamphlet P-2.5, *Transfilling of High Pressure Gaseous Oxygen to Be Used for Respiration*, 2000.

Pamphlet P-2.6, *Transfilling of Liquid Oxygen to Be Used for Respiration*, 1995.

Pamphlet P-2.7, *Guide for the Safe Storage, Handling and Use of Portable Liquid Oxygen Systems in Health Care Facilities*, 2000.

Pamphlet P-9, *Inert Gases: Argon, Nitrogen and Helium*, 1992.

Pamphlet V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections* (ANSI B57.1), 1994.

Pamphlet V-5, *Diameter-Index Safety System (Non-Interchangeable Low Pressure Connections for Medical Gas Applications)*, 2000.

Pamphlet E-10, *Maintenance of Medical Gas and Vacuum Systems in Health-Care Facilities*, 1997.

2.3.7 CDA Publication. Copper Development Association Inc., 260 Madison Avenue, New York, NY 10016, www.copper.org.

Copper Tube Handbook.

2.3.8 ISA Publication. The Instrumentation, Systems, and Automation Society (ISA), 67 Alexander Drive, Research Triangle Park, NC 27709.

RP 12.6, *Installation of Intrinsically Safe Systems in Hazardous Locations*, 1995.

2.3.9 MSS Publications. Manufacturer's Standardization Society of the Valve and Fittings Industry, Inc., 127 Park Street NE, Vienna, VA 22180.

SP-58, *Pipe Hangers and Supports — Materials, Design, and Manufacture*, 1996.

SP-69, *Pipe Hangers and Supports — Selection and Application*, 1996.

SP-73 *Brazing Joints for Copper and Copper Alloy Pressure Fittings*, 1991.

2.3.10 NCCLS Publication. National Committee for Clinical Laboratory Standards, 940 West Valley Road, Suite 1400, Wayne, PA 19087-1898.

NCCLS ASI-5, *Power Requirements for Clinical Laboratory Instruments and for Laboratory Power Sources.*

2.3.11 UL Publication. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL Subject 94, *Standard for Safety Test for Flammability of Plastic Materials for Parts in Devices and Appliances*, 1996.

2.3.12 U.S. Government Publication. Document Automation and Production Service (DAPS), Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, www.dodssp.daps.mil.

MIL-Standard 104C, *Limit for Electrical Insulation Color.*

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not included, common usage of the terms shall apply. The letters in parentheses at the end of each definition refer to the Technical Committee responsible for defining the term.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

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

3.2.4 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.

3.2.5 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.6* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets identified standards or has been tested and found suitable for a specified purpose.

3.2.7 Shall. Indicates a mandatory requirement.

3.2.8 Should. Indicates a recommendation or that which is advised but not required.

3.2.9 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.

3.3 General Definitions.

3.3.1 ACFM. Actual cubic feet per minute. (PIP)

3.3.2 Adiabatic Heating. The heating of a gas caused by its compression. (HYP)

3.3.3 Aerosol. An intimate mixture of a liquid or a solid in a gas; the liquid or solid, called the dispersed phase, is uniformly distributed in a finely divided state throughout the gas, which is the continuous phase or dispersing medium. (GAS)

3.3.4 Alarm Systems.

3.3.4.1 Area Alarm System. A warning system within an area of use that provides continuous visible and audible surveillance of Level 1 and Level 2 medical gas and vacuum systems. (PIP)

3.3.4.2 Level 3 Alarm System. A warning system within an area of use that provides continuous visible and audible surveillance of Level 3 medical gas systems. (PIP)

3.3.4.3 Local Alarm System. A warning system that provides continuous visible and audible surveillance of medical gas and vacuum system source equipment at the equipment site. (PIP)

3.3.4.4 Master Alarm System. A warning system that monitors the operation and condition of the source of supply, the reserve source (if any), and the pressure in the main lines of each medical gas and vacuum piping system. (PIP)

3.3.5 Alternate Power Source. One or more generator sets, or battery systems where permitted, intended to provide power during the interruption of the normal electrical service; or the public utility electrical service intended to provide power during interruption of service normally provided by the generating facilities on the premises. (ELS)

3.3.6 Ambulatory Health Care Center. A building or portion thereof used to provide services or treatment simultaneously to four or more patients that (1) provides, on an outpatient basis, treatment for patients that renders the patients incapable of taking action for self-preservation under emergency

conditions without the assistance of others; or (2) provides, on an outpatient basis, anesthesia that renders the patients incapable of taking action for self-preservation under emergency conditions without the assistance of others. (ADM)

3.3.7 Ampacity. The current, in amperes, that a conductor can carry continuously under the conditions of use without exceeding its temperature rating. (ELS)

3.3.8 Anesthetic. As used in this standard, applies to any inhalation agent used to produce relative analgesia or general anesthesia. (GAS)

3.3.9* Anesthetizing Location. Any area of a facility that has been designated to be used for the administration of nonflammable inhalation anesthetic agents in the course of examination or treatment, including the use of such agents for relative analgesia. *(See definition of Relative Analgesia.)* (GAS)

3.3.10 Anoxia. A state of markedly inadequate oxygenation of the tissues and blood, of more marked degree than hypoxia. (HYP)

3.3.11 Appliance. Utilization equipment, generally other than industrial, normally built in standardized sizes or types, that is installed or connected as a unit to perform one or more functions. (ELE)

3.3.12* Applicator. A means of applying high-frequency energy to a patient other than by an electrically conductive connection. (ELE)

3.3.13 Area of Administration. Any point within a room within 15 ft (4.3 m) of oxygen equipment or an enclosure containing or intended to contain an oxygen-enriched atmosphere. (GAS)

3.3.14* Atmosphere. The pressure exerted by, and gaseous composition of, an environment. (HYP)

3.3.14.1 Ambient Atmosphere. The pressure and composition of the environment surrounding a chamber. (HYP)

3.3.14.2 Chamber Atmosphere. The environment inside a chamber. (HYP)

3.3.14.3 Atmosphere Absolute (ATA). The pressure of the earth's atmosphere, 760.0 mmHg, 101.325 kPa, or 14.7 psia. Two ATA = two atmospheres. *(See also Atmosphere.)* (HYP)

3.3.14.4* Atmosphere of Increased Burning Rate. Any atmosphere containing a percentage of oxygen or oxygen and nitrous oxide greater than the quotient of 23.45 divided by the square root of the total pressure in atmospheres. (HYP)

3.3.15 Automatic. Providing a function without the necessity of human intervention. [**101B:**2.2] (ELS)

3.3.16* Bends. Decompression sickness; caisson worker's disease. (HYP)

3.3.17 Branch Circuit. The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s). [**70:**100.I] (ELS)

3.3.18 Branch Line. See definition of Piping.

3.3.19 Bulk System. An assembly of equipment, such as storage containers, pressure regulators, pressure relief devices, vaporizers, manifolds, and interconnecting piping, that terminates at the point where the system gas at service pressure first enters the facility supply line. Bulk systems contain more than 566,335 L (20,000 ft^3) of oxygen or 1452 kg (3200 lb) of nitrous oxide including unconnected reserves on the site. (PIP)

3.3.19.1 Bulk Nitrous Oxide System. An assembly of equipment as described in the definition of bulk oxygen system that has a storage capacity of more than 3200 lb (1452 kg) [approximately 28,000 ft^3 (793 m^3) (at normal temperature and pressure)] of nitrous oxide. (PIP)

3.3.19.2* Bulk Oxygen System. An assembly of equipment such as oxygen storage containers, pressure regulators, pressure relief devices, vaporizers, manifolds, and interconnecting piping that has a storage capacity of more than 20,000 ft^3 (566 m^3) of oxygen (at normal temperature and pressure) including unconnected reserves on hand at the site. (PIP)

3.3.20 Cold Room. A refrigerated area large enough for personnel to enter. (LAB)

3.3.21 Combustible. Capable of undergoing combustion. (GAS)

3.3.22* Combustible Liquid. A liquid having a flash point at or above 37.8°C [100°F]. Combustible liquids shall be subdivided as follows: (a) Class II liquids shall include those having flash points at or above 37.8°C [100°F] and below 60°C [140°F]; (b) Class IIIA liquids shall include those having flash points at or above 60°C [140°F] and below 93°C [200°F]; (c) Class IIIB liquids shall include those having flash points at or above 93°C [200°F]. (LAB)

3.3.23* Combustion. A chemical process (such as oxidation) accompanied by the rapid evolution of heat and light. (GAS)

3.3.24 Combustion Products. The gases, volatilized liquids and solids, particulate matter, and ash generated by combustion. (GAS)

3.3.25 Compressed Air System. A Level 3 gas distribution system comprised of component parts, including, but not limited to, air compressor, motor, receiver, controls, filters, dryers, valves, and piping, that delivers compressed air [gage pressure <160 psi (1100 kPa)] to power devices (e.g., hand pieces, syringes, cleaning devices) as a power source. (PIP)

3.3.26 Container. A low-pressure, vacuum-insulated vessel containing gases in liquid form. (GAS)

3.3.27 Critical Branch. A subsystem of the emergency system consisting of feeders and branch circuits supplying energy to task illumination, special power circuits, and selected receptacles serving areas and functions related to patient care and that are connected to alternate power sources by one or more transfer switches during interruption of normal power source. (ELS)

3.3.28 Critical Care Area. See definition of Patient Care Area.

3.3.29 Critical Equipment. That equipment essential to the safety of the occupants of the facility. (HYP)

3.3.30 Critical System. A system of feeders and branch circuits in nursing homes and custodial care facilities arranged for connection to the alternate power source to restore service to certain critical receptacles, task illumination, and equipment. (ELS)

3.3.31 Cylinder. A supply tank containing high-pressure gases or gas mixtures at pressures that can be in excess of 2000 psig (13.8 kPa gage). (GAS)

3.3.32 Decompression Sickness. A syndrome due to evolved gas in the tissues resulting from a reduction in ambient pressure. (HYP)