Report of the Committee on

Health Care Facilities

Technical Correlating Committee (HEA-AAC)

John P. Swope, *Chair*
Derwood, MD [SE]

Constance Bobik, B&E Fire Safety Equipment Inc., FL [IM]
Jay Crowley, U.S. Department of Health/Human Services, MD [E]
Marvin J. Fischer, Jamesburg, NJ [U]
Thomas W. Gardner, Gage-Babcock & Associates, VA [U]
Rep. American Health Care Association
Stanley Kahn, Tri-City Electric Company, Inc., CA [IM]
Rep. National Electrical Contractors Association
William E. Koffel, Jr., 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]

Committee Scope: This Committee shall have primary responsibility for documents which contain criteria for safeguarding patients and health care personnel in the delivery of health care services within health care facilities: a) 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; b) from fire and explosion hazards associated with laboratory practices; c) in connection with the use of hyperbaric and hypobaric facilities for medical purposes; d) through performance, maintenance and testing criteria for electrical systems, both normal and essential; and e) through performance, maintenance and testing and installation criteria: 1) for vacuum systems for medical or surgical purposes, and 2) for medical gas systems.

Technical Committee on

Administration (HEA-ADM)
(Chapters 1, 2, and 4)

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

Thomas Bulow, Tucson, AZ [U]
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

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 7 [new Chapter 8] and Chapter 9 [new Chapter 10])

Lawrence S. Sandler, *Chair*
U.S. Department of Veterans Affairs, CA [U]

Saul Aronow, Waban, MA [SE]
Yadin David, Texas Childrens Hospital, TX [U]
Albert G. Garlatti, Intertek Testing Services NA Inc., MN [RT]
Alan Lipschultz, Christiana Health Care 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, La Porte Hospital, IN [U]
Rep. American Society for Healthcare Engr
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

Alternates

George Mills, MM EC, Limited, IL [U]
(Alt. to T. Peglow)
Robert A. Carlson, Hubbell Inc., CT [M]
(Voting Alt. to NEMA Rep.)

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 3)

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

Dan Chisholm, Motor and Generator Institute, Inc., FL [IM]
James L. Crawford, U.S. Department of Health & Human Service, WA [E]
Herbert Daugherty, Middlesex County Utilities Authority, NJ [U]
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 Engineers
Howard Stickley, U.S. Army Corps of Engineers, DC [U]
Raymond J. Swisher, Naval Healthcare Support Office, VA [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)
Robert A. Carlson, Hubbell Inc., CT [M]
(Voting Alt. to NEMA Rep.)
Douglas S. Erickson, American Society for Healthcare Engineers, VI [U]
(Alt. to R. M. Smidt)
James Meade, US Army Corps of Engineers, MD [U]
(Alt. to H. Stickley)
Jeffrey L. Steplowski, U.S. Department of Veterans Affairs (183A), DC [E]
(Alt. to D. K. Norton)

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 2 [definitions] Chapter 8, 13 [moving some items to Chapter 13] and 21)

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/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 Health Care 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]
John P. Swope, Derwood, MD [SE]
Rep. NFPA Health Care Section

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 Preparedness and Disaster Planning (HEA-HCE)
(Chapters 2 and 11)

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

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, Sedgwick James of PA, Inc., PA [I]
James C. Kendig, 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 Engr
Michael L. Sinsigalli, Windsor Locks Fire Department, CT [E]
Gregory E. Spahr, Loss Prevention Services, Inc., CA [SE]
Robert J. Stone, Acordia of Cincinnati, Inc., OH [I]
Clevis T. Svetlik, Marsh USA, Inc., OH [I]
Steven Vargo, Raritan Bay Medical Center, NJ [U]
Ronald W. Woodfin, TetraTek, Inc., TN [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)

Committee Scope: This Committee shall have primary responsibility for documents or portions of documents covering the performance of health care facilities under disaster conditions.

Technical Committee on

Hyperbaric and Hypobaric Facilities (HEA-HYP)
(Chapter 19 and NFPA 99B)

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

Peter Atkinson, Hyperbaric Technical & Nurses Associates Inc., Australia [U]
Harold D. Beeson, NASA Johnson Space Center, NM [RT]
Dave DeAngelis, U.S. Navy - Naval Facilities ESCECD, DC [E]
William H. L. Dornette, Kensington, MD [SE]
Christy Foreman, U.S. Department of Health & Human Service, MD [E]
W. T. Gurnée, Oxy Heal 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
Richard A. Leland, Environmental Tectonics Corporation, PA [M]
Michael D. Martin, Ford Motor Company, MI [U]
Dennis J. Murray, KMS-Medical Gas System Consultants Limited, MI [U]
Rep. American Society for Healthcare Engineers
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., TX [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)
George Mills, MM EC, Limited, IL [U]
(Alt. to D. J. Murray)
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 & 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)

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)
(Chapters 2, 10, and 13)

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/Fire Prevention Section, MD [E]
Susan Y. Nickasch, Neenah, WI [SE]
Rep. American Society for Clinical Laboratory Science
Thomas A. Salamone, Health Care and Life Safety Concepts, NY [I]
Rep. Kemper Insurance Companies
Josephine Simmons, U.S. The Health Care Financing Administration, MD [E]
James O. Wear, U.S. Department of Veterans Admin. Medical Center, AR [U]
Rep. NFPA Health Care Section

Alternates

Robert A. Guy, Earl Walls Associates, CA [SE]
(Alt. to U. M. Linder)
Carol Jacobson, Ohio State Univ. 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)

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 2 [definitions] and Chapter 4)

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

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 Fitting (UA), 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
Henry R. Kaht, Squire-Cogswell Company, IL [M]
David Eric Lees, Georgetown University Medical Ctr., DC [C]
Rep. American Society of Anesthesiologists
Richard L. Miller, Medical Gas Technology Inc., SC [RT]
David B. Mohile, Medical Engr Services, Inc., VA [RT]
Thomas J. Mraulak, Metropolitan Detroit Plumbing Ind. Training Ctr., MI [L]
Rep. American Society of Sanitary Engineering
Ron Ridenour, National ITC Corporation, CA [L]
Rep. Piping Industry Progress and Education
E. Daniel Shoemaker, Apollo Dental Products, AZ [M]
Ronald M. Smidt, Carolinas HealthCare System, NC [U]
Rep. NFPA Health Care Section
Edward K. Stevenson, LMG Property Engineers, MA [I]
Rep. The Alliance of American Insurers
J. Richard Wagner, Poole & Kent Company, MD [IM]
Rep. Mechanical Contractors Association of America, Inc.
Craig B. Williams, MEDAES Inc., GA [M]
F. David Wyrick, Sr., Cambiare Limited, 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]
(Alt. to H. R. Kaht)
Michael J. Lynam, Porter Instrument Company, Inc., PA [M]
(Alt. to F. David Wyrick, Sr.)
James A. Meyer, Pettis Memorial VA Hospital, CA [C]
(Alt. to D. E. Lees)
George Mills, MM EC, Limited, IL [U]
(Alt. to D. S. Erickson)
Sharon Stanford, American Dental Association, IL [U]
(Alt. to P. L. Fan)
Christopher P. Swayze, The Sherman Engineering Company, PA [M]
(Alt. to M. W. Allen)

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

Staff Liaison: **Craig H. Kampmier**

These lists represent the membership at the time each Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the front of this book.

The Report of the Committee on **Health Care Facilities** is presenting two Reports for adoption, as follows:

The Reports were prepared by the:

- Technical Correlating Committee on Health Care Facilities (HEA-AAC)
- Technical Committee on Administration (HEA-ADM)
- Technical Committee on Electrical Equipment (HEA-ELE)
- Technical Committee on Electrical Systems (HEA-ELS)
- Technical Committee on Gas Delivery Equipment (HEA-GAS)
- Technical Committee on Health Care Emergency Preparedness and Disaster Planning (HEA-HCE)
- Technical Committee on Hyperbaric and Hypobaric Facilities (HEA-HYP)
- Technical Committee on Laboratories (HEA-LAB)
- Technical Committee on Piping Systems (HEA-PIP)

Report I: The Technical Committee proposes for adoption amendments to NFPA 99, **Standard for Health Care Facilities**, 1999 edition. NFPA 99-1999 is published in Volume 4 of the 2000 National Fire Codes and in separate pamphlet form.

NFPA 99 has been submitted to letter ballot of the individual Technical Committees. The results of the balloting, after circulation of any negative votes, can be found in the report.

NFPA 99 has also been submitted to letter ballot of the **Technical Correlating Committee on Health Care Facilities**, which consists of 11 voting members; of whom 8 voted affirmatively and 3 ballots were not returned (Crowley, Gardner, Swope).

Report II: The Technical Committee proposes for adoption amendments to NFPA 99B, **Standard for Hypobaric Facilities**, 1999 edition. NFPA 99B-1999 is published in Volume 4 of the 2000 National Fire Codes and in separate pamphlet form.

NFPA 99B has been submitted to letter ballot of the **Technical Committee on Hyperbaric and Hypobaric Facilities**, which consists of 20 voting members. The results of the balloting, after circulation of any negative votes, can be found in the report.

NFPA 99B has also been submitted to letter ballot of the **Technical Correlating Committee on Health Care Facilities**, which consists of 11 voting members; of whom 8 voted affirmatively and 3 ballots were not returned (Crowley, Gardner, Swope).

NFPA 99

(Log #CP1)
Committee: HEA-ADM

99- 1 - (Entire Document): Accept
SUBMITTER: Technical Committee on Administration
RECOMMENDATION: Restructure entire document to comply with the NFPA Manual of Style as follows:
1. Chapter 1 to contain administrative text only.
2. Chapter 2 to contain only referenced publications cited in the mandatory portions of the document.
3. Chapter 3 to contain only definitions.
4. All mandatory sections of the document must be evaluated for usability, adoptability, and enforceability language. Generate necessary committee proposals.
5. All units of measure in the document are converted to SI units with inch/pound units in parentheses.
6. Appendices restructured and renamed as "Annexes."
SUBSTANTIATION: Editorial restructuring, to conform with the 2000 edition of the NFPA Manual of Style.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 6
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 5
NOT RETURNED: 1 McPeck

(Log #CP100)
Committee: HEA-ELE

99- 2 - (Entire Document): Accept
SUBMITTER: Technical Committee on Electrical Equipment
RECOMMENDATION: Restructure entire document to comply with the NFPA Manual of Style as follows:
1. Chapter 1 to contain administrative text only.
2. Chapter 2 to contain only referenced publications cited in the mandatory portions of the document.
3. Chapter 3 to contain only definitions.
4. All mandatory sections of the document must be evaluated for usability, adoptability, and enforceability language. Generate necessary committee proposals.
5. All units of measure in the document are converted to SI units with inch/pound units in parentheses.
6. Appendices restructured and renamed as "Annexes."
SUBSTANTIATION: Editorial restructuring, to conform with the 2000 edition of the NFPA Manual of Style.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 4 Aronow, Carlson, Meyer, Peglow

(Log #CP200)
Committee: HEA-ELS

99- 3 - (Entire Document):
SUBMITTER: Technical Committee on Electrical Systems
RECOMMENDATION: Restructure entire document to comply with the NFPA Manual of Style as follows:
1. Chapter 1 to contain administrative text only.
2. Chapter 2 to contain only referenced publications cited in the mandatory portions of the document.
3. Chapter 3 to contain only definitions.
4. All mandatory sections of the document must be evaluated for usability, adoptability, and enforceability language. Generate necessary committee proposals.
5. All units of measure in the document are converted to SI units with inch/pound units in parentheses.
6. Appendices restructured and renamed as "Annexes."
SUBSTANTIATION: Editorial restructuring, to conform with the 2000 edition of the NFPA Manual of Style.
COMMITTEE ACTION: Accept.
See Committee Proposal 99-32 (Log #CP201).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #CP300)
Committee: HEA-GAS

99- 4 - (Entire Document): Accept
SUBMITTER: Technical Committee on Gas Delivery Equipment
RECOMMENDATION: Restructure entire document to comply with the NFPA Manual of Style as follows:
1. Chapter 1 to contain administrative text only.
2. Chapter 2 to contain only referenced publications cited in the mandatory portions of the document.
3. Chapter 3 to contain only definitions.
4. All mandatory sections of the document must be evaluated for usability, adoptability, and enforceability language. Generate necessary committee proposals.
5. All units of measure in the document are converted to SI units with inch/pound units in parentheses.
6. Appendices restructured and renamed as "Annexes."
SUBSTANTIATION: Editorial restructuring, to conform with the 2000 edition of the NFPA Manual of Style.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 8
NOT RETURNED: 3 Bancroft, Mills, Swope

(Log #CP400)
Committee: HEA-HCE

99- 5 - (Entire Document): Accept
SUBMITTER: Technical Committee on Health Care Emergency Preparedness and Disaster Planning
RECOMMENDATION: Restructure entire document to comply with the NFPA Manual of Style as follows:
1. Chapter 1 to contain administrative text only.
2. Chapter 2 to contain only referenced publications cited in the mandatory portions of the document.
3. Chapter 3 to contain only definitions.
4. All mandatory sections of the document must be evaluated for usability, adoptability, and enforceability language. Generate necessary committee proposals.
5. All units of measure in the document are converted to SI units with inch/pound units in parentheses.
6. Appendices restructured and renamed as "Annexes."
SUBSTANTIATION: Editorial restructuring, to conform with the 2000 edition of the NFPA Manual of Style.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 4 Kitchin, McPeck, Sinsigalli, Woodfin

(Log #CP600)
Committee: HEA-LAB

99- 6 - (Entire Document): Accept
SUBMITTER: Technical Committee on Laboratories
RECOMMENDATION: Restructure entire document to comply with the NFPA Manual of Style as follows:
1. Chapter 1 to contain administrative text only.
2. Chapter 2 to contain only referenced publications cited in the mandatory portions of the document.
3. Chapter 3 to contain only definitions.
4. All mandatory sections of the document must be evaluated for usability, adoptability, and enforceability language. Generate necessary committee proposals.
5. All units of measure in the document are converted to SI units with inch/pound units in parentheses.
6. Appendices restructured and renamed as "Annexes."
SUBSTANTIATION: Editorial restructuring, to conform with the 2000 edition of the NFPA Manual of Style.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 2 Nickasch, Simmons

(Log #CP700)
Committee: HEA-PIP

99- 7 - (Entire Document):

TCC NOTE: The Technical Correlating Committee directs that the primary units of measure be in SI units and that conversion to english units be provided in parentheses.

SUBMITTER: Technical Committee on Piping Systems

RECOMMENDATION: Restructure entire document to comply with the NFPA Manual of Style as follows:

1. Chapter 1 to contain administrative text only.
2. Chapter 2 to contain only referenced publications cited in the mandatory portions of the document.
3. Chapter 3 to contain only definitions.
4. All mandatory sections of the document must be evaluated for usability, adoptability, and enforceability language. Generate necessary committee proposals.
5. All units of measure in the document are converted to SI units with inch/pound units in parentheses.
6. Appendices restructured and renamed as "Annexes."

SUBSTANTIATION: Editorial restructuring, to conform with the 2000 edition of the NFPA Manual of Style.

COMMITTEE ACTION: Accept in Principle.

The committee wishes to keep english units and have metric in paren.

COMMITTEE STATEMENT: The committee feels that english units need to be kept as the primary for this cycle.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #CP500)
Committee: HEA-HYP

99- 8 - (Entire Document): Accept

SUBMITTER: Technical Committee on Hyperbaric and Hypobaric Facilities

RECOMMENDATION: Restructure entire document to comply with the NFPA Manual of Style as follows:

1. Chapter 1 to contain administrative text only.
2. Chapter 2 to contain only referenced publications cited in the mandatory portions of the document.
3. Chapter 3 to contain only definitions.
4. All mandatory sections of the document must be evaluated for usability, adoptability, and enforceability language. Generate necessary committee proposals.
5. All units of measure in the document are converted to SI units with inch/pound units in parentheses.
6. Appendices restructured and renamed as "Annexes."

SUBSTANTIATION: Editorial restructuring, to conform with the 2000 edition of the NFPA Manual of Style.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 15

NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #CP2)
Committee: HEA-ADM

99- 9 - (Chapter 1): Accept

TCC NOTE: It was the action of the Technical Correlating Committee to direct the Techncial Committee to include "areas not addressed" and refer the user to a location where the information can be found.

SUBMITTER: Technical Committee on Administration

RECOMMENDATION: Revise Chapter 1 as follows:

Chapter 1 Administration

SECTION 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 C 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.

(a) Communication equipment, resuscitation equipment (e.g., defibrillators), or physiological stimulators, (e.g., used for anesthesia, acupuncture.)

(b) 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 within the annex.

1.1.3 Annex D 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.

(a) Specific requirements for wiring and installation on equipment are covered in NFPA 70, National Electrical Code.

(b) Requirements for illumination and identification of means of egress in health care facilities are covered in NFPA 101®, Life Safety Code®. The alternate source of emergency power for illumination and identification of means of egress shall be the essential electrical system.

(c) Requirements for fire protection signaling systems except that the alternate source of power shall be the essential electrical system.

(d) Requirements for fire pumps except that the alternate source of power shall be permitted to be the essential electrical system.

(e) 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:

(a) Nonflammable medical gas systems with operating pressures below 2068 kPa (300 psig).

(b) Vacuum systems used within healthcare facilities

(c) Waste anesthetic gas disposal (WAGD) systems

(d) Manufactured assemblies that are intended for connection to the medical gas, vacuum, or WAGD systems.

1.1.5.1 Areas Not Addressed. The chapter does not apply to portable compressed gas systems.

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.

1.1.9.1* Areas Not Addressed. The chapter does not apply to special atmospheres, such as those encountered in hyperbaric chambers.

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. This section is not intended to cover hazards resulting from the misuse of:

(a) chemicals,

(b) radioactive materials, or

(c) biological materials that will not result in fires or explosions.

Although it deals primarily with hazards related to fires and explosions, many of the requirements to protect against fire or explosion, such as those for hood exhaust systems, also serve to protect persons from exposure to nonfire health hazards of these materials.

1.1.12* Chapter 12 Health Care Emergency Preparedness establishes minimum criteria for health care facility emergency preparedness management in the development of a program for effective disaster preparedness, mitigation, response, and recovery.

1.1.13 Chapter 13 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.

1.1.14.1 Areas Not Addressed. As defined in Chapter 3:

(a) Hospitals

(b) Nursing homes

(c) Limited care facilities

1.1.15 Reserved.

1.1.16 Reserved.

1.1.17 Chapter 17 addresses safety requirements of nursing homes.

1.1.18 Chapter 18 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 pressures from 0 psig to 100 psig (14.7 psia to 114.7 psia) (0 to 690 kPa gauge).

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.

SECTION 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.

SECTION 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.

SECTION 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.

SECTION 1.5 UNITS AND FORMULAS

1.5.1* Primary units will be trade units, secondary will be the conversion. While it is common practice for medical appliances to have metric units on their dials, gauges, and controls, many components of systems within the scope of this document, which are manufactured and used in the U.S., 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 U.S. Conversion factors to metric units are included in C-4.5.

A.1.5.1 Trade units vary from SI to English units depending on the equipment devices or material.

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

A.1.6.2 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.

SUBSTANTIATION: Chapter 1 was revised to conform to the new Manual of Style.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 6

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 5

NOT RETURNED: 1 McPeck

(Log #262)
Committee: HEA-ADM

99- 10 - (1-1 Scope): Reject
TCC NOTE: The Technical Correlating Committee supports the Technical Committee's action by reaffirming the Techncial Correlating Committee's previous position that free-standing veterinary facilities are outside the scope of the Health Care Facilities Project.
SUBMITTER: Peter Esherick, Patient Instrumentation Corp.
RECOMMENDATION: Add new sentence after first sentence:
"The scope also applies to veterinary facilities."
SUBSTANTIATION: (1) Problem is that we should not only take care of ill human beings, but also ill animals-many of whom are loved by their owners as much or more than they love their fellow human beings.
In addition, we must be looking out for the fire and health safety of the people who are treating the animals. This is also in first paragraph of 12-4.1.1.1 "...health care personnel from fire, explosion, electrical, and related hazards associated with the administration of inhalation anesthetics."
(2) Note that the "Scope" of the HEA-AAC Technical Correlating Committee has responsibility for documents "...which contain criteria for safeguarding patients and health care personnel...".
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The committee's interpretation is that the committee scope is limited to services for human beings. The submitter should propose that veterinary facilities be addressed in NFPA 5000, NFPA Building Code, or in the Mechanical and Plumbing Code. In addition no loss history or data has been submitted to substantiate the proposed change or a problem in these facilities.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 6
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 5
NOT RETURNED: 1 McPeck

(Log #257)
Committee: HEA-ADM

99- 11 - (1-3): Accept
SUBMITTER: David B. Mohile, Medical Engineering Services, Inc.
RECOMMENDATION: Add wording for new paragraph as follows:
"Nonflammable piped medical gases covered by this document include, but are not limited to, oxygen, nitrogen, nitrous oxide, medical air, carbon dioxide, and helium."
SUBSTANTIATION: In the 1996 edition of this standard the above list was a note at the very beginning of the chapter. However, part of the editing of the 1999 edition of the standard was to move all notes to the appendix and this list of gases never made it. It is important to list the gases that we are dealing with. Also, by adding the word "piped" we reinforce the negative wording in 4-1.3 which states that portable compressed gas systems are not covered.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 6
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 4
NEGATIVE: 1
NOT RETURNED: 1 McPeck
EXPLANATION OF NEGATIVE:
BULOW: Piped systems are noted in A-4-1 of the 1999 edition of NFPA 99. Levels 1 and 2 are covered adequately in A-4-2.2 referring back to Sections 4-3 and 4-4. Piped and portable appear to be adequately and clearly defined. If this recommendation goes forward, then all hospital utility systems should be so noted.

(Log #CP407)
Committee: HEA-HCE

99- 12 - (2-2): Accept
SUBMITTER: Technical Committee on Health Care Emergency Preparedness and Disaster Planning
RECOMMENDATION: Delete "(From NFPA 1600, Recommended Practice for Disaster Management)" from Incident Command System (ICS).
SUBSTANTIATION: The text in NFPA 99 and in NFPA 1600 are no longer identical.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 4 Kitchin, McPeck, Sinsigalli, Woodfin

(Log #335)
Committee: HEA-PIP

99- 13 - (2-2 Alarm System Level III): Accept
SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.
RECOMMENDATION: Definition for Alarm System Level ~~III~~ should be 3.
Delete part of text ~~medical air~~.
SUBSTANTIATION: Level 3 is the correct use and Roman numerals is incorrect. The use of "~~medical air~~" is confusing since no manufacturer of Level 3 has a medical air alarm and is not normally used in Level 3. This adds more confusion for inspectors and builders. They are thinking the Level 3 air compressor is medical and wanting a Level 1 or 2 installation. Medical air is not for powering devices such as handpieces.
This was not the committee's intent. (b) There is no definition of "general anesthesia." Would this be oral, IV, analgesic, which gases or what type of delivery device?
COMMITTEE ACTION: Accept.
Also delete the word "and".
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #CP3)
Committee: HEA-ADM

99- 14 - (2-2 Ambulatory Health Care, Free Standing Birthing Center, Hospital Facility, Hyperbaric, Hypobaric, Limited Care Facility):
TCC NOTE: It was the action of the Technical Correlating Committee that the Technical Committee review two definitions for stylistic continuity or parallelism. In the first paragraph, "Hospital Facility" delete "facility." In the second paragraph, "Ambulatory Health Care", insert the word "Center" after "Ambulatory Health Care."
SUBMITTER: Technical Committee on Administration
RECOMMENDATION: Reorganize and revise the following definitions of Healthcare Facilities: Ambulatory Health Care, Free Standing Birthing Center, Hospital Facility, Hyperbaric, Hypobaric, Limited Care Facility, Medical/Dental Office, and Nursing Home, as follows:
Ambulatory Health Care. 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.
Free Standing Birthing Center. A facility in which low-risk births are expected following normal, uncomplicated pregnancies, and in which professional midwifery care is provided to women during pregnancy, birth, and postpartum.
Hospital Facility. A building or portion thereof used on a 24-hour basis for the medical, psychiatric, obstetrical, or surgical care of four or more inpatients.
Hyperbaric. Facility, building or structure used to house chambers and all auxiliary service equipment for medial applications and procedures at pressures above normal atmospheric pressures.
Hypobaric. Facility, building or structure used to house chambers and all auxiliary service equipment for medical applications and procedures at pressures below atmospheric pressures.
Limited Care Facility. A building or portion of a building used on a 24-hour basis for the housing of four or more persons who are incapable of self-preservation because of age; physical limitations due to accident or illness; or limitations such as mental retardation/developmental disability, mental illness, or chemical dependency.
Medical/Dental Office. A building or part thereof in which the following occur:
(1) Examinations and minor treatments/procedures are performed under the continuous supervision of a medical/dental professional.

(2) Only sedation or local anesthesia is involved and treatment or procedures do not render the patient incapable of self-preservation under emergency conditions.
(3) Overnight stays for patients or 24-hour operation are not provided.
Nursing Home. A building or portion of a building used on a 24-hour basis for the housing and nursing care of four or more persons who, because of mental or physical incapacity, might be unable to provide for their own needs and safety without the assistance of another person.
SUBSTANTIATION: Conforms to the Manual of Style.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 6
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 5
NOT RETURNED: 1 McPeck

(Log #269)
Committee: HEA-GAS

99- 15 - (2-2 Anesthetic): Reject
SUBMITTER: Peter Esherick, Patient Instrumentation Corp.
RECOMMENDATION: Delete text as follows:
Anesthetic. As used in this standard, applies to any ~~inhalation~~ agent used to produce relative analgesia or general anesthesia.
SUBSTANTIATION: There are other types of anesthetizing agents commonly used for general anesthesia. One example: sodium pentothal. There are others.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The requirements of the standard are based on inhalation anesthetics. The proposal would greatly expand where the requirements would be applied. The submitter did not substantiate how the proposed change would be applied or why.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NEGATIVE: 1
NOT RETURNED: 3 Bancroft, Mills, Swope
EXPLANATION OF NEGATIVE:
DAVID: Reject: Non-inhalation agent does not present specific hazard subjected to the scope of this standard.

(Log #270)
Committee: HEA-GAS

99- 16 - (2-2 Anesthetizing Location): Reject
SUBMITTER: Peter Esherick, Patient Instrumentation Corp.
RECOMMENDATION: Add to the definition of Anesthetizing Location: "Any area of a facility that has been designated to be used for the administration of nonflammable inhalation, intravenous, and/or other types of anesthetic agents in the course of examination or treatment...".
SUBSTANTIATION: More and more procedures, such as endoscopy, tooth extraction, and others use intravenous or other means of introducing anesthesia that would render the patient comatose and thus be incapable of protecting themselves in an emergency situation.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Statement on Proposal 99-15 (Log #269).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NEGATIVE: 1
NOT RETURNED: 3 Bancroft, Mills, Swope
EXPLANATION OF NEGATIVE:
DAVID: Reject: The appropriate monitoring of sedated patient is not regulated by this standard, but rather the conditions that may lead to fire and/or explosion.

(Log #334)
Committee: HEA-PIP

99- 17 - (2-2 Clinic): Reject
TCC NOTE: The Technical Correlating Committee refers this proposal to the Technical Committee on Administration for review and comment.
SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.
RECOMMENDATION: This definition should be deleted totally. This is not in NFPA 99C.
SUBSTANTIATION: This adds more confusion to non-hospital Level 3. This is a duplicate of "Anesthetizing Location" as a definition.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: This is not the responsibility of Piping. It should be the Administrative committee.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
WYRICK: This is most confusing because some non-hospital based facilities are called clinics. There are Dental Clinics, Medical Clinics, and Out Patient Surgery Clinics that may or may not be viewed as what they really are or should be identified. The definition does not appear in the NFPA 99C document. To add to the confusion, we still do not have a definition for Anesthesia. If the inspector uses Life Support 101, it will become more confusing and has happened just last week in Tennessee. A dental office was required to be Level 1 because of the difference in definitions. What should be followed: Clinic, Ambulatory Health Care Facility or Office Practice, Medical or Dental? Do we change all Medical or Dental facilities if they have more than 4 treatment rooms.
Can they treat wheel chair patients, blind patients and some children? Clinic and Ambulatory Facilities need to be revised and explained with a better definition. All of these should be corrected in NFPA 101.

(Log #334a)
Committee: HEA-ADM

99- 18 - (2-2 Clinic): Accept
SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.
RECOMMENDATION: This definition should be deleted totally. This is not in NFPA 99C.
SUBSTANTIATION: This adds more confusion to non-hospital Level 3. This is a duplicate of "Anesthetizing Location" as a definition.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 6
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 4
NEGATIVE: 1
NOT RETURNED: 1 McPeck
EXPLANATION OF NEGATIVE:
BULOW: The definition "Clinic" should be kept with expanded definition to include the term "Relative Analgesia" as referred to in Section 2-2, definition for "Anesthetizing Location" as in the 1999 edition of NFPA 99.
My proposed corrective text is as follows:
Clinic. A health care facility where patients are seen on an ambulatory basis, but where surgery involving general anesthesia is not performed at a level to cause the patient to lose consciousness (conscious sedation).

(Log #CP601)
Committee: HEA-LAB

99- 19 - (2-2 Combustible, Combustible Liquid, Flammable, Flammable Liquid, Laboratory Work Area): Accept
SUBMITTER: Technical Committee on Laboratories
RECOMMENDATION: Use the "preferred definitions" from the Glossary of Terms.
1. Combustible. Capable of undergoing combustion.
2. 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 ll liquids shall include those having flash points at or above 37.8°C [100°F] and below 60°C [140°F].
(b) Class lllA liquids shall include those having flash points at or above 60°C [140°F] and below 93°C [200°F].

(c) Class lllB liquids shall include those having flash points at or above 93°C [200°F]. (See NFPA 321, Standard on Basic Classification of Flammable and Combustible Liquids, for further information on flash point test procedures).

3. Flammable. A combustible that is capable of easily being ignited and rapidly consumed by fire. Flammables may be solids, liquids, or gases exhibiting these qualities.

4. Flammable Liquid. A liquid that has a closed-cup flash point that is below 37.8°C [100°F] and a maximum vapor pressure of 2068 mm Hg [40 psia] at 37.8°C [100°F].

5. Laboratory Work Area. A room or space for testing, analysis, research, instruction, or similar activities that involve the use of chemicals. This work area may or may not be enclosed.

SUBSTANTIATION: While accepting the preferred definition for "combustible liquid" in the new glossary of terms/definitions, the committee desires this definition to also appear in Appendix C-10.2.1 where a definition presently exists.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 2 Nickasch, Simmons

(Log #CP710)
Committee: HEA-PIP

99- 20 - (2-2 Compressed Air System, Gas Powered System, Level 1 Medical Piped Gas and Vacuum Systems, Level 2 Medical Piped Gas and Vacuum Systems, Level 3 Piped Gas Systems, Level 3 Vacuum System): Accept

TCC NOTE: The Technical Correlating Committee refers this proposal to the Technical Committee on Administration for review and comment.
SUBMITTER: Technical Committee on Piping Systems
RECOMMENDATION: Add definitions as follows:

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 [gauge pressure <160 psi(1100kPa)] to power devices (e.g., hand pieces, syringes, cleaning devices) as a power source.

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

Level 1 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS would place patients in imminent danger of morbidity or mortality.

Level 2 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS system would place patients at manageable risk of morbidity or mortality.

Level 3 Piped Gas Systems. Systems serving occupancies where interruption of the PGS would terminate procedures but would not place patients at risk of morbidity or mortality.

Level 3 Vacuum System. A Level 3 vacuum distribution system that can be either a wet system, designed to remove liquids, air/gas or solids from the treated area, or a dry system designed to trap liquids and solids before the service inlet and to accommodate air-gas only through the service inlet.

SUBSTANTIATION: The definitions are needed to describe the various levels.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #CP6)
Committee: HEA-ADM

99- 21 - (2-2 Home Care): Accept
SUBMITTER: Technical Committee on Administration
RECOMMENDATION: Add a new definition of "Home Care" as follows:

Home Care. Medical services (equipment) provided in residential occupancies.

SUBSTANTIATION: This definition was added to describe home care as used in this standard.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 6
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 5
NOT RETURNED: 1 McPeck

(Log #21)
Committee: HEA-PIP

99- 22 - (2-2 Levels 1, 2, 3, and 4 Facilities):

TCC NOTE: The Technical Correlating Committee directs that the committee action be changed to Accept In Principle pursuant to the action on Log #CP710.
SUBMITTER: Susan Havas, Sullivan Schein Dental
RECOMMENDATION: Include clear definitions of Levels 1, 2, 3, and 4 facilities at the beginning of the report. Index should include reference to these definitions.
SUBSTANTIATION: NFPA 99 assumes prior knowledge of "levels" and the types of facilities included in each. However, only Level 3 is actually defined (Definitions, Section 2-2). A clear definition of all levels should appear right at the beginning of the book.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The submitter did not provide specific wording for the recommendation.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #33)
Committee: HEA-PIP

99- 23 - (2-2 Medical Air (b)4): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:

"≤5 mg/m^3 at normal atmospheric pressure of particulate at 1 micron size or greater."

SUBSTANTIATION: The standard now allows only 5 mg, no less or no more.
COMMITTEE ACTION: Accept in Principle.
Modify as follows:

"<5 mg/m^3 at normal atmospheric pressure of particulate at 1 micron size or greater."

COMMITTEE STATEMENT: The committee feels that it's equal to or less than the 5 mg/m^3.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #341)
Committee: HEA-PIP

99- 24 - (2-2 Medical Air): Accept in Principle
SUBMITTER: Fritz Koppenberger, Environmental Testing Services Inc.
RECOMMENDATION: Revise text as follows:

"4. Permanent particulates (1) ~~(5)~~ mg/m^3 at normal atmospheric pressure...".

SUBSTANTIATION: The particulate weight in this definition is too high given the filtration systems required by this code for new installations and the documented performance of existing systems, which can easily achieve 1.0 mg/m^3. We have over 15 years of documentation of particulate testing on existing medical air systems, and it is extremely rare for an existing system to have more than 1.0 mg/m^3 of particulate matter. When an existing system produces more than 1.0 mg/m^3, it is an appropriate warning level for action to be taken. The 5 mg/m^3 standard is inappropriate and unsafe.
COMMITTEE ACTION: Accept in Principle.
Revise as follows:

"4. Permanent paticulates <1 mg/m^3 at normal atmospheric pressure...".

COMMITTEE STATEMENT: Editorial.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft

EXPLANATION OF NEGATIVE:
ESHERICK: See Committee Action on Proposal 99-23 (Log #33) [2-2 Medical Air (6)4]
Modify text as follows:
"< 5 mg/m^3 at normal atmospheric pressure of particulate at 1 micron size or greater."

(Log #333)
Committee: HEA-PIP

99- 25 - (2-2 Office Practice, Medical/Dental): Reject
SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.
RECOMMENDATION: Revise as follows:
"~~Office Practice, Medical/Dental~~" change to "Medical Facility" as a definition and "Dental Facility" as a definition.
SUBSTANTIATION: As a definition, it would be easier to find in Chapter 2. Many of the facilities are called clinics, offices, and outpatient surgery clinics (oral surgery or plastic surgery). This has been misunderstood by many inspectors and resulted in Level 1 or 2 requirements. This becomes so expensive many of these offices forgo piping of gases and use portable devices.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The submitter did not recommend specific wording.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
WYRICK: My mistake, I should have given again the definition. Delete "Office Practice, Medical/Dental" and enter 2 new definitions.
Dental Care Facility. A health care facility where patients are seen on an ambulatory basis and treated for dental procedures. Treatment or surgery may involve anesthesia or conscious sedation. For -purposes of this standard, facilities that retain patients for more than 12 hours post procedure shall not be considered a dental care facility or Level 3 facility.
Medical Care Facility. A health care facility where patients are seen on an ambulatory basis and tested for minor medical procedures. Treatment or surgery may involve anesthesia or conscious sedation. For purposes of this standard, facilities that retain patients for more than 12 hours post procedure shall not be considered a medical care facility or Level 3 facility.
The use of the word "Office" implies no treatment of any kind is performed. Most plans for new construction would not use the word Office, most will say Medical Facility, medical Clinic, Plastic Surgery Center, etc. The Dental Plan may say Dental Clinic, Endodontic Dental P.A., and so on. The inspector will look for that type of definition. This has been a problem since the use of Type I and II.

(Log #306)
Committee: HEA-ELS

99- 26 - (2-2 Reference Grounding Point): Accept
SUBMITTER: Hugh Nash, Nash Lipsey Burch, LLC
RECOMMENDATION: Change the definition of "Reference Grounding Point" to read as follows:
"The ground bus of the panelboard or isolated power system panel supplying the patient care area."
SUBSTANTIATION: The NEC wording given above is simpler and more straightforward. Moreover, an "extension of the equipment grounding bus" is not permitted by the NEC.
COMMITTEE ACTION: Accept.
COMMITTEE STATEMENT: The committee agrees with the recommendation. However, the committee disagrees with sentence number two of the submitters substantiation because an extension is permitted under certain circumstances.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #332)
Committee: HEA-PIP

99- 27 - (2-2 Station Inlet): Accept
SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.
RECOMMENDATION: Delete the words "~~Type I~~."
SUBSTANTIATION: Type is no longer used in Chapters 2 or 4. There is no mention of types or levels in "Station Outlet." They should be the same.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #CP209)
Committee: HEA-ELS

99- 28 - (2-2 Various definitions): Accept
SUBMITTER: Technical Committee on Electrical Systems
RECOMMENDATION: 1. Change the following definitions to the NFPA preferred definitions as follows:
Ampacity. The current, in amperes, that a conductor can carry continuously under the conditions of use without exceeding its temperature rating.
Automatic. Providing a function without the necessity of human intervention.
Emergency System. A system of circuits and equipment intended to supply alternate power to a limited number of prescribed functions vital to the protection of life and safety.
Equipment System. A system of feeders and branch circuits arranged for delayed, automatic, or manual connection the alternate power source and that serves primarily 3-phase power equipment.
Feeder. All circuit conductors between the service equipment, the source of a separately derived system, or other power supply source and the final branch-circuit overcurrent device.
Ground-Fault Circuit-Interrupter (GFCI). A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.
Total Hazard Current. The hazard current of a given isolated system with all devices, including the line isolation monitor, connected.
2. Do not accept the preferred definitions for the following five words/phrases:
Hazard Current.
Isolation Transformer.
Life Safety Branch.
Selected Receptacles.
Task Illumination.
which should defer to the NFPA 99 definition for Chapter 2 purposes.
SUBSTANTIATION: The terms were modified to conform to the preferred definitions for the glossary of terms.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #1)
Committee: HEA-PIP

99- 29 - (2-2 Various Definitions, 4-4, 12-3.4, Chapter 13, 16-3.4, 17-3.4):
TCC NOTE: The Technical Correlating Committee directs that the recommended text be reconsidered by the applicable Technical Committee and consider the following recommendations:
Paragraph 2: "...emergency ~~rooms~~ departments..." to be consistent with current nomenclature.
Paragraph 3: "~~Note:~~ For the purpose..." Delete Note per Manual of Style.
The Technical Correlating Committee refers paragraph 3 to the Technical Committee on Administration for review and comment.
SUBMITTER: Technical Committee on Piping Systems
RECOMMENDATION: Revise text as follows:
1. In 2-2, delete the following terms and associated definitions:
Ambulatory Health Care Center
Clinic
Office Practice, Medical/Dental

2. In 2-2, under the definition of "Critical Care Area," add after "operating rooms" the following: "emergency room." The definition would read:

"Critical care areas are those special care units, intensive care units, coronary care units, angiography laboratories, cardiac catheterization laboratories, delivery rooms, operating rooms, emergency rooms, and similar areas in which patients are intended to be subjected to invasive procedures and connected to line-operated, patient-care-related electrical appliances."

3. In 2-2, under the definition of "Critical Care Area," add the following NOTE:

"NOTE: For the purpose of this standard, the use of intravenous needles or catheters used to administer fluids and/or medications, endoscopes, colonoscopes, sigmoidscopes, and urinary catheters are not considered invasive."

4. Revise 4-4 in its entirety to read as follows:

4-4 Level 2 Piped Systems.

4-4.1 Piped Gas Systems (Source and Distribution). Level 2 piped gas systems shall conform to the requirements for Level 1 piped gas systems.

Exception No. 1: Medical air compressors shall be permitted to be simplex.

Exception No. 2: Dryers, aftercoolers, filters, and regulators, as listed in 4-3.1.1.9(g), shall be permitted to be simplex.

Exception No. 3: A single alarm panel, as described in 4-3.1.2.1(b)2, shall be mounted in an area of continuous surveillance while the facility is in operation.

Exception No. 4: One alarm panel that complies with 4-3.1.2.1(b)3a, b, c, and d, and with 4-3.1.2.1(c)2 and 5, shall be permitted.

Exception No. 5: Pressure switches shall be mounted at the source with a pressure gauge or readout located at the master alarm panel.

4-4.2 Piped Vacuum Systems (Source and Distribution). Level 2 piped vacuum systems shall conform to the requirements for Level 1 piped vacuum systems.

Exception: Medical vacuum pumps shall be permitted to be simplex.

4-4.3 Piped WAGD Systems (Source and Distribution). Level 2 piped WAGD systems shall conform to the requirements for Level 1 piped WAGD systems.

Exception: Medical WAGD pumps shall be permitted to be simplex.

4-4.4 Performance Criteria and Testing.

4-4.4.1 Piped Gas Systems - Level 2. The performance and testing criteria for Level 2 piped gas systems shall conform to the requirements for Level 1 piped gas systems.

4-4.4.2 Piped Vacuum Systems - Level 2. The performance and testing criteria for Level 2 piped vacuum systems shall conform to the requirements for Level 1 piped vacuum systems.

4-4.4.3 Piped WAGD Systems - Level 2. The performance and testing criteria for Level 2 piped WAGD systems shall conform to the requirements for Level 1 piped WAGD systems.

4-4.5 Administration - Level 2.

4-4.5.1 Responsibility of Governing Body. (Reserved)

4-4.5.2 Piped Gas Systems Policies - Level 2. The policies for Level 2 piped gas systems shall conform to the requirements for Level 1 piped gas systems.

4-4.5.3 Piped Vacuum Systems - Level 2. The policies for Level 2 piped vacuum systems shall conform to the requirements for Level 1 piped vacuum systems.

4-4.5.4 Piped WAGD Systems - Level 2. The policies for Level 2 piped WAGD systems shall conform to the requirements for Level 1 piped WAGD systems.

5. Revise 12-3.4 to read as follows:

12-3.4 Gas and Vacuum System Requirements.

12-3.4.1 If installed, patient gas systems shall conform to Level 1 gas systems of Chapter 4.

~~Exception:~~ 12-3.4.2 If installed, a ~~A~~ Level 3 patient gas system of Chapter 4 shall be permitted when not served by the hospital's central patient gas systems.

~~12-3.4.2~~ 12-3.4.3 If installed, patient vacuum systems shall conform to Level 1 vacuum systems of Chapter 4.

12-3.4.4 ~~Exception:~~ If installed, a ~~A~~ Level 3 patient vacuum system of Chapter 4 shall be permitted when not served by the hospital's central patient vacuum system.

~~12-3.4.3~~ 12-3.4.5 If installed, patient WAGD systems shall conform to Level 1 WAGD systems of Chapter 4. [NOTE: a public comment is being prepared to revise this paragraph to correlate with Proposal 99-218 (Log #179).]

~~12-3.4.4~~ 12-3.4.6 If installed, laboratory gas systems shall conform to Level 4 gas systems of Chapter 4.

~~12-3.4.5~~ 12-3.4.7 If installed, laboratory vacuum systems shall conform to Level 4 vacuum systems of Chapter 4.

6. Insert new Chapter 13 to read as follows:

Chapter 13 'Other' Health Care Facilities

13-1 General.

13-1.1 Scope. This chapter addresses safety requirements for facilities, or portions thereof, that provide diagnostic and treatment services to patients in health care facilities other than hospitals, nursing homes, limited care facilities, or hyperbaric facilities as defined in Chapter 2.

13-2 General Responsibilities.

13-2.1 Laboratories. The governing boards of these facilities shall have the responsibility of protecting the facilities (for patient care and clinical investigation) and the personnel employed therein.

13-3 General Requirements.

13-3.1 (Reserved)

13-3.2 (Reserved)

13-3.3 Electrical System Requirements.

13-3.3.1 Normal Electrical Distribution System. (Reserved)

13-3.3.2 Essential Electrical Distribution System. The essential electrical distribution system shall conform to a Type 3 system as described in Chapter 3.

13-3.3.2.1 If electrical life support equipment is required, the essential electrical distribution system shall conform to a Type 1 system as described in Chapter 3.

13-3.3.2.2 If critical care areas are present, the essential electrical distribution system shall conform to a Type 1 system as described in Chapter 3.

13-3.4 Gas and Vacuum System Requirements.

13-3.4.1 If installed where patients are provided mechanical ventilation or assisted mechanical ventilation, patient gas systems shall conform to Level 1 piped gas systems of Chapter 4.

"A single alarm panel, as described in 4-3.1.2.1(b)2, shall be mounted in an area of continuous surveillance while the facility is in operation."

13-3.4.2 If installed where patients due to medical, surgical, or diagnostic intervention are dependent on the piped gas system, the patient gas system shall conform to Level 2 piped gas systems of Chapter 4.

13-3.4.3 If installed where the patient population is not on critical life support equipment, the patient gas system shall conform to Level 3 piped gas systems of Chapter 4.

13-3.4.4 If installed where patients are provided mechanical ventilation or assisted mechanical ventilation, patient vacuum system shall conform to Level 1 piped vacuum systems of Chapter 4.

13-3.4.5 If installed where patients due to medical, surgical, or diagnostic intervention are dependent on the piped vacuum system, the patient vacuum system shall conform to Level 2 piped vacuum systems of Chapter 4.

13-3.4.6 If installed where the patient population is not on critical life support equipment, the patient vacuum system shall conform to Level 3 piped vacuum systems of Chapter 4.

13-3.4.7 If installed, patient WAGD systems shall conform to Level 1 WAGD systems in Chapter 4. [NOTE: a public comment is being prepared to revise this paragraph to correlate with Proposal 99-218 (Log #179).]

13-3.4.8 If installed, laboratory gas systems shall conform to Level 4 gas systems of Chapter 4.

13-3.4.9 If installed, laboratory vacuum systems shall conform to Level 4 vacuum systems in Chapter 4.

13-3.5 Environmental Systems. (Reserved)

13-3.6 Material Requirements. (Reserved)

13-3.7 Electrical Equipment Requirements.

13-3.7.1 Patient Care Areas. If critical care areas are present, electrical appliances shall conform to Chapter 7.

13-3.7.2 Laboratories. Equipment shall conform to 7-5.2.2 and 7-6.

13-3.8 Gas Equipment Requirements.

13-3.8.1 Patient. Gas equipment shall conform to the patient equipment requirements in Chapter 8.

13-3.9 (Reserved)

13-3.10 (Reserved)

13-3.11 Facilities covered by this chapter shall comply with the provisions of Chapter 11 for disaster planning, as appropriate.

7. Delete current Chapter 13.

8. Delete text of existing Chapter 14, and have Chapter 14 indicated as "(Reserved)."

9. Delete text of existing Chapter 15, and have Chapter 15 indicated as "(Reserved)."

10. Revise 16-3.4 to read as follows:

16-3.4 Gas and Vacuum System Requirements.

16-3.4.1 If installed where patients are provided mechanical ventilation or assisted mechanical ventilation, patient gas systems shall conform to Level 1 piped gas systems of Chapter 4.

A single alarm panel, as described in 4-3.1.2.1(b)2, shall be mounted in an area of continuous surveillance while the facility is in operation.

~~Exception: For facilities that do not provide mechanical ventilation or assisted mechanical ventilation:~~

~~(a) Medical air compressors shall be permitted to be simplex.~~

~~(b) Dryers, after-coolers, filters, and regulators, as listed in 4-3.1.1.9(g), shall be permitted to be simplex.~~

~~(c) One alarm panel that complies with 4-3.1.2.1(b)3a, b, c, and d, and with 4-3.1.2.1(c)2 and 5, shall be permitted.~~

~~(d) Pressure switches shall be mounted at the source with a pressure gauge or readout located at the master alarm panel.~~

16-3.4.2 If installed where patients due to medical, surgical, or diagnostic intervention are dependent on the piped gas system, the patient gas system shall conform to Level 2 piped gas systems of Chapter 4.

16-3.4.3 If installed where the patient population is not on critical life support equipment, the patient gas system shall conform to Level 3 piped gas systems of Chapter 4.

16-3.4.4 If installed where patients are provided mechanical ventilation or assisted mechanical ventilation, patient vacuum systems shall conform to Level 1 piped vacuum systems of Chapter 4.

16-3.4.5 If installed where patients due to medical, surgical, or diagnostic intervention are dependent on the piped vacuum system, the patient vacuum system shall conform to Level 2 piped vacuum systems of Chapter 4.

16-3.4.6 If installed where the patient population is not on critical life support equipment, the patient vacuum system shall conform to Level 3 piped vacuum systems of Chapter 4.

~~16-3.4.2 If installed, patient vacuum systems shall conform to Level 1 vacuum systems of Chapter 4.~~

~~Exception: Medical vacuum pumps shall be permitted to be simplex.~~

~~16-3.4.3 (Reserved)~~

16-3.4.7 If installed, patient WAGD systems shall conform to Level 1 WAGD systems in Chapter 4. [NOTE: a public comment is being prepared to revise this paragraph to correlate with Proposal 99-218 (Log #179).]

~~16-3.4.4~~ 16-3.4.8 Laboratory Gas Systems. (Reserved)

~~16-3.4.5~~ 16-3.4.9 Laboratory Vacuum Systems. (Reserved)

11. Revise 17-3.4 to read as follows:

17-3.4 Gas and Vacuum System Requirements.

~~17-3.4.1 If installed, patient gas systems shall conform to Level 3 gas systems of Chapter 4.~~

~~Exception: For systems with compressed gases totaling more than 3000 cu ft (85 m^3), the source supply shall comply with a Level 1 gas system of Chapter 4.~~

~~17-3.4.2 If installed, patient vacuum systems shall conform to Level 3 vacuum systems of Chapter 4.~~

17-3.4.1 If installed where patients are provided mechanical ventilation or assisted mechanical ventilation, patient gas systems shall conform to Level 1 piped gas systems of Chapter 4.

17-3.4.2 If installed where patients due to medical, surgical, or diagnostic intervention are dependent on the piped gas system, the patient gas system shall conform to Level 2 piped gas systems of Chapter 4.

17-3.4.3 If installed where the patient population is not on critical life support equipment, the patient gas system shall conform to Level 3 piped gas systems of Chapter 4.

17-3.4.4 If installed where patients are provided mechanical ventilation or assisted mechanical ventilation, patient vacuum systems shall conform to Level 1 piped vacuum systems of Chapter 4.

17-3.4.5 If installed where patients due to medical, surgical, or diagnostic intervention are dependent on the piped vacuum system, the patient vacuum system shall conform to Level 2 piped vacuum systems of Chapter 4.

17-3.4.6 If installed where the patient population is not on critical life support equipment, the patient vacuum system shall conform to Level 3 piped vacuum systems of Chapter 4.

17-3.4.8 If installed, patient WAGD systems shall conform to Level 1 WAGD systems in Chapter 4. [NOTE: a public comment is being prepared to revise this paragraph to correlate with Proposal 99-218 (Log #179).]

~~17-3.4.3 (Reserved)~~

~~17-3.4.4 (Reserved)~~

~~17-3.4.5 (Reserved)~~

SUBSTANTIATION: In meeting the directive of the Technical Correlating Committee on Health Care Facilities to review those proposals in the ROP relating to definitions, risks, and levels of care, the Task Group notes that changes in the delivery of health care over the past ten years have made the current delineation of health care facilities in Chapter 12 to 17 not reflective of current practice. Specifically, Chapters 13 to 15 were no longer representative of activities and subject to frequent misinterpretations.

The change and NOTE to "Critical care area" are recommended for correlation with previously existing requirements in Chapters 13 to 15 and new Chapter 13.

The Task Group notes the need for the Technical Correlating Committee to review the scope of new Chapter 13 if the proposal to add a new chapter on free-standing birthing centers is approved.

Technical Committees affected by these recommendations:

Technical Committee on Electrical Equipment (responsible for definition of "Critical Care Area").

Technical Committee on Electrical Systems (responsible for electrical system criteria in new Chapter 13).

Technical Committee on Piping Systems (responsible for piping system criteria in 4-4, new Chapter 13).

Technical Committee on Administration (responsible for technical issues in Chapter 2, and other technical matters as directed by the Technical Correlating Committee).

NOTE: It was the direction of the Technical Correlating Committee that this Proposal, originally submitted as Comment 99-15 (Log #CC7) in the 1998 Fall Meeting Report on Comments, based on the action on 2-2 be changed to Hold for the affected Committees to develop a definition for "Level-Gas Systems" and "Type - Electrical Systems" for the next edition of the Code. At that time, the Technical Correlating Committee also wishes to reorganize the chapters as follows:

Chapter 12 - Hospital Requirements
Chapter 13 - Nursing Home Requirements
Chapter 14 - Limited Care Facility Requirements
Chapter 15 - Hyperbaric Chambers
Chapter 16 - Other

See also Comment 99-1 (Log #CC1) for changes to Chapters 4, 12, 13, 14, 15, 16, and 17.

COMMITTEE ACTION: Accept in Principle.

COMMITTEE STATEMENT: See Committee Proposal 99-20 (Log #CP710) which reads as follows:

Add definitions as follows:

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 [gauge pressure <160 psi(1100kPa)] to power devices (e.g., hand pieces, syringes, cleaning devices) as a power source.

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

Level 1 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS would place patients in imminent danger of morbidity or mortality.

Level 2 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS system would place patients at manageable risk of morbidity or mortality.

Level 3 Piped Gas Systems. Systems serving occupancies where interruption of the PGS would terminate procedures but would not place patients at risk of morbidity or mortality.

Level 3 Vacuum System. A Level 3 vacuum distribution system that can be either a wet system, designed to remove liquids, air/gas or solids from the treated area, or a dry system designed to trap liquids and solids before the service inlet and to accommodate air-gas only through the service inlet.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

COMMENT ON AFFIRMATIVE:

ESHERICK: Item 3, I believe that endoscopes, colonoscopes, sigmoidscopes and urinary catheters are invasive.

WAGNER: Where piped systems other than Level 1 are permitted in health care facilities, they should be permitted and not be made

mandatory. Change "shall conform to" to "shall be permitted to conform to" in the following paragraphs:
13-3.4.2, 13-3.4.3, 13-3.4.5, 13-3.4.6, 16-3.4.2, 16-3.4.3, 16-3.4.5, 16-3.4.6, 17-3.4.2, 17-3.4.3, 17-3.4.5, and 17-3.4.6.

(Log #CP4)
Committee: HEA-ADM

99- 30 - (2-2 Wet Locations): Accept
SUBMITTER: Technical Committee on Administration
RECOMMENDATION: Modify the definition of Wet Locations as follows:
Wet Locations. A patient care area that is normally subject to wet locations while patients are present including standing fluids on the floor or drenching of the work area, either of which condition is intimate to the patient or staff. Routine housekeeping procedures and incidental spillage of liquids do not define a wet location.
SUBSTANTIATION: Conforms to the Manual of Style.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 6
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 5
NOT RETURNED: 1 McPeck

(Log #309)
Committee: HEA-ELS

99- 31 - (Chapter 3): Accept
SUBMITTER: Hugh Nash, Nash Lipsey Burch, LLC
RECOMMENDATION: Approve all editorial changes to Chapter 3 (now 4) as shown in the draft prepared by NFPA Staff. Revise the text in 4-3.2.2.2 to reflect two separate and independent requirements. Change "or" to "and."
SUBSTANTIATION: To comply with NFPA Manual of Style requirements.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #CP201)
Committee: HEA-ELS

99- 32 - (Chapter 3): Accept
SUBMITTER: Technical Committee on Electrical Systems
RECOMMENDATION: Revise Chapter 3 (new Chapter 4) as follows:

~~Chapter 3~~ Chapter 4 Electrical Systems

4.1 General.

4.1.1 Wiring and installation requirements on equipment shall be in accordance with NFPA 70, National Electrical Code.

4.1.2 Requirements for illumination and identification of means of egress in health care shall be in accordance with NFPA *101*,® *Life Safety Code*.®

4.1.3 The alternate source of emergency power for illumination and identification of means of egress shall be from the essential electrical system.

4.1.4 Requirements for the installation of stationary engines and gas turbines shall be in accordance with NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*.

4.2* Nature of Hazards.

A.4.2 The hazards attendant to the use of electricity include electrical shock, thermal injury, and interruption of power.

4.2.1* Fire and Explosions.

A.4.2.1 Electrical systems can be subject to the occurrence of electrical fires. Grounding systems, overcurrent protective devices, and other subjects discussed in this standard could be intended for fire prevention as well as other purposes. This aspect of electrical systems is the primary focus of other NFPA standards and will not be emphasized herein.

4.2.2 Shock.

4.2.2.1 General.

4.2.2.2* Control.

A.4.2.2.2 Control of electric shock hazard requires the limitation of electric current that might flow in an electric circuit involving the patient's body and is accomplished through a variety of alternative approaches.

4.2.3 Thermal. (Reserved)

4.2.4* Interruption of Power.

A.4.2.4 General. Medical and nursing sciences are becoming progressively more dependent on electrical apparatus for the preservation of life of hospitalized patients. For example, year by year more cardiac operations are performed, in some of which the patient's life depends on artificial circulation of the blood. In other operations, life is sustained by means of electrical impulses that stimulate and regulate heart action. In still others, suction developed by electrical means is routinely relied on to remove body fluids and mucus that might otherwise cause suffocation. In another sense, lighting is needed in strategic areas in order that precise procedures can be carried out, and power is needed to safeguard such vital services as refrigerated stores held in tissue, bone, and blood banks.

Interruption of normal electrical service in health care facilities can be caused by catastrophes such as storms, floods, fires, earthquakes, or explosions; by failures of the systems supplying electrical power; or by incidents within the facility. For all such situations, electrical systems should be planned to limit internal disruption and to provide for continuity of vital services at all times. Outages might be corrected in seconds or might require hours for correction. This indicates that the system or protection needs to be designed to cope with the longest probable outage.

Selecting vital areas and functions considered to be essential, designing safeguards to ensure continuity in these circuits, and maintaining the electrical and mechanical components of such essential services so that they will work when called on are complex problems that warrant standardized guidance for regulating agencies, governing boards, and administrators of health care facilities and architects and engineers concerned with their construction. Such guidance is offered in this chapter.

This chapter is predicated on the basic principle of achieving dependability. It is intended to recognize the different degrees of reliability that can result from varying approaches to electrical design. Therefore, its requirements have been developed to allow the designer the flexibility needed to achieve a reliable electrical system.

Need to Maintain Power. Interruption of the supply of electric power in a facility can be a hazard. Implementation of the requirements of this chapter serves to maintain the required level of continuity and quality of electrical power for patient care electrical appliances.

4.2.5 RF Interference. (Reserved)

4.3 Electrical System Requirements.

4.3.1 Sources. Each appliance of a hospital requiring electrical line power for operation shall be supported by power sources and distribution systems that provide power adequate for each service.

4.3.1.1 Power/Utility Company. (Reserved)

4.3.1.2 On-Site Generator Set. (Reserved)

4.3.2 Distribution.

4.3.2.1 Electrical Installation. Installation shall be in accordance with NFPA 70, *National Electrical Code*.

4.3.2.2 All Patient Care Areas.

4.3.2.2.1* Wiring, regular voltage, shall comply with all of the following:

(a) Circuits. Branch circuits serving a given patient bed location shall be fed from not more than one normal branch circuit distribution panel. When required, branch circuits serving a given patient bed location shall be permitted to be fed from more than one emergency branch circuit distribution panel.

(b) Critical Care Areas. These areas shall be served by circuits from critical branch panel(s) served from a single

automatic transfer switch and a minimum of one circuit served by the normal power distribution system or by a system originating from a second critical branch transfer switch.

(c) Special Purpose Outlets. Branch circuits serving only special-purpose outlets or receptacles (e.g., portable X-ray receptacles) shall not be rewuired to conform to the requirements of 4-3.2.2.1(b).

4.3.2.2.2 Grounding requirements shall comply the following**:**

(a) Grounding Circuitry Integrity. Grounding circuits and conductors in patient care areas shall be installed in such a way that the continuity of other parts of those circuits cannot be interrupted nor the resistance raised above an acceptable level by the installation, removal, or replacement of any installed equipment, including power receptacles.

(b)* Reliability of Grounding. Where used, the reliability of installed grounding circuits to a power receptacle in all patient care areas shall be at least equivalent to that provided by an electrically continuous copper conductor of appropriate ampacity run from the receptacle to a grounding bus in the distribution panel. The grounding conductor shall conform to NFPA 70, *National Electrical Code*.

(c) Separate Grounding Conductor. When existing construction does not use a separate grounding conductor the continued use of the system shall be permitted to be used provided it meets the performance requirements in 4.3.3.2, Grounding System in Patient Care Areas.

(d) Metal Receptacle Boxes. Where metal receptacle boxes are used, the performance of the connection between the receptacle grounding terminal and the metal box shall be equivalent to the performance provided by copper wire no smaller than No. 12 AWG.

4.3.2.2.3* Grounding Interconnects. In patient care areas supplied by the normal distribution system and any branch of the essential electrical system, the grounding system of the normal distribution system and that of the essential electrical system shall be interconnected.

4.3.2.2.4 Circuit Protection.

4.3.2.2.4.1* The main and downstream ground-fault protective devices (where required) shall be coordinated as required in 4.3.2.5.

4.3.2.2.4.2* If used, ground-fault circuit interrupters (GFCIs) shall be approved for the purpose.

4.3.2.2.5 Wiring in Anesthetizing Locations.

4.3.2.2.5.1 Wiring. Installed wiring shall be in metal raceway or shall be in accordance with NFPA 70, *National Electrical Code*, Sections 517-60 through 517-63.

4.3.2.2.5.2 Raceway. Such distribution systems shall be run in metal raceways along with a green grounding wire sized no smaller than the energized conductors.

4.3.2.2.5.3 Grounding to Raceways. Each device connected to the distribution system shall be effectively grounded to the metal raceway at the device.

4.3.2.2.5.4 Installation. Methods of installation shall be in accordance with Articles 250 and 517 of NFPA 70, National Electrical Code.

4.3.2.2.5.5 Battery-Powered Emergency Lighting Units. One or more battery-powered emergency lighting units shall be provided in accordance with NFPA 70, National Electrical Code, Section 700-12(e).

4.3.2.2.3 Wiring, low-voltage shall comply with all of the following:

(a) Fixed systems of 30 V (dc or ac rms) or less shall be either ungrounded, provided the insulation between each ungrounded conductor and the primary circuit, which is supplied from a conventionally grounded distribution system, shall be the same protection as required for the primary voltage, or

(1) A grounded low-voltage system shall be permitted provided that load currents are not carried in the grounding conductors.

(b) Wiring for low-voltage control systems and nonemergency communications and signaling systems shall not be required to be installed in metal raceways in anesthetizing locations.

4.3.2.2.4 Switches, Anesthetizing Locations. Switches controlling ungrounded circuits within or partially within an inhalation anesthetizing location shall have a disconnecting pole for each conductor.

4.3.2.2.5 Receptacles.

4.3.2.2.5.1* Types of Receptacles. Each power receptacle shall provide at least one separate, highly dependable grounding pole capable of maintaining low-contact resistance with its mating plug despite electrical and mechanical abuse. Special receptacles (such as four-pole units providing an extra pole for redundant grounding or ground continuity monitoring; or locking-type receptacles; or, where required for reduction of electrical noise on the grounding circuit, receptacles in which the grounding terminals are purposely insulated from the receptacle yoke) shall be permitted.

4.3.2.2.5.2 Minimum Number of Receptacles. The number of receptacles shall be determined by the intended use of the patient care areas as shown below:

(a) Receptacles for Patient Bed Locations in General Care Areas. Each patient bed location shall be provided with a minimum of four receptacles.

(b) Receptacles for Patient Bed Locations in Critical Care Areas. Each patient bed location shall be provided with a minimum of six receptacles.

(c) Receptacles for Bathrooms or Toilets. Receptacles shall not be required in bathrooms or toilet rooms.

(d) Receptacles for Special Areas. Receptacles shall not be required in areas where medical requirements mandate otherwise; for example, certain psychiatric, pediatric, or hydrotherapy areas.

4.3.2.2.5.3 Polarity of Receptacles. Each receptacle shall be wired in accordance with NFPA 70, *National Electrical Code*, to ensure correct polarity.

4.3.2.2.5.4 Anesthetizing Location Receptacles. Receptacles for use in anesthetizing locations shall be listed for the use. In anesthetizing locations of new and existing construction having receptacles on isolated and grounded power, all receptacles shall be identified as to whether they are on isolated or grounded power.

4.3.2.2.5.5 Receptacles and Amperage. Receptacles for use with 250-V, 50-A, and 60-A ac service shall be designed for use in anesthetizing locations and shall be so designed that the 60-A receptacle will accept either the 50-A or the 60-A plug. Fifty-ampere receptacles shall be designed so as not to accept the 60-A attachment plug. These receptacles shall be of the two-pole, three-wire design with the third contact connecting to the (green or green with yellow stripe) grounding wire of the electric system.

4.3.2.2.5.6 Other Services Receptacles. Receptacles provided for other services having different voltages, frequencies, or types on the same premises shall be of such design that attachment plugs and caps used in such receptacles cannot be connected to circuits of a different voltage, frequency, or type, but shall be interchangeable within each classification and rating required for two-wire, 125-V, single-phase ac service.

4.3.2.2.6* Special Grounding.

4.3.2.2.6.1 Use of Quiet Grounds. A quiet ground, if used, shall not defeat the purposes of the safety features of the grounding systems detailed herein.

4.3.2.2.6.2 Patient Equipment Grounding Point. A patient equipment grounding point comprising one or more grounding terminals or jacks shall be permitted in an accessible location in the patient care vicinity.

4.3.2.2.6.3* Special Grounding in Patient Care Areas. In addition to the grounding required to meet the performance requirements of 4.3.3.2, additional grounding shall be permitted where special circumstances so dictate.

4.3.2.2.7 Wet Locations.

4.3.2.2.7.1* Wet location patient care areas shall be provided with special protection against electric shock. This special protection shall be provided as follows:

(a) A power distribution system that inherently limits the possible ground-fault current due to a first fault to a low value, without interrupting the power supply;

(b) A power distribution system in which the power supply is interrupted if the ground-fault current does, in fact, exceed a value of 6 mA.

4.3.2.2.7.2 Patient beds, toilets, bidets, and wash basins shall not be required to be considered wet locations.

4.3.2.2.7.3 In existing construction, the requirements of 2.3.2.2.6.1 are not required when written inspection procedure, acceptable to the authority having jurisdiction, is continuously enforced by a designated individual at the hospital, to indicate that equipment-grounding conductors for 120-V, single-phase, 15- and 20-A receptacles, equipment connected by cord and plug, and fixed electrical equipment are installed and maintained in accordance with NFPA 70, National Electrical Code, and applicable performance requirements of this chapter. The procedure shall include electrical continuity tests of all required equipment, grounding conductors, and their connections. These tests shall be conducted as follows.

Fixed receptacles, equipment connected by cord and plug, and fixed electrical equipment shall be tested as follows:

(a) When first installed

(b) Where there is evidence of damage

(c) After any repairs, or

(d) At intervals not exceeding 6 months

4.3.2.2.7.4 The use of an isolated power system (IPS) shall be permitted as a protective means capable of limiting ground fault current without power interruption. When installed, such a power system shall conform to the requirements of 4.3.2.2.

4.3.2.2.7.5 Where power interruption under first fault condition (line-to-ground fault) is tolerable, the use of a ground-fault circuit interrupter (GFCI) shall be permitted as the protective means that monitors the actual ground fault current and interrupts the power when that current exceeds 6 mA.

4.3.2.2.8 Isolated Power. An isolated power system shall not be required to be installed in any patient care area except as specified in 4.3.2.2.6. The system shall be permitted to be installed, however, and, when installed, shall conform to the performance requirements specified in 3-3.2.2.

4.3.2.3 Laboratories. Power outlets shall be installed in accordance with NCCLS Standard ASI-5, *Power Requirements for Clinical Laboratory Instruments and for Laboratory Power Sources*. Outlets with two to four receptacles, or an equivalent power strip, shall be installed every 0.5 to 1.0 m (1.6 to 3.3 ft) in instrument usage areas, and either installation is to be at least 8 cm (3.15 in.) above the countertop.

4.3.2.4 Other Nonpatient Areas. (Reserved)

4.3.2.5 Ground-Fault Protection. When ground-fault protection is provided for operation of the service or feeder disconnecting means, an additional step of ground-fault protection shall be provided in the next level of feeder downstream toward the load. Ground-fault protection for operation of the service and feeder disconnecting means shall be fully selective such that the downstream device and not the upstream device shall open for downstream ground faults. The additional step of ground-fault protection shall not be required where the service or feeder disconnecting means does not serve patient care areas or equipment intended to support life, such as clinical air compressors and vacuum pumps. When equipment ground-fault protection is first installed, each level shall be performance tested to ensure compliance with 2the above.

4.3.2.6* Isolated Power Systems.

4.3.2.6.1 Isolation Transformer.

4.3.2.6.1.1 The isolation transformer shall be approved for the purpose.

4.3.2.6.1.2 The primary winding shall be connected to a power source so that it is not energized with more than 600 V (nominal). The neutral of the primary winding shall be grounded in an approved manner. If an electrostatic shield is present, it shall be connected to the reference grounding point.

4.3.2.6.1.3 Wiring of isolated power systems shall be in accordance with Section 517-62 of NFPA 70, *National Electrical Code*.

4.3.2.6.2 Impedance of Isolated Wiring.

4.3.2.6.2.1* The impedance (capacitive and resistive) to ground of either conductor of an isolated system shall exceed 200,000 ohms when installed. The installation at this point shall include receptacles but is not required to include lighting fixtures or components of fixtures. This value shall be determined by energizing the system and connecting a low-impedance ac milliammeter (0 to 1 mA scale) between the reference grounding point and either conductor in sequence. This test shall be permitted to be performed with the line isolation monitor *(see 3-3.2.2.3)* connected, provided the connection between the line isolation monitor and the reference grounding point is open at the time of the test. After the test is made, the milliammeter shall be removed and the grounding connection of the line isolation monitor shall be restored. When the installation is completed, including permanently connected fixtures, the reading of the meter on the line isolation monitor, which corresponds to the unloaded line condition, shall be made. This meter reading shall be recorded as a reference for subsequent line-impedance evaluation.

This test shall be conducted with no phase conductors grounded.

4.3.2.6.2.2 An approved capacitance suppressor shall be permitted to be used to improve the impedance of the permanently installed isolated system; however, the resistive impedance to ground of each isolated conductor of the system shall be at least 1 megohm prior to the connection of the suppression equipment. Capacitance suppressors shall be installed so as to prevent inadvertent disconnection during normal use.

4.3.2.6.3 Line Isolation Monitor.

4.3.2.6.3.1* In addition to the usual control and protective devices, each isolated power system shall be provided with an approved continually operating line isolation monitor that indicates possible leakage or fault currents from either isolated conductor to ground.

4.3.2.6.3.2 The monitor shall be designed such that a green signal lamp, conspicuously visible to persons in the anesthetizing location, remains lighted when the system is adequately isolated from ground; and an adjacent red signal lamp and an audible warning signal (remote if desired) shall be energized when the total hazard current (consisting of possible resistive and capacitive leakage currents) from either isolated conductor to ground reaches a threshold value of 5.0 mA under normal line voltage conditions. The line isolation monitor shall not alarm for a fault hazard current of less than 3.7 mA.

4.3.2.6.3.3 The line isolation monitor shall either have sufficient internal impedance such that, when properly connected to the isolated system, the maximum internal current that will flow through the line isolation monitor, when any point of the isolated system is grounded, shall be 1 mA or it shall be permitted to be of the low-impedance type such that the current through the line isolation monitor, when any point of the isolated system is grounded, will not exceed twice the alarm threshold value for a period not exceeding 5 msec.

4.3.2.6.3.4 An ammeter connected to indicate the total hazard current of the system (contribution of the fault hazard current plus monitor hazard current) shall be mounted in a plainly visible place on the line isolation monitor with the "alarm on" (total hazard current = 5.0 mA) zone at approximately the center of the scale. It is desirable to locate the ammeter such that it is conspicuously visible to persons in the anesthetizing location.

4.3.2.6.3.5 Means shall be provided for shutting off the audible alarm while leaving the red warning lamp activated. When the fault is corrected and the green signal lamp is reactivated, the audible alarm silencing circuit shall reset automatically, or an audible or distinctive visual signal shall indicate that the audible alarm is silenced.

4.3.2.6.3.6 A reliable test switch shall be mounted on the line isolation monitor to test its capability to operate (i.e., cause the alarms to operate and the meter to indicate in the "alarm on" zone). This switch shall transfer the grounding connection of the line isolation monitor from the reference grounding point to a test impedance arrangement connected across the isolated line; the test impedance(s) shall be of the appropriate magnitude to produce a meter reading corresponding to the rated total hazard current at the nominal line voltage, or to a lesser alarm hazard current if the line isolation monitor is so rated. The operation of this switch shall break the grounding connection of the line isolation monitor to the reference grounding point before transferring this grounding connector to the test impedance(s), so that making this test will not add to the hazard of a system in actual use, nor will the test include the effect of the line to ground stray impedance of the system. The test switch shall be of a self-restoring type.

4.3.2.6.3.7 The line isolation monitor shall not generate energy of sufficient amplitude or frequency, as measured by a physiological monitor with a gain of at least 10^4 with a source impedance of 1000 ohms connected to the balanced differential input of the monitor,

to create interference or artifact on human physiological signals. The output voltage from the amplifier shall not exceed 30 mV when the gain is 10^4. The 1000 ohms impedance shall be connected to the ends of typical unshielded electrode leads which are a normal part of the cable assembly furnished with physiological monitors. A 60-Hz notch filter shall be used to reduce ambient interference as is typical in physiological monitor design.

4.3.2.6.4 Identification of Conductors for Isolated (Ungrounded) Systems. The isolated conductors shall be identified in accordance with Section 517-160(a)(5) of NFPA 70, *National Electrical Code*.

4.3.3 Performance Criteria and Testing.

4.3.3.1 Grounding System in Patient Care Areas.

4.3.3.1.1* Grounding System Testing. The effectiveness of the grounding system shall be determined by voltage measurements and impedance measurements.

4.3.3.1.1.1 For new Construction,the effectiveness of the grounding system shall be evaluated before acceptance.

4.3.3.1.1.2 Small, wall-mounted conductive surfaces, not likely to become energized, such as surface-mounted towel and soap dispensers, mirrors, and so forth, shall not be required to be intentionally grounded or tested.

4.3.3.1.1.3 Large, metal conductive surfaces not likely to become energized, such as windows, door frames, and drains, shall not be required to be intentionally grounded or periodically tested.

4.3.3.1.1.4* Whenever the electrical system has been altered or replaced, that portion of the system shall be tested.

4.3.3.1.2 Reference Point. The voltage and impedance measurements shall be taken with respect to a reference point. The reference point shall be one of the following:

(a) A reference grounding point *(see Chapter 2, Definitions)*

(b) A grounding point, in or near the room under test, that is electrically remote from receptacles, for example, an all-metal cold-water pipe

(c) The grounding contact of a receptacle that is powered from a different branch circuit from the receptacle under test

4.3.3.1.3* Voltage Measurements. The voltage measurements shall be made under no-fault conditions between a reference point and exposed fixed electrical equipment with conductive surfaces in a patient care vicinity. The voltage measurements shall be made with an accuracy of ±20 percent. Voltage measurements for faceplates of wiring devices shall not be required.

4.3.3.1.4* Impedance Measurements. The impedance measurement shall be made with an accuracy of ±20 percent. For new construction, the impedance measurement shall be made between the reference point and the grounding contact of 10 percent of all receptacles in each patient care vicinity. The impedance measurement shall be the ratio of voltage developed (either 60 Hz or dc) between the point under test and the reference point to the current applied between these two points.

4.3.3.1.5 Test Equipment. Electrical safety test instruments shall be tested periodically, but not less than annually, for acceptable performance.

4.3.3.1.5.1 Voltage measurements specified in 4.3.3.2.3 shall be made with an instrument having an input resistance of 1000 ohms ± 10 percent at frequencies of 1000 Hz or less.

4.3.3.1.5.2 The voltage across the terminals (or between any terminal and ground) of resistance-measuring instruments used in occupied patient care areas shall not exceed 500 mV rms or 1.4 dc or peak to peak.

4.3.3.1.6 Criteria for Acceptability for New Construction.

4.3.3.1.6.1 Voltage limit shall be 20 mV.

4.3.3.1.6.2 Impedance limit shall be 0.2 ohms. For quiet ground systems, and 0.1 ohms for all others.

4.3.3.2 Receptacle Testing in Patient Care Areas.

4.3.3.2.1 The physical integrity of each receptacle shall be confirmed by visual inspection.

4.3.3.2.2 The continuity of the grounding circuit in each electrical receptacle shall be verified.

4.3.3.2.3 Correct polarity of the hot and neutral connections in each electrical receptacle shall be confirmed.

4.3.3.2.4 The retention force of the grounding blade of each electrical receptacle (except locking-type receptacles) shall be not less than 115 g (4 oz).

4.3.3.3 Isolated Power Systems.

4.3.3.3.1 Patient Care Areas. If installed, the isolated power system shall be tested in accordance with 3-3.3.4.2.

4.3.3.3.2 Line Isolation Monitor Tests.

4.3.3.3.2.1 The LIM circuit shall be tested after installation, and prior to being placed in service, by successively grounding each line of the energized distribution system through a resistor of 200 × V ohms, where V = measured line voltage. The visual and audible alarms *[see 3-3.2.2.3(b)]* shall be activated.

4.3.3.3.2.2 The LIM circuit shall be tested at intervals of not more than 1 month by actuating the LIM test switch *[see 3-3.2.2.3(f)]*. For a LIM circuit with automated self-test and self-calibration capabilities, this test shall be performed at intervals of not more than 12 months. Actuation of the test switch shall activate both visual and audible alarm indicators.

4.3.3.3.2.3 After any repair or renovation to an electrical distribution system and at intervals of not more than 6 months, the LIM circuit shall be tested in accordance with paragraph (a) above and only when the circuit is not otherwise in use. For a LIM circuit with automated self-test and self-calibration capabilities, this test shall be performed at intervals of not more than 12 months.

4.3.4* Administration of Electrical System.

4.3.4.1 Maintenance and Testing of Electrical System.

4.3.4.1.1 Testing interval for hospital grade receptacles in patient care areas shall be performed after initial installation, replacement, or servicing of the device.

4.3.4.1.2 Additional testing shall be performed at intervals defined by documented performance data.

4.3.4.1.3 Receptacles not listed as hospital-grade shall be tested at intervals not exceeding 12 months.

4.3.4.2 Recordkeeping.

4.3.4.2.1* General. A record shall be maintained of the tests required by this chapter and associated repairs or modification. At a minimum, this record shall contain the date, the rooms or areas tested, and an indication of which items have met or have failed to meet the performance requirements of this chapter.

4.3.4.2.2 Isolated Power System (Where Installed). A permanent record shall be kept of the results of each of the tests.

4.4 Essential Electrical System Requirements — Type I.

4.4.1 Sources (Type I EES).

4.4.1.1 On-Site Generator Set.

4.4.1.1.1* Design Considerations. Dual sources of normal power shall be considered. Such dual sources of normal power shall not constitute an alternate source of power as described in this chapter.

Distribution system arrangements shall be designed to minimize interruptions to the electrical systems due to internal failures by the use of adequately rated equipment. The following factors shall be considered in the design of the distribution system:

(a) Abnormal voltages such as single phasing of three-phase utilization equipment, switching and/or lightning surges, voltage reductions, and so forth

(b) Capability of achieving the fastest possible restoration of any given circuit(s) after clearing a fault

(c) Effects of future changes, such as increased loading and/or supply capacity

(d) Stability and power capability of the prime mover during and after abnormal conditions

(e)* Sequence reconnection of loads to avoid large current inrushes that trip overcurrent devices or overload the generator(s)

(f) Bypass arrangements to permit testing and maintenance of system components that could not otherwise be maintained without disruption of important hospital functions

(g) Effects of any harmonic currents on neutral conductors and equipment

4.4.1.1.2 Current-sensing devices, phase and ground, shall be selected to minimize the extent of interruption to the electrical system due to abnormal current caused by overload and/or short circuits.

4.4.1.1.3 Generator load shed circuits designed for the purpose of load reduction or for load priority systems shall not shed life safety branch loads, critical branch loads serving critical care areas, medical air compressors, medical surgical vacuum pumps, fuel pumps, jockey pumps, or other generator accessories.

4.4.1.1.4 Essential electrical systems shall have a minimum of two independent sources of power: a normal source generally supplying the entire electrical system and one or more alternate sources for use when the normal source is interrupted.

4.4.1.1.5 The alternate source of power shall be a generator(s) driven by some form of prime mover(s) and located on the premises.

4.4.1.1.6 Where the normal source consists of generating units on the premises, the alternate source shall be either another generating set or an external utility service.

4.4.1.1.7 General. Generator sets installed as an alternate source of power for essential electrical systems shall be designed to meet the requirements of such service.

4.4.1.1.7.1 Type I and Type II essential electrical system power sources shall be classified as Type 10, Class X, Level 1 generator sets per NFPA 110, *Standard for Emergency and Standby Power Systems*.

4.4.1.1.7.2 Type III essential electrical system power sources shall be classified as Type 10, Class X, Level 2 generator sets per NFPA 110, *Standard for Emergency and Standby Power Systems.*

4.4.1.1.8 Uses for Essential Electrical System.

4.4.1.1.8.1 The generating equipment used shall be either reserved exclusively for such service or normally used for "other purposes" of peak demand control, internal voltage control, load relief for the external utility, or cogeneration. If normally used for other purposes listed above, two or more sets shall be installed, such that the maximum actual demand likely to be produced by the connected load of the emergency system as well as medical air compressors, medical-surgical vacuum pumps, electrically operated fire pumps, jockey pumps, fuel pumps, and generator accessories shall be met with the largest single generator set out-of-service. Load shed circuits, if provided, shall not shed the above equipment upon loss of the largest single generator set.

4.4.1.1.8.2 A single generator set that operates the essential electrical system shall be permitted to be part of the system supplying the "other purposes" as listed above, provided any such use will not decrease the mean period between service overhauls to less than three years.

4.4.1.1.8.3 Any loads served by the generating equipment not permitted in 4.4.2 to be on the essential electrical system shall be served by their own transfer switch(es) such that these loads shall not be transferred onto the generating equipment if the transfer will overload the generating equipment, and shall be shed upon a generating equipment overload. It shall not constitute "other purposes" as described in 4.4.1.1.7.1.

4.4.1.1.9† Work Space or Room.

(a) Energy converters shall be located in a separate service room dedicated to the generating equipment, separated from the remainder of the building by fire separations having a minimum 2-hour fire rating, or located in an adequate enclosure outside the building capable of preventing the entrance of snow or rain and resisting maximum wind velocity required by the local building code. Rooms for such equipment shall not be shared with other equipment or electrical service equipment that is not a part of the essential electrical system. [**110:** 5-2.4]

(b) The generating equipment shall be installed in a location that will permit ready accessibility and adequate [minimum of 30 in. (76 cm)] working space around the unit for inspection, repair, maintenance, cleaning, or replacement. [**110:** 5-2.5]

4.4.1.1.10* Capacity and Rating. The generator set(s) shall have sufficient capacity and proper rating to meet the maximum actual demand likely to be produced by the connected load of the essential electrical system(s) at any one time.

4.4.1.1.11† Load Pickup. The generator set(s) shall have sufficient capacity to pick up the load and meet the minimum frequency and voltage stability requirements of the emergency system within 10 seconds after loss of normal power. [**110:** 3-4.1]

4.4.1.1.12† Maintenance of Temperature. Provisions shall be made to maintain the generator room at not less than 50°F (10°C) or the engine water-jacket temperature at not less than 90°F (32°C). [**110:** 3-3.1, 5-7.6]

4.4.1.1.13† Ventilating Air. Provision shall be made to provide adequate air for cooling and to replenish engine combustion air. [**110:** 5-7.2, 5-7.4]

4.4.1.1.14 Cranking Batteries. Internal combustion engine cranking batteries shall be in accordance with the battery requirements of NFPA 110, *Standard for Emergency and Standby Power Systems.*

4.4.1.1.15 Compressed Air Starting Devices. Internal combustion engine air starting devices shall have sufficient capacity to supply five 10-second cranking attempts, with not more than a 10-second rest between attempts, with the compressor not operating.

4.4.1.1.16 Fuel Supply. The fuel supply for the generator set shall comply with 4.1.1 and 4.4.2 of NFPA 110, *Standard for Emergency and Standby Power Systems.*

4.4.1.1.17† Requirements for Safety Devices. [**110:** 3-5.5.2]

(a) *Internal Combustion Engines.* Internal combustion engines serving generator sets shall be equipped with the following:

1. A sensor device plus visual warning device to indicate a water-jacket temperature below those required in 4.4.1.1.9

2. Sensor devices plus visual prealarm warning device to indicate the following:

a. High engine temperature (above manufacturer's recommended safe operating temperature range)

b. Low lubricating oil pressure (below manufacturer's recommended safe operating range)

c. Low water coolant level

3. An automatic engine shutdown device plus visual device to indicate that a shutdown took place due to the following:

a. Overcrank (failed to start)

b. Overspeed

c. Low lubricating oil pressure

d. Excessive engine temperature

4. A common audible alarm device to warn that any one or more of the prealarm or alarm conditions exist

(b) *Other Types of Prime Movers.* Prime movers, other than internal combustion engines, serving generator sets shall have appropriate safety devices plus visual and audible alarms to warn of alarm or approaching alarm conditions.

(c) *Liquid Fuel Supplies.* Liquid fuel supplies for emergency or auxiliary power sources shall be equipped with a sensor device to warn that the main fuel tank contains less than a 4.hour operating supply.

4.4.1.1.18† Alarm Annunciator. A remote annunciator, storage battery powered, shall be provided to operate outside of the generating room in a location readily observed by operating personnel at a regular work station *(see NFPA 70, National Electrical Code, Section 700-12.)*

The annunciator shall indicate alarm conditions of the emergency or auxiliary power source as follows:

(a) Individual visual signals shall indicate the following:

1. When the emergency or auxiliary power source is operating to supply power to load

2. When the battery charger is malfunctioning

(b) Individual visual signals plus a common audible signal to warn of an engine-generator alarm condition shall indicate the following:

1. Low lubricating oil pressure

2. Low water temperature (below those required in 4.4.1.1.9)

3. Excessive water temperature

4. Low fuel — when the main fuel storage tank contains less than a 4.hour operating supply

5. Overcrank (failed to start)

6. Overspeed

Where a regular work station will be unattended periodically, an audible and visual derangement signal, appropriately labeled, shall be established at a continuously monitored location. This derangement signal shall activate when any of the conditions in 4.4.1.1.15(a) and (b) occur, but need not display these conditions individually. [**110:** 4.5.5.2]

4.4.1.2 Battery. Battery systems shall meet all requirements of Article 700 of NFPA 70, *National Electrical Code*.

4.4.2* Distribution (Type I EES).

4.4.2.1 General Requirements.

4.4.2.1.1† Electrical characteristics of the transfer switches shall be suitable for the operation of all functions and equipment they are intended to supply. [**110:** 4-1.1]

4.4.2.1.2† Switch Rating. The rating of the transfer switches shall be adequate for switching all classes of loads to be served and for withstanding the effects of available fault currents without contact welding. [**110:** 4-2.1]

4.4.2.1.3 Automatic Transfer Switch Classification. Each automatic transfer switch shall be approved for emergency electrical service *(see NFPA 70, National Electrical Code, Section 700-3)* as a complete assembly.

4.4.2.1.4† Automatic Transfer Switch Features. [**110:** 4-2.4]

(a) *General.* Automatic transfer switches shall be electrically operated and mechanically held. The transfer switch shall transfer and retransfer the load automatically.

Exception: It shall be permitted to program the transfer switch (1) for a manually initiated retransfer to the normal source, or (2) for an automatic intentional "off" delay, or (3) for an in-phase monitor relay or similar automatic delay method, so as to provide for a planned momentary interruption of the load. If used, this arrangement shall be provided with a bypass feature to permit automatic retransfer in the event that the alternate source fails and the normal source is available.

(b) *Interlocking.* Reliable mechanical interlocking, or an approved alternate method, shall be inherent in the design of transfer switches to prevent the unintended interconnection of the normal and alternate sources of power, or any two separate sources of power.

(c) * *Voltage Sensing.* Voltage sensing devices shall be provided to monitor all ungrounded lines of the normal source of power.

(d) *Time Delay on Starting of Alternate Power Source.* A time delay device shall be provided to delay starting of the alternate source generator. The timer is intended to prevent nuisance starting of the alternate source generator with subsequent load transfer in the event of harmless momentary power dips and interruptions of the normal source. The time range shall be short enough so that the generator can start and be on the line within 10 seconds of the onset of failure.

(e) *Time Delay on Transfer to Alternate Power.* An adjustable time delay device shall be provided for those transfer switches requiring "delayed-automatic" operation. The time delay shall commence when proper alternate source voltage and frequency are achieved. The delay device shall prevent transfer to the alternate power source until after expiration of the preset delay.

(f) * *Time Delay on Retransfer to Normal Power.* An adjustable timer with a bypass shall be provided to delay retransfer from the alternate source of power to the normal. This timer will permit the normal source to stabilize before retransfer to the load and help to avoid unnecessary power interruptions. The bypass shall operate similarly to the bypass in 4.4.2.1.4(a).

(g) * *Test Switch.* A test switch shall be provided on each automatic transfer switch that will simulate a normal power source failure to the switch.

(h) * *Indication of Switch Position.* Two pilot lights, properly identified, shall be provided to indicate the transfer switch position.

(i) *Manual Control of Switch.* A means for the safe manual operation of the automatic transfer switch shall be provided.

(j) *Time Delay on Engine Shutdown.* A time delay of 5 minutes minimum to allow engine cooldown shall be provided for unloaded running of the alternate power source generator set prior to shutdown.

Exception: Time delay need not be provided on small (15 kW or less) aircooled prime movers or if included with the engine control panel. [110: 4-2.4.8]

(k) * *Motor Load Transfer.* Provisions shall be included to reduce excessive currents resulting from motor load transfer if such currents can damage essential electrical system equipment or cause nuisance tripping of essential electrical system overcurrent protective devices. [110: 4-2.4.12]

(l) *Isolation of Neutral Conductors.* Provisions shall be included for ensuring proper continuity, transfer, and isolation of the normal and the alternate power source neutral conductors whenever they are separately grounded, if needed, to achieve proper ground-fault sensing. *[See NFPA 70, National Electrical Code, Section 230-95(b).]* [110: 4-2.4.13]

4.4.2.1.5 Nonautomatic Transfer Device Classification. Nonautomatic transfer devices shall be approved for emergency electrical service *(see NFPA 70, National Electrical Code, Section 700-3)*.

4.4.2.1.6† Nonautomatic Transfer Device Features. [**110:** 4-2.5]

(a) *General.* Switching devices shall be mechanically held. Operation shall be by direct manual or electrical remote manual control. Electrically operated switches shall derive their control power from the source to which the load is being transferred. A means for safe manual operation shall be provided.

(b) *Interlocking.* Reliable mechanical interlocking, or an approved alternate method, shall be inherent in the design in order to prevent the unintended interconnection of the normal and alternate sources of power, or of any two separate sources of power.

(c) *Indication of Switch Position.* Pilot lights, properly identified, shall be provided to indicate the switch position.

4.4.2.1.7† Bypass-Isolation Switches. [**110:** 4-4.1] Bypass-isolation switches shall be permitted for bypassing and isolating the transfer switch. If installed, they shall be in accordance with all of the following:

(a) *Bypass-Isolation Switch Rating.* The bypass-isolation switch shall have a continuous current rating and withstand current rating compatible with that of the associated transfer switch.

(b) *Bypass-Isolation Switch Classification.* Each bypass-isolation switch shall be listed for emergency electrical service as a completely factory-assembled and tested apparatus. *(See NFPA 70, National Electrical Code, Section 700-3.)*

(c) * *Operation.* With the transfer switch isolated or disconnected or both, means shall be provided so the bypass-isolation switch can function as an independent nonautomatic transfer switch and allow the load to be connected to either power source. Reconnection of the transfer switch shall be possible with a load interruption no greater than the maximum time, in seconds, by the type of essential electrical system.

4.4.2.2 Specific Requirements.

4.4.2.2.1* General.

A.4.4.2.2.1 Type I essential electrical systems are comprised of two separate systems capable of supplying a limited amount of lighting and power service, which is considered essential for life safety and effective facility operation during the time the normal electrical service is interrupted for any reason. These two systems are the emergency system and the equipment system.

4.4.2.2.1.1 The emergency system shall be limited to circuits essential to life safety and critical patient care and are designated the life safety branch and the critical branch.

4.4.2.2.1.2 The equipment system shall supply major electrical equipment necessary for patient care and basic Type I operation.

4.4.2.2.1.3 Both systems shall be arranged for connection, within time limits specified in this chapter, to an alternate source of power following a loss of the normal source.

4.4.2.2.1.4 The number of transfer switches to be used shall be based upon reliability, design, and load considerations. Each

branch of the emergency system and each equipment system shall have one or more transfer switches. One transfer switch shall be permitted to serve one or more branches or systems in a facility with a maximum demand on the essential electrical system of 150 kVA (120 kW).

4.4.2.2.2 Emergency System.

4.4.2.2.2.1 General. Those functions of patient care depending on lighting or appliances that shall be permitted to be connected to the emergency system are divided into two mandatory branches, described in 4.4.2.2.2(b) and (c).

†All ac-powered support and accessory equipment necessary to the operation of the EPS shall be supplied from the load side of the automatic transfer switch(es), or the output terminals of the EPS, ahead of the main EPS overcurrent protection, as necessary, to ensure continuity of the EPSS operation and performance. (**110:** 5-12.5)

4.4.2.2.2.2 Life Safety Branch. The life safety branch of the emergency system shall supply power for the following lighting, receptacles, and equipment:

(a) Illumination of means of egress as required in NFPA *101*,® *Life Safety Code*®

(b) Exit signs and exit direction signs required in NFPA *101*, *Life Safety Code*

(c) Alarm and alerting systems including the following:

1. fire alarms and

2. alarms required for systems used for the piping of nonflammable medical gases as specified in Chapter 4, "Gas and Vacuum Systems"

(d)* Hospital communication systems, where used for issuing instruction during emergency conditions

(e) Task illumination, battery charger for emergency battery-powered lighting unit(s), and selected receptacles at the generator set location

(f) Elevator cab lighting, control, communication, and signal systems

(g) Automatically operated doors used for building egress.

(h) The auxiliary functions of fire alarm combination systems complying with NFPA 72, *National Fire Alarm Code*.

No function other than those listed above in items 1 through 7 shall be connected to the life safety branch.

4.4.2.2.2.3* Critical Branch. The critical branch shall be permitted to be subdivided into two or more branches. The critical branch of the emergency system shall supply power for task illumination, fixed equipment, selected receptacles, and selected power circuits serving the following areas and functions related to patient care.

(a) Critical care areas that utilize anesthetizing gases, task illumination, selected receptacles, and fixed equipment

(b) The isolated power systems in special environments

(c) Task illumination and selected receptacles in the following:

1. Patient care areas including infant nurseries, selected acute nursing areas, psychiatric bed areas (omit receptacles), and ward treatment rooms

2. Medication preparation areas

3. Pharmacy dispensing areas

4. Nurses' stations (unless adequately lighted by corridor luminaires)

(d) Additional specialized patient care task illumination and receptacles, where needed

(e) Nurse call systems

(f) Blood, bone, and tissue banks

(g)* Telephone equipment rooms and closets

(h) Task illumination, selected receptacles, and selected power circuits for the following areas:

1. General care beds shall have at least one duplex receptacle per patient bedroom

2. Angiographic labs

3. Cardiac catheterization labs

4. Coronary care units

5. Hemodialysis rooms or areas

6. Emergency room treatment areas (selected)

7. Human physiology labs

8. Intensive care units

9. Postoperative recovery rooms (selected)

(i) Additional task illumination, receptacles, and selected power circuits needed for effective facility operation. Single-phase fractional horsepower motors shall be permitted to be connected to the critical branch.

4.4.2.2.3 Equipment System.

4.4.2.2.3.1 General. The equipment system shall be connected to equipment described in (c)through (e).

4.4.2.2.3.2 Connection to Alternate Power Source. The equipment system shall be installed and connected to the alternate power source, such that equipment described in 4.4.2.2.3.4 is automatically restored to operation at appropriate time lag intervals following the energizing of the emergency system. Its arrangement shall also provide for the subsequent connection of equipment described in 4.4.2.2.3.5 by either delayed-automatic or manual operation.

4.4.2.2.3.3 AC Equipment for Nondelayed Automatic Connection. Generator accessories, including but not limited to, the transfer fuel pump, electrically operated louvers, and other generator accessories essential for generator operation, shall be arranged for automatic connection to the alternate power source.

4.4.2.2.3.4* Equipment for Delayed-Automatic Connection. The following equipment shall be arranged for delayed-automatic connection to the alternate power source:

(a) Central suction systems serving medical and surgical functions, including controls. It shall be permitted to place such suction systems on the critical branch.

(b)Sump pumps and other equipment required to operate for the safety of major apparatus, including associated control systems and alarms

(c) Compressed air systems serving medical and surgical functions, including controls. It shall be permitted to place such air systems on the critical branch.

(d) Smoke control and stair pressurization systems

(e) Kitchen hood supply and/or exhaust systems, if required to operate during a fire in or under the hood

4.4.2.2.3.5 Equipment for Delayed-Automatic or Manual Connection. The following equipment shall be arranged for either delayed-automatic or manual connection to the alternate power source *[also see A-3-4.2.2.3(d)]:*

(a) Heating equipment to provide heating for operating, delivery, labor, recovery, intensive care, coronary care, nurseries, infection/isolation rooms, emergency treatment spaces, and general patient rooms, and pressure maintenance (jockey or make-up) pump(s) for water-based fire protection systems

(b)* Heating of general patient rooms during disruption of the normal source shall not be required under any of the following conditions:

1. The outside design temperature is higher than +20°F (-6.7°C), or

2. The outside design temperature is lower than +20°F (-6.7°C) and a selected room(s) is provided for the needs of all confined patients [then only such room(s) need be heated], or

3. The facility is served by a dual source of normal power as described in 4.4.1.1.1.

(c)* Elevator(s) selected to provide service to patient, surgical, obstetrical, and ground floors during interruption of normal power .

A.4.4.2.3.5 For elevator cab lighting, control, and signal system requirements, see 4.4.2.2.2.2(f).

In instances where interruption of normal power would result in other elevators stopping between floors, throw-over facilities shall be provided to allow the temporary operation of any elevator for

the release of patients or other persons who are confined between floors.

(d) Supply, return, and exhaust ventilating systems for surgical and obstetrical delivery suites, intensive care, coronary care, nurseries, and emergency treatment spaces.

(e) Supply, return, and exhaust ventilating systems for airborne infectious/isolation rooms, protective environment rooms, exhaust fans for laboratory fume hoods, nuclear medicine areas where radioactive material is used, ethylene oxide evacuation and anesthesia evacuation. Where delayed automatic connection is not appropriate, such ventilation systems shall be permitted to be placed on the critical branch.

(f) Hyperbaric facilities

(g) Hypobaric facilities

(h) Autoclaving equipment shall be permitted to be arranged for either automatic or manual connection to the alternate source.

(i) Controls for equipment listed in 4.4.2.2.3.

(j)* Other selected equipment shall be permitted to be served by the equipment system.

4.4.2.2.4 Wiring Requirements.

4.4.2.2.4.1* Separation from Other Circuits. The life safety branch and critical branch of the emergency system shall be kept entirely independent of all other wiring and equipment.

4.4.2.2.4.2 Receptacles. The requirements for receptacles shall be as follows:

(a) The number of receptacles on a single branch circuit for areas described in 4.4.2.2.23(h) shall be minimized to limit the effects of a branch circuit outage. Branch circuit overcurrent devices shall be readily accessible to nursing and other authorized personnel.

(b)* The electrical receptacles or the cover plates for the electrical receptacles supplied from the emergency system shall have a distinctive color or marking so as to be readily identifiable.

4.4.2.2.4.3 Switches. Switches installed in the lighting circuits connected to the essential electrical system shall comply with Article 700, Section E, of NFPA 70, *National Electrical Code*.

4.4.2.2.4.4 Mechanical Protection of the Emergency System. The wiring of the emergency system shall be mechanically protected by raceways, as defined in NFPA 70, *National Electrical Code*.

4.4.2.2.4.5 Flexible power cords of appliances or other utilization equipment connected to the emergency system shall not be required to be enclosed in raceways.

4.4.2.2.4.6 Secondary circuits of transformer-powered communication or signaling systems shall not be required to be enclosed in raceways unless otherwise specified by Chapters 7 or 8 of NFPA 70, *National Electrical Code*.

4.4.3 Performance Criteria and Testing (Type I EES).

4.4.3.1 Source. The branches of the emergency system shall be installed and connected to the alternate power source specified in 4.4.1.1.4 and 4.4.1.1.5 so that all functions specified herein for the emergency system shall be automatically restored to operation within 10 seconds after interruption of the normal source.

4.4.3.2 Transfer Switches.

4.4.3.2.1 The essential electrical system shall be served by the normal power source except when the normal power source is interrupted or drops below a predetermined voltage level. Settings of the sensors shall be determined by careful study of the voltage requirements of the load.

4.4.3.2.2 Failure of the normal source shall automatically start the alternate source generator after a short delay as described in *[see 4.4.2.1.4(d)]*. When the alternate power source has attained a voltage and frequency that satisfies minimum operating requirements of the essential electrical system, the load shall be connected automatically to the alternate power source.

4.4.3.2.3 Upon connection of the alternate power source, the loads comprising the emergency system shall be automatically reenergized. The load comprising the equipment system shall be connected either automatically after a time delay as described in *[see 4.4.2.1.4(e)]* or nonautomatically and in such a sequential manner as not to overload the generator.

4.4.3.2.4 When the normal power source is restored, and after a time delay as described in *[see 4.4.2.1.4(f)]*, the automatic transfer switches shall disconnect the alternate source of power and connect the loads to the normal power source. The alternate power source generator set shall continue to run unloaded for a preset time delay as described in *[see 4.4.2.1.4(j)]*.

4.4.3.2.5 If the emergency power source fails and the normal power source has been restored, retransfer to the normal source of power shall be immediate, bypassing the retransfer delay timer.

4.4.3.2.6 If the emergency power source fails during a test, provisions shall be made to immediately retransfer to the normal source.

4.4.3.2.7 Nonautomatic transfer switching devices shall be restored to the normal power source as soon as possible after the return of the normal source or at the discretion of the operator.

4.4.4 Administration (Type I EES).

4.4.4.1 Maintenance and Testing of Essential Electrical System.

4.4.4.1.1 Maintenance and Testing of Alternate Power Source and Transfer Switches.

4.4.4.1.1.1 Maintenance of Alternate Power Source. The generator set or other alternate power source and associated equipment, including all appurtenant parts, shall be so maintained as to be capable of supplying service within the shortest time practicable and within the 10-second interval specified in 4.4.1.1.8 and 4.4.3.1. Maintenance shall be performed in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems,* Chapter 6.

4.4.4.1.1.2 Inspection and Testing. Criterial, conditions and personnel requirements shall be in accordance with the following:

(a)* *Test Criteria.* Generator sets shall be tested twelve (12) times a year with testing intervals between not less than 20 days or exceeding 40 days. Generator sets serving emergency and equipment systems shall be in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems*, Chapter 6.

(b) *Test Conditions.* The scheduled test under load conditions shall include a complete simulated cold start and appropriate automatic and manual transfer of all essential electrical system loads.

(c) *Test Personnel.* The scheduled tests shall be conducted by competent personnel. The tests are needed to keep the machines ready to function and, in addition, serve to detect causes of malfunction and to train personnel in operating procedures.

4.4.4.1.2 Maintenance and Testing of Circuitry.

4.4.4.1.2.1* Circuit Breakers. Main and feeder circuit breakers shall be inspected annually and a program for periodically exercising the components shall be established according to manufacturer's recommendations.

4.4.4.1.2.2 Insulation Resistance. The resistance readings of main feeder insulation shall be taken prior to acceptance and whenever damage is suspected.

4.4.4.1.3 Maintenance of Batteries. Storage batteries used in connection with essential electrical systems shall be inspected at intervals of not more than 7 days and shall be maintained in full compliance with manufacturer's specifications. Defective batteries shall be repaired or replaced immediately upon discovery of defects (see NFPA 70, *National Electrical Code*, Section 700-4).

4.4.4.2 Recordkeeping. A written record of inspection, performance, exercising period, and repairs shall be regularly maintained and available for inspection by the authority having jurisdiction.

4.5 Essential Electrical System Requirements — Type 2.

4.5.1 Sources (Type 2 EES). The requirements for sources for Type 2 essential electrical systems shall conform to those listed in 4.4.1.

4.5.2 Distribution (Type 2 EES).

4.5.2.1 General. The distribution requirements for Type 2 essential electrical systems shall conform to those listed in 4.4.2.1.

4.5.2.2 Specific Requirements.

4.5.2.2.1* General.

A.4.5.2.2.1 Type 2 essential electrical systems are comprised of two separate systems capable of supplying a limited amount of lighting and power service, which is considered essential for the protection of life and safety and effective operation of the institution during the time normal electrical service is interrupted for any reason. These two separate systems are the emergency system and the critical system.

The number of transfer switches to be used shall be based upon reliability, design, and load considerations. Each branch of the emergency system and each critical system shall have one or more transfer switches. One transfer switch shall be permitted to serve one or more branches or systems in a facility with a maximum demand on the essential electrical system of 150 kVA (120 kW).

4.5.2.2.2 Emergency System. The emergency system shall supply power for the following lighting, receptacles, and equipment as follows:

(a) Illumination of means of egress in accordance with NFPA *101*, *Life Safety Code*

(b) Exit signs and exit directional signs in accordanec with NFPA *101*, *Life Safety Code*

(c) Alarm and alerting systems, including the following:

1. Fire alarms

2. Alarms required for systems used for the piping of nonflammable medical gases as specified in Chapter 4, "Gas and Vacuum Systems"

(d)* Communication systems, where used for issuing instructions during emergency conditions

(e) Sufficient lighting in dining and recreation areas to provide illumination to exit ways of a minimum of 5 footcandles

(f) Task illumination and selected receptacles at the generator set location

(g) Elevator cab lighting, control, communication, and signal systems

No function other than those listed above in items (a) through (g) shall be connected to the emergency system.

4.5.2.2.3 Critical System.

4.5.2.2.3.1 General. The critical system shall be so installed and connected to the alternate power source that equipment listed in 4.5.2.2.3(b) shall be automatically restored to operation at appropriate time-lag intervals following the restoration of the emergency system to operation. Its arrangement shall also provide for the additional connection of equipment listed in 4.5.2.2.3(c) by either delayed-automatic or manual operation.

4.5.2.2.3.2 Delayed-Automatic Connections to Critical System. The following equipment shall be connected to the critical system and be arranged for delayed-automatic connection to the alternate power source:

(a) Task illumination and selected receptacles in the following:

1. Patient care areas

2. Medication preparation areas

3. Pharmacy dispensing areas

4. Nurses' stations (unless adequately lighted by corridor luminaires)

(b) Supply, return, and exhaust ventilating systems for airborne infectious isolation rooms

(c) Sump pumps and other equipment required to operate for the safety of major apparatus and associated control systems and alarms

(d) Smoke control and stair pressurization systems

(e) Kitchen hood supply and/or exhaust systems, if required to operate during a fire in or under the hood

4.5.2.2.3.3* Delayed-Automatic or Manual Connections to Critical System. The following equipment shall be connected to the critical system and be arranged for either delayed-automatic or manual connection to the alternate power source:

(a) *Heating Equipment to Provide Heating for General Patient Rooms.* Heating of general patient rooms during disruption of the normal source shall not be required under any of the following conditions:

1.* The outside design temperature is higher than +20°F (-6.7°C), or

2. The outside design temperature is lower than +20°F (-6.7°C) and, where a selected room(s) is provided for the needs of all confined patients, then only such room(s) need be heated, or

3. The facility is served by a dual source of normal power as described in 4.4.1.1.1.

(b)* *Elevator Service.* In instances where interruptions of power would result in elevators stopping between floors, throw-over facilities shall be provided to allow the temporary operation of any elevator for the release of passengers.

A.4.5.2.2.3(b) For elevator cab lighting, control, and signal system requirements, see 4.5.2.2.2(g).]

(d) *Optional Connections to the Critical System.* Additional illumination, receptacles, and equipment shall be permitted to be connected only to the critical system.

4.5.2.2.4 Wiring Requirements.

4.5.2.2.4.1* Separation from Other Circuits. The emergency system shall be kept entirely independent of all other wiring and equipment.

4.5.2.2.4.2* Receptacles. The electrical receptacles or the cover plates for the electrical receptacles supplied from the emergency system shall have a distinctive color or marking so as to be readily identifiable.

4.5.3 Performance Criteria and Testing (Type 2 EES).

4.5.3.1 Source. The emergency system shall be installed and connected to the alternate source of power specified in 4.4.1.1.2 and 4.4.1.1.3 so that all functions specified herein for the emergency system will be automatically restored to operation within 10 seconds after interruption of the normal source.

4.5.3.2 Transfer Switches.

4.5.3.2.1 The essential electrical system shall be served by the normal power source until the normal power source is interrupted or drops below a predetermined voltage level. Settings of the sensors shall be determined by careful study of the voltage requirements of the load.

4.5.3.2.2 Failure of the normal source shall automatically start the alternate source generator, after a short delay as described in *[see 4.4.2.1.4(d)]*. When the alternate power source has attained a voltage and frequency that satisfies minimum operating requirements of the essential electrical system, the load shall be connected automatically to the alternate power source.

†All ac-powered support and accessory equipment necessary to the operation of the EPS shall be supplied from the load side of the automatic transfer switch(es), or the output terminals of the EPS, ahead of the main EPS overcurrent protection, as necessary, to ensure continuity of the EPSS operation and performance. (**110:** 5-12.5)

4.5.3.2.3 Upon connection of the alternate power source, the loads comprising the emergency system shall be automatically reenergized. The loads comprising the critical system shall be connected either automatically after a time delay as described in *[see 4.4.2.1.4(e)]* or nonautomatically and in such a sequential manner as not to overload the generator.

4.5.3.2.4 When the normal power source is restored, and after a time delay as described in *[see 4.4.2.1.4(f)]*, the automatic transfer switches shall disconnect the alternate source of power and connect the loads to the normal power source. The alternate power source generator set shall continue to run unloaded for a preset time delay as desribed in *[see 4.4.2.1.4(j)]*.

4.5.3.2.5 If the emergency power source fails and the normal power source has been restored, retransfer to the normal source of power shall be immediate, bypassing the retransfer delay timer.

4.5.3.2.6 If the emergency power source fails during a test, provisions shall be made to immediately retransfer to the normal source.

4.5.3.2.7 Nonautomatic transfer switching devices shall be restored to the normal power source as soon as possible after the return of the normal source or at the discretion of the operator.

4.5.4 Administration (Type 2 EES).

4.5.4.1 Maintenance and Testing of Essential Electrical System.

4.5.4.1.1 Maintenance and Testing of Alternate Power Source and Transfer Switches.

4.5.4.1.1.1 Maintenance of Alternate Power Source. The generator set or other alternate power source and associated equipment, including all appurtenant parts, shall be so maintained as to be capable of supplying service within the shortest time practicable and within the 10-second interval specified in 4.4.1.1.8 and 4.4.3.1.

4.5.4.1.1.2 Inspection and Testing. Generator sets shall be inspected and tested in accordance with 4.4.4.1.1(b).

4.5.4.1.2 Maintenance and Testing of Circuitry. Circuitry shall be maintained and tested in accordance with 4.4.4.1.2.

4.5.4.1.3 Maintenance of Batteries. Batteries shall be maintained in accordance with 4.4.4.1.3.

4.5.4.2 Recordkeeping. A written record of inspection, performance, exercising period, and repairs shall be regularly maintained and available for inspection by the authority having jurisdiction.

4.6 Essential Electrical System Requirements — Type 3.

4.6.1 Sources (Type 3 EES). The alternate source of power for the system shall be specifically designed for this purpose and shall be either a generator, battery system, or self-contained battery integral with the equipment.

4.6.1.1 Generators shall conform to 4.4.1.1.

4.6.1.2 Battery systems shall conform to 4.4.1.2.

4.6.2 Distribution (Type 3 EES).

4.6.2.1 General. The distribution requirements for Type 3 essential electrical systems shall conform to those listed in 4.4.2.1.

4.6.2.2 Specific Requirements.

4.6.2.2.1* General.

A.4.6.2.2.1 Type 3 essential electrical systems are comprised of a system capable of supplying a limited amount of lighting and power service that is considered essential for life safety and orderly cessation of procedure during the time normal electrical service is interrupted for any reason.

4.6.2.2.2 Connection to the Essential Electrical System. The system shall supply power for task illumination that is related to the safety of life and that is necessary for the safe cessation of procedures in progress.

4.6.2.2.3 Wiring Requirements.

4.6.2.2.3.1 General. The design, arrangement, and installation of the system shall be in accordance with NFPA 70, *National Electrical Code*.

4.6.2.2.3.2* Receptacles. The cover plates for the electrical receptacles or the electrical receptacles themselves supplied from the emergency system shall have a distinctive color or marking so as to be readily identifiable.

4.6.3 Performance Criteria and Testing (Type 3 EES).

4.6.3.1 Source.

4.6.3.1.1 The emergency system shall have an alternate source of power separate and independent from the normal source that will be effective for a minimum of $1\frac{1}{2}$ hours after loss of the normal source.

4.6.3.1.2 The emergency system shall be so arranged that, in the event of failure of normal power source, the alternate source of power shall be automatically connected to the load within 10 seconds.

4.6.3.2 Transfer Switches with Engine Generator Sets.

4.6.3.2.1 The operation of the equipment shall be arranged such that the load will be served by the normal source until the normal source is interrupted, or when the voltage drops below the setting of the voltage sensing device. The settings of the voltage sensing relays shall be determined by careful study of the voltage requirements of the load.

4.6.3.2.2 When the normal source is restored, and after a time delay as described in *[see 4.4.2.1.4(f)]*, the automatic transfer switch shall disconnect the alternate source of power and connect the loads to the normal power source.

4.6.3.2.3 If the alternate power source fails and the normal power source has been restored, retransfer to the normal source of power shall be immediate.

4.6.3.3 Transfer Switches with Battery System.

4.6.3.3.1 Failure of the normal source shall automatically transfer the load to the battery system.

4.6.3.3.2 Retransfer to the normal source shall be automatic upon restoration of the normal source.

4.6.4 Administration (Type 3 EES).

4.6.4.1 Maintenance and Testing.

4.6.4.1.1 Maintenance and Testing of Alternate Power Source and Transfer Switches.

4.6.4.1.1.1 Maintenance of Alternate Power Source. The generator set or other alternate power source and associated equipment, including all appurtenant parts, shall be so maintained as to be capable of supplying service within the shortest time practicable and within the 10-second interval specified in 4.4.1.1.11 and 4.6.3.1.

4.6.4.1.1.2 Inspection and Testing. Generator sets shall be inspected and tested in accordance with 4.4.1.1.2.

4.6.4.1.1.3 Stored Energy Power Source. Maintenance and testing of stored emergency power supply systems shall be in accordance with NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*, Section 6-1 through 6-4.5.

4.6.4.1.2 Maintenance and Testing Circuitry. Circuitry shall be maintained and tested in accordance with 4.4.4.1.2.

4.6.4.1.3 Maintenance of Batteries. Batteries shall be maintained in accordance with 4.4.4.1.3.

4.6.4.2 Recordkeeping. A written record of inspection, performance, exercising period, and repairs shall be regularly maintained and available for inspection by the authority having jurisdiction.

SUBSTANTIATION: The revised chapter incorporated the Manual of Style edits. This included renumbering the chapter from Chapter 3 to Chapter 4.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #84)
Committee: HEA-ELS

99- 33 - (3-3.2.1.2(a)1): Reject
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: At end of paragraph 1, add the following:
"These circuits shall supply no other patient bed locations."
SUBSTANTIATION: To prevent a problem at one patient location from interrupting power to another patient bed location if the branch circuit opens due to overload, short circuit, etc.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The committee is unaware of any substantiated problem.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #287)
Committee: HEA-ELS

99- 34 - (3-3.2.1.2(a)4a.): Reject
SUBMITTER: Joseph Pavia, Wildwood, MO
RECOMMENDATION: Add new text as "a" and move the current "a" to new "b," and the current "b" to new "c." Delete the current "Note."

a. Circuit breakers and fuses shall be selectively coordinated so that power interruption in that part of the circuit that precedes the interrupting device closest to a fault will not occur.
b. Same as "a." in 1996 edition.
c. Same as "b." in 1996 edition.

SUBSTANTIATION: The 1990 edition of NFPA 99 called out for mandatory selective coordination between fuses, circuit breakers, and equipment ground fault protection. The 1996 edition loosened these requirements by only mandating coordination for two levels of equipment ground fault protection and simply suggesting selective coordination for fuses and circuit breakers for all other types of short-circuit currents. This has resulted in a very hazardous situation because consulting engineers no longer are required to take the extra time to make sure the systems are selectively coordinated, and as a result, systems are being designed with built-in blackouts.

For example, in the last several years, I have completed numerous coordination studies and have found that the design engineer often does not take into consideration the selectivity of the electrical distribution system. The submitted one-line diagram is taken from a recently designed health care facility in the southeastern United States. As designed, faults in Panel "BUS-PLA" from 6,000 to 37,280 amperes would not only open the device "OPCD-4-200," but also devices "OCPD-2-400," and "OCPD-1-600." At that time the emergency generator would start and try to supply power to the system. Since "OCPD-2-400" had already opened, the entire PHA panel would be out of power, even with back-up emergency power. This same would occur for Panel EM1HA for fault currents as low as 2,000 amperes and up to 16,405 amperes.

As designed, this system could not be selectively coordinated whether fuses or circuit breakers are utilized. But, by rearranging the loads, both fuses and circuit breakers are available to meet the requirements of this proposal. Fuses can be coordinated through the use of "ratio charts" and circuit breakers have adjustable instantaneous trips, short time delays, and zone selective interlocking to help them coordinate.

It is a shame, but this system now meets the requirements of NFPA 99-1996. It does not meet the requirements of NFPA 99-1990. I urge the committee to reconsider their action which changed the 1996 edition and simply require that the overcurrent protective devices be selectively coordinated for all types of short circuits, not just for shorts to ground. I believe that my suggested wording will do just that.

NOTE: Supporting material is available for review at NFPA Headquarters.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: The committee believes 3-4.1.1.1(a) adequately covers the coordination requirement. The committee still believes that it is impractical to mandate the requirements.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #85)

Committee: HEA-ELS

99- 35 - (3-3.2.1.2(a) 5e and 12-4.1.2.10 (new)): Accept in Principle

TCC NOTE: The Technical Correlating Committee directs the Technical Committee on Electrical Systems and the Technical Committee on Gas Delivery Equipment to consider battery operated automatic activating battery pack emergency lighting. The Technical Correlating Committee therefore directs that public comments be submitted in the correlating committee's name requesting that HEA-ELS and HEA-GAS reconsider this proposal with the following proposed revision to the proposal as follows: "...shall be provided in each ~~operating room~~ anesthetizing location and procedure room." The Technical Correlating Committee proposes the following definition: Procedure room. Where the proceduralist is using instrumentation that requires constant observation and control. Substantiation: Introduction of a new term requires a definition. (Technical Correlating Committee explanation: The intended application of the definition in correlation with the new 12-4.1.2.10 is that constant observation means with light to see, i.e. the removal of a corn and not the retraction of an instrument from a body cavity.)

SUBMITTER: Burton R. Klein, Burton Klein Associates

RECOMMENDATION: 1. Delete 3-3.2.1.2(a)5e.

2. Insert new 12-4.1.2.10 to read: Battery Powered Lighting. At least one battery-powered emergency unit shall be provided in each operating room. Units shall be wired in accordance with NFPA 70, National Electrical Code.

3. Renumber existing 12-4.1.2.10 as new 12-4.1.2.11.

SUBSTANTIATION: The subject of battery-powered lighting more appropriately belongs in Chapter 12, Section 12-4.1, since it is a specific operational safety feature for anesthetizing locations. It is not part of the essential electrical system.

Wording revised to clarify that each operating room is to have at least one such unit.

COMMITTEE ACTION: Accept in Principle.

COMMITTEE STATEMENT: See Committee Proposal 99-37 (Log #CP206).

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #85a)

Committee: HEA-GAS

99- 36 - (3-3.2.1.2(a) 5e and 12-4.1.2.10 (new)): Accept in Principle

TCC NOTE: The Technical Correlating Committee directs the Technical Committee on Electrical Systems and the Technical Committee on Gas Delivery Equipment to consider battery operated automatic activating battery pack emergency lighting. The Technical Correlating Committee therefore directs that public comments be submitted in the correlating committee's name requesting that HEA-ELS and HEA-GAS reconsider this proposal with the following proposed revision to the proposal as follows: "...shall be provided in each ~~operating room~~ anesthetizing location and procedure room." The Technical Correlating Committee proposes the following definition: Procedure room. Where the proceduralist is using instrumentation that requires constant observation and control. Substantiation: Introduction of a new term requires a definition. (Technical Correlating Committee explanation: The intended application of the definition in correlation with the new 12-4.1.2.10 is that constant observation means with light to see, i.e. the removal of a corn and not the retraction of an instrument from a body cavity.)

SUBMITTER: Burton R. Klein, Burton Klein Associates

RECOMMENDATION: 1. Delete 3-3.2.1.2(a)5e.

2. Insert new 12-4.1.2.10 to read: Battery Powered Lighting. At least one battery-powered emergency unit shall be provided in each operating room. Units shall be wired in accordance with NFPA 70, National Electrical Code.

3. Renumber existing 12-4.1.2.10 as new 12-4.1.2.11.

SUBSTANTIATION: The subject of battery-powered lighting more appropriately belongs in Chapter 12, Section 12-4.1, since it is a specific operational safety feature for anesthetizing locations. It is not part of the essential electrical system.

Wording revised to clarify that each operating room is to have at least one such unit.

COMMITTEE ACTION: Accept in Principle.

Replace "operating room" with "anesthetizing location." In paragraph 20-3.3 insert , 12 and 13, between "Chapter 3" and "as applicable."

COMMITTEE STATEMENT: Operating room is not a defined term and therefore vague. The submitter added clarification by adding "in each" location, and stipulated the units should be wired, clarifying that flashlights are not acceptable for meeting this requirement. For continuity with the action of the Technical Committee on Electrical Systems 99-35 (Log #85) and 99-346 (Log #CP206), Chapters 12 and 13 needed to be included.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 7

NEGATIVE: 1

NOT RETURNED: 3 Bancroft, Mills, Swope

EXPLANATION OF NEGATIVE:

DAVID: Reject: Will provide guide for individuals whom will not consult with other chapters.

(Log #CP206)
Committee: HEA-ELS

99- 37 - (3-3.2.1.2(a)5, 3-3.2.1.2(a)5f, 13-3.3.2.1(a), A-12-4.1.2.6(a)): Accept

TCC NOTE: The Technical Correlating Committee directs that 5.e. of the recommendation be revised to read as follows: "... shall be provided ~~in accordance with~~ as required in NFPA 70 ..." for continuity with 5.a. and per Manual of Style, 3-6.6.1.

SUBMITTER: Technical Committee on Electrical Systems

RECOMMENDATION: Delete 3-3.2.1.2(a)5.

1) Replace 12-4.1.2.6(a) with wording from 3-3.2.1.2(a)5 as follows:

5. Wiring in Anesthetizing Locations.

a. Wiring. Installed wiring shall be in metal raceway or shall be as required in NFPA 70, National Electrical Code, Sections 517-60 through 517-63.

b. Raceway. Such distribution systems shall be run in metal raceways along with a green grounding wire sized no smaller than the energized conductors.

c. Grounding to Raceways. Each device connected to the distribution system shall be effectively grounded to the metal raceway at the device.

d. Installation. Methods of installation shall conform to Articles 250 and 517 of NFPA 70, National Electrical Code.

e. Battery-Powered Emergency Lighting Units. One or more battery-powered emergency lighting units shall be provided in accordance with NFPA 70, National Electrical Code, Section 700-12(e).

2) Add a new 3-3.2.1.2(a)5f that reads:

"If an anesthetizing location is a wet location the provisions of 3-3.2.1(f) shall apply."

3) Insert new 13-3.3.2.1(a) as follows:

5. Wiring in Anesthetizing Locations Requiring Electrical Powered Critical Life Support.

a. Wiring. Installed wiring shall be in metal raceway or shall be as required in NFPA 70, National Electrical Code, Sections 517-60 through 517-63.

b. Raceway. Such distribution systems shall be run in metal raceways along with a green grounding wire sized no smaller than the energized conductors.

c. Grounding to Raceways. Each device connected to the distribution system shall be effectively grounded to the metal raceway at the device.

d. Installation. Methods of installation shall conform to Articles 250 and 517 of NFPA 70, National Electrical Code.

e. Battery-Powered Emergency Lighting Units. One or more battery-powered emergency lighting units shall be provided in accordance with NFPA 70, National Electrical Code, Section 700-12(e).

4) Delete A-12-4.1.2.6(a).

SUBSTANTIATION: 3-3.2.1.2(a)5 is pertinent only to Chapters 12 and 13 (Hospitals and Other Health Care Facilities). The deletion of 3-3.2.1.2(a)5 will eliminate unnecessary requirements on other health care occupancies.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #18)
Committee: HEA-ELS

99- 38 - (3-3.2.1.5): Reject

SUBMITTER: James A. Wolfe, Rep. The Sear-Brown Group

RECOMMENDATION: Revise to read as follows:

"When ground-fault protection is provided for operation of the service or feeder disconnecting means, an additional step of ground-fault protection shall be provided in the next level of feeder downstream toward the load for normal power distribution equipment only."

SUBSTANTIATION: If load is transferred to emergency power distribution, potential loss of life due to interruption of life safety/critical branch power would seem of greater concern than shock hazard. If emergency power is interrupted due to GFI trip of a feeder serving a life safety or critical branch panel, this could occur and no other power service would be available at that panel. Currently, according to phone conversation with (NFPA Staff), 3-3.2.1.5 requires GFI on normal and emergency main distribution equipment.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: The committee believes that the performance criteria is adequately addressed in NFPA 99 and that installation criteria is adequately addressed in NFPA 70.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #113)
Committee: HEA-ELS

99- 39 - (3-3.3.2.3, 7-5.1.3.3, 9-2.1.13.3): Reject

TCC NOTE: The Technical Correlating Committee directs that this proposal be returned to committee for reconsideration. The action and Committee Statement are confusing. The Technical Committee chairs for Electrical Systems and for Electrical Equipment are directed to collaborate in developing consistent requirements with specific wording, and rationale, for applicable paragraphs.

SUBMITTER: Charles Rawlings, SBI

RECOMMENDATION: Revise the characteristics of leakage-current meters so that the specifications in various chapters and the recommended "loading circuit(s)" are the same.

SUBSTANTIATION: Chapter 3 specifies certain characteristics of meters of leakage currents. Chapters 7 and 9 specify other characteristics for such meters. The specifications refer to different circuits in Appendix A. The "numbers" are 3-3.3.2.3; A-3-3.3.2.3(a) and (b); 7-5.1.3.3; A-7-5.1.3.3; and 9-2.1.13.3.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: 3-3.3.2.3 is a requirement for voltage measurements. The committee assumes the submitter intended to address 3-3.2.2.3. This is a test for the line isolation monitoring system whereas the test in 7-5.1.3.3 and 9-2.1.13.3 are for equipment requirements.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 14

NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #113a)
Committee: HEA-ELE

99- 40 - (3-3.3.2.3, 7-5.1.3.3, 9-2.1.13.3): Accept in Principle

TCC NOTE: The Technical Correlating Committee directs that this proposal be returned to committee for reconsideration. The action and committee statement are confusing. The Technical Committee chairs for Electrical Systems and for Electrical Equipment are directed to collaborate in developing consistent requirements with specific wording, and rationale, for applicable paragraphs.

SUBMITTER: Charles Rawlings, SBI

RECOMMENDATION: Revise the characteristics of leakage-current meters so that the specifications in various chapters and the recommended "loading circuit(s)" are the same.

SUBSTANTIATION: Chapter 3 specifies certain characteristics of meters of leakage currents. Chapters 7 and 9 specify other characteristics for such meters. The specifications refer to different circuits in Appendix A. The "numbers" are 3-3.3.2.3; A-3-3.3.2.3(a) and (b); 7-5.1.3.3; A-7-5.1.3.3; and 9-2.1.13.3.

COMMITTEE ACTION: Accept in Principle.

The committee will seek to harmonize Chapters 7 and 9 with the Technical Committee on Electrical Systems Chapter 3.

COMMITTEE STATEMENT: The circuit requirements in Chapters 7 and 9 were designed to simulate the frequency response characteristics of humans. The corresponding rationale and application of these requirements is reflected in appendix A-9-2.1.13.3.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 7

NOT RETURNED: 4 Aronow, Carlson, Meyer, Peglow

(Log #22)
Committee: HEA-ELS

99- 41 - (3-3.3.3(d)): Reject

TCC NOTE: The Technical Correlating Committee directs the Committee to provide more information in the Committee Statement.

SUBMITTER: Steve Campolo, Leviton Manufacturing Co., Inc.

RECOMMENDATION: Change period to a comma on part (d) and add:

- "<u>, as measured by a listed receptacle tension tester,</u>"

SUBSTANTIATION: NFPA 99 requires the receptacle ground contact to exhibit at least 4 ounces of retention. UL-1436 has established levels of accuracy and endurance as well as calibration, for listed tension testers. By accepting this proposal, the accurate and repeatable measurement can be achieved.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: There is no substantiation that this would improve performance.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #115)
Committee: HEA-ELS

99- 42 - (3-3.3.3(d)): Reject
SUBMITTER: Charles Rawlings, SBI
RECOMMENDATION: Revise text as follows:
"The retention force of the grounding blade of each electrical receptacle (except locking ~~type~~ receptacles) shall be not less than ~~115 g (4 oz)~~ 4 oz and not more than [???]."
SUBSTANTIATION: Removing the "equivalent" force in grams would stop criticism of not using the dyne as the unit of force in the cgs system. Absence of an upper limit on the retention force allows excessive clamping of the blades of an inserted plug. Withdrawal of the plug might prompt further use of a remarkably unsafe method, such as metal-tool leverage or inappropriate kinetic energy. Moving a heavy "crash cart" fast enough to snap the plug from the receptacle is an example of the kinetic technique.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Improper proposal, a value number was not provided.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #272)
Committee: HEA-ELS

99- 43 - (3-3.3.3.2): Reject
SUBMITTER: Kenneth M. Hicks, Duke University Hospital
RECOMMENDATION: None given.
SUBSTANTIATION: What are the requirements for impedance testing of mobile patient care units such as mobile cath labs? The current code only addresses permanent locations. Mobile units are frequently moved and set up. This causes a lot of stress to the wiring/grounding system.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: No recommendation was given.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #116)
Committee: HEA-ELS

99- 44 - (3-4.1.1.1(i)): Accept in Principle
TCC NOTE: The Technical Correlating Committee directs the following revised sentence be inserted under Committee Action:
" ... vacuum pumps, pressure maintenance (jockey or make-up) pump(s) for water based fire protection systems, generator fuel pumps, ~~jockey pumps,~~ or other generator accessories."
Substantiation: Wording was inadvertently omitted in the committee actions on the proposal.
SUBMITTER: Lawrence A. Bey, Onan Corp.
RECOMMENDATION: Revise last sentence as follows: "...vacuum pumps, fire ~~fuel~~ pumps, jockey pumps, fuel pumps, or other generator accessories."
SUBSTANTIATION: Editorial.
COMMITTEE ACTION: Accept in Principle.
Revise to read:
"...vacuum pumps, jockey pumps, fuel pumps or other generator accessories."
COMMITTEE STATEMENT: Editorial clarification and continuity. It continues to be the committees intent not to include fire pumps.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #117)
Committee: HEA-ELS

99- 45 - (3-4.1.1.3): Accept in Principle
SUBMITTER: Lawrence A. Bey, Onan Corp.
RECOMMENDATION: Revise text as follows:
"The alternate source of power shall be a generator(s) driven by a reliable ~~some form of~~ prime mover(s) and located on the premises."
SUBSTANTIATION: Editorial. The performance requirements of the standard anticipate a reliable, proven prime mover.
COMMITTEE ACTION: Accept in Principle.
Replace and insert NFPA 110 Level 1 System. Text will now read as follows:
"The alternate source of power shall be a NFPA 110 Level 1 System."
COMMITTEE STATEMENT: Editorial clarification.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #CP202)
Committee: HEA-ELS

99- 46 - (3-4.1.1.5(a)): Accept
SUBMITTER: Technical Committee on Electrical Systems
RECOMMENDATION: Delete the last sentence which reads: "Load shed circuits, if provided, shall not shed the above equipment upon loss of the largest single generator."
SUBSTANTIATION: This section is intended to provide the criteria for use of the generating equipment for other purposes. It is not intended to address load shed. Load shed is covered adequately by 3-4.1.1.1(i).
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #118)
Committee: HEA-ELS

99- 47 - (3-4.1.1.5(b)): Accept in Principle
TCC NOTE: The Technical Correlating Committee directs that this proposal be returned to committee for revision. The Technical Correlating Committee does not understand the intended actions.
SUBMITTER: Lawrence A. Bey, Onan Corp.
RECOMMENDATION: Revise text as follows:
(b) Optional ~~Any~~ loads shall be permitted to be served by the essential electrical system generating equipment. ~~not permitted in 3-4.2 to be on the essential electrical system,~~ Optional loads shall be served by their own transfer switch(es) such that these loads (1) shall not be transferred onto the generating equipment if the transfer will overload the generating equipment, and (2) shall be shed upon a generating equipment overload. Use of the generating equipment to serve optional loads ~~It~~ shall not constitute "other purposes" as described in 3-4.1.1.5(a).
SUBSTANTIATION: Editorial clarification.
COMMITTEE ACTION: Accept in Principle.
Only change "Any" to "Optional".
COMMITTEE STATEMENT: Editorial clarification. See Committee Action on Proposal 99-48 (Log #307).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #307)
Committee: HEA-ELS

99- 48 - (3-4.1.1.5(b)): Accept in Principle
TCC NOTE: The Technical Correlating Committee directs that this proposal be returned to Committee for revision. The Technical Correlating Committee does not understand the intended actions.
SUBMITTER: Hugh Nash, Nash Lipsey Burch, LLC
RECOMMENDATION: Change (b) to read:
"Any loads served by the generating equipment not permitted in health care facilities, as provided in Chapters 3 (now 4), 12, 13, 16, and 17, to be on the...".
SUBSTANTIATION: Some authorities having jurisdiction have been requiring load shed for contiguous medical office buildings, nursing homes, and other health care facilities.
COMMITTEE ACTION: Accept in Principle.
Replace "It" with "This use shall not constitute..." in the last sentence of paragraph (b).
COMMITTEE STATEMENT: Editorial clarification.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #308)
Committee: HEA-ELS

99- 49 - (3-4.1.1.5(b)): Reject
SUBMITTER: Hugh Nash, Nash Lipsey Burch, LLC
RECOMMENDATION: Delete all wording from (1) to the end of the section and replace with, "are transferred manually."
SUBSTANTIATION: It may not be practical to monitor the generator load in order to shed one transfer switch.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Automatic transfer means is preferred for load shedding of these optional loads. Current technology makes it practical.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #310)
Committee: HEA-ELS

99- 50 - (3-4.1.1.5(b)): Accept in Principle
TCC NOTE: The Technical Correlating Committee directs that this proposal be returned to committee for revision; the changes are not explicit.
SUBMITTER: Hugh Nash, Nash Lipsey Burch, LLC
RECOMMENDATION: Add fine print note at end of section to read:
"Care should be taken that the requirements of NFPA 70, Article 700, are met without service from the generating equipment."
SUBSTANTIATION: The facility or area that is shed may be required to have egress and exit lighting on emergency power.
COMMITTEE ACTION: Accept in Principle.
Add as a very last sentence:
"and where optional loads are connected the requirements of NFPA 101 and NFPA Article 700 shall be met under load shed conditions."
COMMITTEE STATEMENT: Editorially rewritten to be incorporated within the mandatory text.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #119)
Committee: HEA-ELS

99- 51 - (3-4.1.3): Accept
SUBMITTER: Lawrence A. Bey, Onan Corp.
RECOMMENDATION: Delete: ~~3-4.1.3 Separate Utility. (Reserved)~~
SUBSTANTIATION: The standard is clear under 3-4.1.1.1 that a second source of normal power, while encouraged, does not constitute an alternate source of power.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #CP208)
Committee: HEA-ELS

99- 52 - (3-4.2.2(b)5): Accept
SUBMITTER: Technical Committee on Electrical Systems
RECOMMENDATION: After the word "generator set" add "essential electrical system transfer switch."
Also change "Location" to "Locations".
SUBSTANTIATION: To provide task illuminator in the event that those components need to be manually transferred or repaired during an emergency.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #CP207)
Committee: HEA-ELS

99- 53 - (3-4.2.2.1, 3-5.2.2.1): Accept
SUBMITTER: Technical Committee on Electrical Systems
RECOMMENDATION: Revise last sentence to read:
"One transfer switch shall be permitted to serve one or more branches or systems in a facility with a continuous load on the switch of 150 kVA or less."
SUBSTANTIATION: To clarify the intent, and to eliminate ambiguity with the rating of the generator set.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #86)
Committee: HEA-ELS

99- 54 - (3-4.2.2.2(a)): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Move Paragraph 2 ["All ac-powered support ... and performance. (NFPA 110: 5-12.5)"] to Section 3-4.3.2 and number it 3-4.3.2.2. Renumber existing 3-4.3.2.2 to 3-4.3.2.7 accordingly.
SUBSTANTIATION: Editorial. Committee Action on Comment 99-34 in 1998 Fall ROP appears to have a typographical error. Insertion of this text in Section 3-4.3.2.2 is correct.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #25)
Committee: HEA-ELS

99- 55 - (3-4.2.2.2(b)5): Accept
SUBMITTER: Dennis Moss, University of Utah
RECOMMENDATION: Add the following at the beginning of the paragraph:
"Generator Set Location."
SUBSTANTIATION: This addition clarifies the intent of this paragraph that it applies only to the generator set location. This is consistent with and will read the same as NFPA 70 (NEC) 517-32(e).
COMMITTEE ACTION: Accept.
COMMITTEE STATEMENT: The committee disagrees with the second sentence of the substantiation. See Committee Action and Statement on Proposal 99-56 (Log #20).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #20)
Committee: HEA-ELS

99- 56 - (3-4.2.2.2(b) and (c)): Reject
SUBMITTER: Western Regional Fire Code Dev. Committee
RECOMMENDATION: Delete the current 3-4.2.2.2(b) and (c) and replace with NFPA 70, Section 517.32 and 517.33.

x517-32. Life Safety Branch. No function other than those listed in (a) through (f) shall be connected to the life safety branch. The life safety branch of the emergency system shall supply power for the following lighting, receptacles, and equipment.

(a) Illumination of Means of Egress. Illumination of means of egress, such as lighting required for corridors, passageways, stairways, and landings at exit doors, and all necessary ways of approach to exits. Switching arrangements to transfer patient corridor lighting in hospitals from general illumination circuits to night illumination circuits shall be permitted provided only one of two circuits can be selected and both circuits cannot be extinguished at the same time.

FPN: See Life Safety Code, NFPA 101-1997, Sections 5-8 and 5-9.

(b) Exit Signs. Exit signs and exit directional signs.

FPN: See Life Safety Code, NFPA 101-1997, Section 5-10.

(c) Alarm and Alerting Systems. Alarm and alerting systems including the following:

1. Fire alarms

FPN: See Life Safety Code, NFPA 101-1997, Section 7-6 and 12-3.4.

2. Alarms required for systems used for the piping of nonflammable medical gases

FPN: See Standard for Health Care Facilities, NFPA 99-1996, 12-3.4.1.

(d) Communications Systems. Hospital communications systems, where used for issuing instructions during emergency conditions.

(e) Generator Set Location. Task illumination battery charger for emergency battery-powered lighting unit(s) and selected receptacles at the generator set location.

(f) Elevators. Elevator cab lighting, control, communications, and signal systems.

x517-33. Critical Branch.

(a) Task Illumination and Selected Receptacles. The critical branch of the emergency system shall supply power for task illumination, fixed equipment, selected receptacles, and special power circuits serving the following areas and functions related to patient care.

1. Critical care areas that utilize anesthetizing gases — task illumination, selected receptacles, and fixed equipment.
2. The isolated power systems in special environments.
3. Patient care areas — task illumination and selected receptacles in the following:
   a. Infant nurseries.
   b. Medication preparation areas.
   c. Pharmacy dispensing areas.
   d. Selected acute nursing areas.
   e. Psychiatric bed areas (omit receptacles)
   f. Ward treatment rooms.
   g. Nurses' stations (unless adequately lighted by corridor luminaires)
4. Additional specialized patient care task illumination and receptacles, where needed.
5. Nurse call systems.
6. Blood, bone, and tissue banks.
7. Telephone equipment rooms and closets.
8. Task illumination, selected receptacles, and selected power circuits for the following:
   a. General care beds (at least one duplex receptacle per patient bedroom)
   b. Angiographic labs.
   c. Cardiac catheterization labs.
   d. Coronary care units.
   e. Hemodialysis rooms or areas.
   f. Emergency room treatment areas (selected).
   g. Human physiology labs.
   h. Intensive care units.
   i. Postoperative recovery rooms (selected).
9. Additional task illumination, receptacles, and selected power circuits needed for effective hospital operation. Single-phase fractional horsepower motors shall be permitted to be connected to the critical branch.

(b) Subdivision of the Critical Branch. It shall be permitted to subdivide the critical branch into two or more branches.

FPN: It is important to analyze the consequences of supplying an area with only critical care branch power when failure occurs between the area and the transfer switch. Some proportion of normal and critical power, or critical power from separate transfer switches, may be appropriate.

x(c) Receptacle Identification. The receptacles or the faceplates for receptacles supplied by the critical branch shall have a distinctive color or marking so as to be readily recognizable.

SUBSTANTIATION: The extraction of the exact wording in NFPA 70 to NFPA 99 provides for consistency with both documents that address these systems.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: As performance criteria this material is extracted from NFPA 99 by NFPA 70.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #305)
Committee: HEA-ELS

99- 57 - (3-4.2.2.2(c)8a.): Accept in Principle
TCC NOTE: The Technical Correlating Committee directs that this proposal be returned to committee to clarify their action and rationale.
SUBMITTER: Hugh Nash, Nash Lipsey Burch, LLC
RECOMMENDATION: Change (c)8a. to read:
a. General care beds [at least one duplex receptacle per patient bedroom and selected (as needed) task lighting].
SUBSTANTIATION: Critical branch lighting should be optional in general care areas. This was the original intent of the words "task lighting."
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-31 (Log #309).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #CP204)
Committee: HEA-ELS

99- 58 - (3-4.2.2.3(c)): Accept
SUBMITTER: Technical Committee on Electrical Systems
RECOMMENDATION: Delete AC from the header.
SUBSTANTIATION: Editorial change, AC is not needed for clarification.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #304)
Committee: HEA-ELS

99- 59 - (3-4.2.2.3(e)1c.): Reject
TCC NOTE: The Technical Correlating Committee directs that this proposal be returned to committee. In consideration of Log #203, the Committee Statement for Log #304 needs clarification.
SUBMITTER: Hugh Nash, Nash Lipsey Burch, LLC
RECOMMENDATION: Delete 3-4.2.2.3(e)1c.
SUBSTANTIATION: 3-3.2.1.1 (referring to two services) no longer exists. Moreover, the existence of two services exactly constitutes two services and what makes two services truly separate is a vague concept.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Proposal 99-61 (Log #CP203).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #87)
Committee: HEA-ELS

99- 60 - (3-4.2.2.3(e)4): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Move this text (Subparagraph 4, "Supply, return ... critical branch.") to 3-4.2.2.3(d) and number it "6."
SUBSTANTIATION: Proposal 99-56 in the ROP for 1996 Fall Meeting recommended that this text be placed under "Equipment for Delayed Automatic Connection." However, another proposal created a new Section 3-4.2.2.3(c). Thus, the text in question should have been placed in Section (d), not (e).
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #CP203)
Committee: HEA-ELS

99- 61 - (3-4.2.2.3(e)1c): Accept
SUBMITTER: Technical Committee on Electrical Systems
RECOMMENDATION: Replace the reference from "3-3.2.1.1" to "3-4.1.1.1".
SUBSTANTIATION: Editorial change.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #302)
Committee: HEA-ELS

99- 62 - (3-4.2.2.3(f) (New)): Accept in Principle
SUBMITTER: Hugh Nash, Nash Lipsey Burch, LLC
RECOMMENDATION: Add the following to the end of 3-4.2.2.3:
(f) Where one switch serves multiple branches or systems as permitted under 3-4.2.2.1, transfer for all loads shall be non-delayed automatic.
SUBSTANTIATION: It would not be permitted to install one switch with automatic transfer with the present wording in 3-4.2.2.3(d) (for example), because (d) says equipment shall be arranged for delayed automatic transfer.
COMMITTEE ACTION: Accept in Principle.
1. 3-4.2.2.3(b): Delete from the last sentence as follows: "~~by either delayed automatic or manual operation~~."
2. 3-5.2.2.3(a): Delete from the last sentence as follows: "~~by either delayed automatic or manual operation~~."
3. 3-5.2.2.3(b)(c): Insert "permitted to be" between "shall be" and "connected" in the first sentence.
4. 3-4.2.2.3(d)(e): Insert "shall be permitted to be arranged" in the first sentence after "shall".

COMMITTEE STATEMENT: The committee determined that the requirement applies to all facilities.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #120)
Committee: HEA-ELS

99- 63 - (3-4.3.2.7): Reject
SUBMITTER: Lawrence A. Bey, Onan Corp.
RECOMMENDATION: Revise text as follows:
"Nonautomatic transfer switching devices shall be restored to the normal power source as soon as possible after the return of the normal source. ~~or at the discretion of the operator.~~"
SUBSTANTIATION: Nonautomatic transfer switches may be slaved to an automatic transfer switch in which case the nonautomatic switch will return to the normal source at the same time as the automatic switch — at the end of the retransfer time delay; or, the nonautomatic transfer switch may be used as a manually-initiated, electrically-operated switch. If the latter is the case, the operator should initiate retransfer before the end of the engine cooldown time delay, or power will be lost to the load.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The committee believes that discretion of the operator does not compromise the intent of this paragraph.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #88)
Committee: HEA-ELS

99- 64 - (3-4.4.1.3): Accept in Principle
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Revise sentence 1 from:
"Storage batteries used in connection with essential electrical systems ..." to read as follows:
"Batteries used in connection with essential electrical systems...".
SUBSTANTIATION: "Storage" batteries normally apply to Stored Energy Power Supply Systems. Intent of this section appears to apply to all batteries used for a Type 1 essential electrical system.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Proposal 99-65 (Log #CP205).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #CP205)
Committee: HEA-ELS

99- 65 - (3-4.4.1.3): Accept
SUBMITTER: Technical Committee on Electrical Systems
RECOMMENDATION: Delete 3-4.4.1.3 and replace with:
"Batteries for on-site generators shall be maintained in accordance with NFPA 110."
SUBSTANTIATION: Inspecting batteries on a precise schedule is not practical and batteries generally replaced 0 repaired. NFPA 110 provides adequate criteria for maintenance and testing.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #301)
Committee: HEA-ELS

99- 66 - (3-5.2.2.1): Accept
SUBMITTER: Hugh Nash, Nash Lipsey Burch, LLC
RECOMMENDATION: Change paragraph two to read:
"The number of transfer switches to be used shall be based upon reliability, design, and load considerations. Each system shall have one or more transfer switches. One switch shall be permitted to serve one or more systems..."
SUBSTANTIATION: Type 2 facilities do not have branches — only systems.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #303)
Committee: HEA-ELS

99- 67 - (3-5.2.2.3(e) (New)): Accept
SUBMITTER: Hugh Nash, Nash Lipsey Burch, LLC
RECOMMENDATION: Add the following to the end of 3-5.2.2.3:
(e) Where one switch serves multiple systems as permitted under 3-5.2.2.1, transfer for all loads shall be non-delayed automatic.
SUBSTANTIATION: It would not be permitted to install one switch with automatic transfer with the present wording in 3-5.2.2.3 (for example), because (c) says equipment shall be arranged for delayed automatic transfer.
COMMITTEE ACTION: Accept.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-62 (Log #302).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17

VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #311)
Committee: HEA-PIP

99- 68 - (Chapter 4): Reject
SUBMITTER: Julie Moen, Medical Gas Testing & Certification, Inc.
RECOMMENDATION: None given.
SUBSTANTIATION: The following is an observation of the current condition at a hospital serving a large metropolitan area. The following condition affects the oxygen, nitrous oxide, and nitrogen systems for the entire hospital.

The area in question has been designated by the hospital as a "Confined Space Area." To enter the area, one must pass through two locked doors, and then step down into the area from a steel ladder, attached to the structure, the distance of approximately 12 to 14 feet. This area could be defined as a sub-basement. The confined space is approximately 20 feet by 30 feet. However, it is attached to an exhaust shaft that rises to the sixth floor roof of the building in which it is located. Located within the confined space are chilled water booster pumps. Also located within the confined space are the entire regulator/bypass systems for the oxygen, nitrous oxide, and nitrogen systems that serve almost the entire hospital. The main shutoff valves (just inside the building) also are located within this confined space. The piping configuration also has the pressure relief valves located within the confined space, and not vented to an outside area.

All confined space requirements and protocol are enforced to enter this area, (e.g., access authorization, sign-in protocol, safety equipment, air monitoring equipment, required trained personnel, etc.). It requires an extended amount of time to enter the area under normal circumstances, the response necessary in the event of an emergency related to the regulators, main shutoff valves and/or pressure relief valves generates a tremendous cause for concern.

If in the event that a pressure regulator or pressure relief valve malfunctioned you could be denied access to correct the item because of unacceptable air quality. Self-contained breathing apparatus could be required. The added danger with an oxygen enriched or oxygen deficient (nitrous oxide) atmosphere created in an area where the chilled water booster pumps are operating is of additional concern.

It is our opinion that medical gas piping, valves, pressure regulators, pressure relief valves, etc. be prohibited in either defined or undefined confined space areas. The amount of time required for proper and safe entry into a confined space has greatly increased the amount of time necessary before a safe first response is even possible. We feel the presence of medical gas systems and their components in a confined space creates the potential for dire consequences to the patient care environment and the safety of the patients.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The summitter did not give any recommendation.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #252)
Committee: HEA-ADM

99- 69 - (4-1.1): Reject
SUBMITTER: David B. Mohile, Medical Engineering Services, Inc.
RECOMMENDATION: Add coverage for the nonflammable gas and vacuum systems installed in veterinary facilities. New sentence to be added to end of paragraph would read:

"This chapter also covers the installation of nonflammable gas and vacuum systems installed in veterinary facilities as a protection for the staff."
SUBSTANTIATION: Oxygen, nitrogen, nitrous oxide, and vacuum are routinely installed in veterinary care facilities. The installation is often haphazard and frequently uses inappropriate materials which can and do expose human staff to potentially serious fire hazards.

We have seen oxygen and nitrous oxide piped in PVC plastic; tanks of gas in the same operating room as the staff and patient; flare and compression fittings used for oxygen and nitrous oxide; no consideration for WAGD disposal thereby dumping the waste anesthetic gas back into the same room as the staff using it; plastic tubing with plastic compression fittings used for high pressure nitrogen; etc.

As a minimum we would like to see the requirements for office-based facilities be applied to veterinary uses since frequently the equipment comes from the same supplier.

In larger health care facilities that have animal research areas within their buildings, merely by using a separate supply of gas than the main hospital supply, minimal safety rules are subverted.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-10 (Log #262).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 6
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 5
NOT RETURNED: 1 McPeck

(Log #331)
Committee: HEA-PIP

99- 70 - (4-1.1): Accept
SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.
RECOMMENDATION: Add after "...WAGD <u>(also referred to as Scavenging)</u>."
SUBSTANTIATION: See the F98 ROC, page 141, Comment 99-35 (Log #12). This was accepted to be inserted. This term is used in Level 3 and sometimes in Levels 2 and 4.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #144)
Committee: HEA-PIP

99- 71 - (4-3.1.1):
TCC NOTE: The Technical Correlating Committee directs the committee to review the intent of diagrams. If the diagrams are directive, incorporate them in the text. If the diagrams are informational, incorporate them in the annex and reference them within the text.
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Affected Paragraphs: 4-3.1.1.1 through 4-3.1.1.8.

Replaces these paragraphs and renumbers all subsequent paragraphs.

Note: This and the 39 following proposals are related and essentially interchangeable. For the convenience of the committee, staff, and reader of the ROP they have been aggregated into this omnibus proposal which is intended to portray the net sum effect of all of the proposals if accepted without modifications. Given that such a blanket acceptance may not be the pleasure of the committee, the individual changes have also been separately proposed for individual consideration.

The left column is the complete proposed text. New material is bold. Where the text is sourced in the current document, the source paragraph is listed in the right hand column. Where the text is new, the relevant proposal is noted.

4-3.1.1.1 Central Supply System Management.		
	(a) Only cylinders and containers constructed, tested, and maintained in accordance with U.S. Department of Transportation specifications and regulations shall be permitted to be used.	4-3.1.1.1(a)
	(b) Cylinder contents shall be identified by attached labels or stencils naming the contents. Cylinders and containers shall be identified in accordance with CGA Pamphlet C-4 "Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained."	4-3.1.1.1(b)
	(c) Contents of cylinders and containers shall be identified by reading the labels prior to use. Labels shall not be defaced, altered, or removed. Cylinders without correct markings or whose markings and gas specific fittings do not match shall not be used.	4-3.1.1.1(c) Proposal #2
	(d) Cylinders and containers shall be handled in strict accordance with 4-3.5.2.	Proposal #3
	(e) Racks, shelves, and supports used in areas containing medical gas shall be constructed of noncombustible materials or limited combustible materials.	4-3.1.1.2(a)
	(f) Only Medical gas cylinders, their immediate packaging materials, and their accessories shall be permitted to be stored in rooms containing central supply systems or medical gas cylinders. No flammable materials, cylinders containing flammable gases, or containers containing flammable liquids shall be stored in these rooms. Wooden racks for cylinder storage are permitted.	4-3.1.1.2(a)7 4-3.1.1.2(a)11e 4-3.1.1.2(a)7
	(g) If cylinders are wrapped when received, the wrappers shall be removed prior to storage.	4-3.1.1.2(a)7
	(h) Cylinders not in use shall have their valve protection caps secured tightly in place.	4-3.1.1.2(a)8
	(i) Locations containing Medical gases other than Oxygen and Medical Air shall have their door labeled substantially as follows: CAUTION Medical Gases NO Smoking or Open Flame Room may have Insufficient Oxygen Open Door and allow room to ventilate before entering.	Proposal #4
	(j) Locations containing only Oxygen and/or Medical Air shall have their door labeled substantially as follows: CAUTION Medical Gases NO Smoking or Open Flame	Proposal #5
	(k) Cryogenic Liquid storage units intended to supply gas to the facility shall not be used to fill other liquid storage vessels.	R. Sutter Proposal
	(l) Central supply systems shall be obtained from and installed in accordance with the instructions of a supplier familiar with their proper construction and use.	4-3.1.1.4(a)5
4-3.1.1.2 Central Supply Location (Level 1 and 2) (Placement, Construction, Arrangement).		
	(a) Location of Central Supply Systems. Central Supply Systems for medical gases and mixtures of these Gases shall be located:	
	1. Systems complying with 4-3.1.1.4, 4-3.1.1.5, and 4-3.1.1.6: Outdoors in an enclosure used only for this purpose sited to comply with Table 2-2.4 in NFPA 50, *Standard for Bulk Oxygen Systems at Consumer Sites*.	4-3.1.1.2(a)10a Proposal #6
	2. Systems complying with 4-3.1.1.8, 4-3.2.1, and 4-3.3.1: Indoors in a dedicated mechanical equipment area, adequately ventilated and with any required utilities. It is permitted to locate more than one of these systems together in the same room. These systems shall not be located in the same room with any systems complying with 4-3.1.1.4, 4-3.1.1.5, or 4-3.1.1.6, except medical air reserve headers complying with 4-3.1.1.3(a)6.	4-3.1.1.2(a)10a
	3. Systems complying with 4-3.1.1.4, 4-3.1.1.5: Indoors within a room used only for this purpose. It is permitted to locate more than one of these systems together in the same room.	
	4. Indoor locations shall be placed on exterior walls whenever possible.	Proposal #7
	5. Locations shall be chosen to admit access by delivery vehicles and management of cylinders (e.g., Proximity to loading docks, access to elevators, passage of cylinders through public areas). Bulk Liquid Vessels shall additionally be provided free access for the positioning and safe operation of the standard delivery vehicle during filling.	Proposal #8
	6. Indoor locations for oxygen, nitrous oxide, and mixtures of these gases shall not communicate with areas involved in critical patient care, anesthetizing locations, locations storing flammables, rooms containing open electrical conductors or transformers, storage tanks for flammable or combustible liquids, engines, kitchens, or areas with open flames.	4-3.1.1.2(a)11b 4-3.1.1.2(a)11e Proposal #9
	7. Cylinders shall be prevented from reaching temperatures in excess of 130°F (54°C). In outdoor locations, they shall be protected from direct sun.	4-3.1.1.2(a)11e Proposal #10
	8. Central Supply Systems for Nitrous Oxide and Carbon Dioxide shall be prevented from reaching temperatures lower than 0°F (-18°C).	Proposal #11
	(b) Central Supply systems for Oxygen complying with 4-3.1.1.6 shall comply with NFPA 50, *Standard for Bulk Oxygen Systems at Consumer Sites*.	4-3.1.1.2(b)1
	(c) Central Supply systems for Nitrous Oxide with a total capacity connected and in storage of 3,200 lbs (1452 kg) or more shall comply with CGA G-8.1, *Standard for the Installation of Nitrous Oxide Systems at Consumer Sites*.	4-3.1.1.2(b)2
	(d) Storage Locations for full or empty Medical Gas Cylinders when not connected shall be located:	4-3.1.1.2(b)3 4-3.1.1.2(a)
	1. Outdoors in an enclosure complying with 4-3.1.1.2(a)1, (e) and (f)1, or Indoors within a room complying with 4-3.1.1.2(e) and (f)1.	
	2. In the same rooms or enclosures as their respective Central Supply systems.	
	3. If Oxygen in storage exceeds 30,000 ft^3 (566 m^3) at Standard Temperature and Pressure (STP), storage locations shall comply with 4-3.1.1.2(b).	
	4. If total Nitrous Oxide in storage exceeds 3,200 lbs (1452 kg) at Storage Temperature and Pressure, storage locations shall comply with 4-3.1.1.2(c).	
	(e) Construction.	

	1. Locations for Central Supply Systems and the storage of medical Gases shall be:	
	a. Constructed with access sufficient to move cylinders, equipment, etc. in and out.	Proposal #12
	b. Doors or gates shall be lockable or otherwise secured.	4-3.1.1.2(a)11c
	c. Outdoor locations shall be provided with a substantial enclosure (wall or fencing) constructed of noncombustible or limited combustible materials.	Proposal #13
	d. Indoor locations and their interior finishes shall be constructed of noncombustible or limited combustible materials and all walls, floors, ceilings, and doors shall be of a minimum one-hour fire resistance rating.	4-3.1.1.2(b)3
	e. Electrical installation shall comply with NFPA 70, *National Electrical Code*, for ordinary locations. Electrical fixtures shall be placed at or above 5 ft (1.5 m) Above Finished Floor (AFF) to avoid physical damage.	4-3.1.1.2(a)4 4-3.1.1.2(a)11d
	f. Heating shall be by indirect means (e.g., steam, hot water).	4-3.1.1.2(a)11g
	g. Racks, chains, or other fastenings shall be provided to secure cylinders from falling. Such restraints shall be provided for all cylinders, whether connected, unconnected, full, or empty.	4-3.1.1.2(a)3 Proposal #14
	2. Electrical supply for central supply systems shall be from the Life Safety Branch of the Essential Electrical System (Chapter 3).	Proposal #39
	(f) Ventilation.	
	1. All locations containing Central Supply systems or used for storing medical gas containers shall be ventilated to prevent the accumulation of medical gases from leaks and operation of cylinder or manifold overpressure safety devices.	4-3.1.1.2(a)10c
	2. Indoor Supply Systems complying with 4-3.1.1.6 and 4-3.1.1.7 shall:	
	a. Have all relief valves vented to outside per 4-3.1.1.3(a)3iii.	Proposal #15
	b. Be provided with dedicated mechanical ventilation drawing from the floor. This mechanical ventilation shall operate continuously and shall be connected to the Life Safety Branch of the Emergency Electrical System. Where the total gas connected and in storage is less than 3,000 ft^3 (85 m^3), or the only gas in the room is medical air, natural ventilation may be employed. Natural ventilation shall be to the outdoors wherever possible, and shall be through a louvered opening with a minimum free area of 72 $in.^2$ (0.05 m^2) placed at floor level. In the event that an outside wall is not available, and the vent will not open to an exit access corridor, this opening shall be permitted to be through the door or wall.	Proposal #16 4-3.1.1.2(b)4 4-3.1.1.2(c) Proposal #17 Proposal #16
	3. Outdoor locations surrounded by impermeable walls shall have grated ventilation openings of 72 $in.^2$ (0.05 m^2) free area each, located at the base of each wall to allow free circulation of air within the enclosure.	Proposal #18
	4. Locations for Medical air compressors, Vacuum pumps, and WAGD producers shall be adequately ventilated to prevent accumulation of heat.	4-3.1.1.2(a)10d
4-3.1.1.3 Central Supply Systems, Level 1. A central supply system shall consist of cylinder manifolds for gas cylinders per 4-3.1.1.4, manifolds for cryogenic liquid cylinders per 4-3.1.1.5, bulk cryogenic liquid systems per 4-3.1.1.6, medical air compressor systems per 4-3.1.1.7, vacuum producers per 4-3.2.1, or WAGD producers per 4-3.3.1. Selection between types shall be made based on owner preference, good engineering practice, and the ability of the system to meet all requirements of this standard when installed at the chosen location and in the available space.		4-3.1.1.4 Proposal #19
	(a) Central Supply Systems, Level 1, Common Requirements.	
	1. Materials. Materials of construction for Central Supply Systems shall be suited to the gases and pressures conveyed, the temperatures encountered, and the environmental challenges of their location.	4-3.1.1.3 Proposal #20
	a. Portions of systems intended to handle oxygen at pressures >300 psig (2,070 kPa) shall contain no polymeric materials. All components shall be made of materials having a resistance to combustion not lower than that of Red Brass in ASTM STP 1197-1993.	Proposal #21
	b. Portions of systems intended to handle Oxygen or Nitrous Oxide at pressures lower than 300 psig (2,070 kPa) shall be constructed of materials having adequate compatibility with oxygen under the temperatures and pressures to which the components may be exposed in the containment and use of oxygen, nitrous oxide, mixtures of these gases, or mixtures containing more than 23.5 percent oxygen. Components include but are not limited to containers, valves, valve seats, lubricants, fittings, gaskets, and interconnecting equipment including hoses. Easily ignitable materials shall be avoided.	4-3.1.1.3(a) Proposal #21
	c. Components and controls which may be subjected to cryogenic exposure shall be suitable for low temperature service.	Proposal #22
	d. Components intended for outdoor installation shall be weather resistant.	Proposal #20
	2. Emergency Oxygen Supply Connection. Supply connections complying with 4-3.1.1.8 shall be installed for Oxygen systems where:	4-3.1.1.3(a)
	a. The central supply system is outside of and remote from the building which the oxygen supply serves.	4-3.1.1.8(h)
	b. There is not in the building a connected oxygen reserve sufficient for an average day's supply.	Proposal #23
	c. Multiple buildings are served from a single oxygen source such that damage to the interconnecting oxygen line could result in (a) building(s) losing oxygen supply.	Proposal #24
	3. Regulators and Relief Valves. *[See Figure 4-3.1.1.3(a)3.]* All positive pressure central supply systems shall:	4-3.1.1.8(c) and 4-3.1.1.9(g)
	a. Be provided with duplex final line pressure regulators, installed in a four valve bypass arrangement permitting service to either regulator without interruption of supply. Each regulator outlet shall be provided with a pressure gauge.	Proposal #25
	b. Be provided with at least one Relief Valve of brass, bronze, or stainless steel construction designed for the gas service, which:	4-3.1.1.8(e) Proposal #26

	i. Is located between the Source Valve and the final line regulator bypass valves.	4-3.1.1.8(e) and figs.
	ii. Is set at 50 percent above the normal system operating pressure (4-3.1.2.4).	4-3.1.1.8(e)
	iii. For all gases other than Air, and for air where total connected cylinder capacity exceeds 3,000 ft^3 (85 m^3) of gas at Standard Temperature and Pressure, is vented to the outside of the building. Relief Valve vent lines shall be sized to prevent back pressure from rupturing the pipe when the relief valve is fully open. Materials shall comply with 4-3.1.1.3. Vent lines shall discharge in areas away from flammable materials and not where passerby may be endangered by the discharge. Vent lines shall be turned down and screened to prevent the entry of water or vermin.	4-3.1.1.8(e) Proposal #27
	4. Multiple Pressures. Where a single Central Supply System supplies two Piped Distribution Networks operating at different pressures, each Piped Distribution Network shall be separately provided with all elements in 4-3.1.1.3(a)3 and 4-3.1.1.3(a)5.	4-3.1.1.8(c)
	5. Alarms and Indicators. Visual indicators shall be located at Central Supply Systems complying with 4-3.1.1.5, 4-3.1.1.6, and 4-3.1.1.7. These shall be visual indicators (audible indicators are not required except as otherwise noted) labeled for the service and condition being monitored. Appropriate weather resistant indicators or housings shall be provided for outdoor locations.	Proposal #28 Proposal #20
	6. Headers. *[See Figure 4-3.1.1.3(a)6.]* In Central Supply systems using pressurized cylinders, either gas or liquid, each header shall consist of:	4-3.1.1.5(a), 4-3.1.1.6(a)3
	a. Sufficient cylinder connections to provide for at least an average day's supply. The appropriate number of cylinders shall be determined after consideration of delivery schedules, proximity of the facility to alternate supplies, and the facility's emergency plan. In no case shall fewer than two cylinders be provided.	4-3.1.1.7(b)1 Proposal #29
	b. A Cylinder lead for each cylinder which shall be provided with end fittings complying with CGA Pamphlet V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections*, (ANSI B57.1). Such fittings shall be permanently attached to the cylinder lead. The use of adapters or conversion fittings to adapt one gas specific fitting to another is prohibited.	4-3.1.1.8(b) Proposal #30
	c. A filter of a material complying with 4-3.1.1.3(a) shall be provided to prevent the intrusion of debris into the manifold controls.	Proposal #31
	d. A Header shutoff valve downstream of the nearest cylinder connection, but upstream of the point at which the header connects to the Central Supply system.	Figs.
	e. A pressure gauge indicating header contents.	Proposal #25
	f. A check valve to prevent backflow into the header and to permit service to the header.	Figure 4-3.1.1.5
	g. If intended for Gas Cylinder service:	4-3.1.1.5(b)
	i. Each cylinder connection shall be provided with a check valve at the header to prevent loss of gas in the event of damage to a cylinder lead or operation of an individual cylinder relief valve.	
	ii. A pressure regulator to reduce the pressure to an intermediate pressure under 300 psig and an intermediate pressure gauge.	Proposal #25
	h. If intended for service with Cryogenic Liquid Cylinders, the Header shall include a pressure relief valve. No check valve in each cylinder lead is required.	4-3.1.1.6(c)
	7. Header Connections. Headers shall be constructed so that each cylinder connection, connections between header sections, and connection of the header to the manifold shall be made using a noninterchangeable, gas specific fitting complying with CGA Pamphlet V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections*, (ANSI B57.1). Such fittings shall be permanently attached to the header pipe.	Proposal #32 (see also 4-3.1.1.8(b)
	8. Vaporizers. Vaporizers provided to convert cryogenic liquids to the gas state shall be ambient heat transfer units so that flow from the vaporizer is unaffected by loss of power. Exception: use of powered vaporizers is permitted provided that:	R. Sutter Proposal
	a. Reserve ambient vaporizers are provided and are piped to the source of supply in such a manner as to be unaffected by a freeze up or flow stoppage from the powered vaporizer. The reserve vaporizer shall be capable of vaporizing at least one day's average use.	
	b. Medical gas is available from a non-cryogenic source capable of providing at least one day's average supply.	
	Vaporizers shall be sized to provide adequate capacity under all conditions. Winter temperature extremes, structures which obstruct air circulation, and sunlight shall be considered by the agency rating and selecting vaporizers. Vaporizers shall be installed in a manner which permits the switching of units to allow deicing. Switching valves shall:	
	a. Not be solenoid type if the valve is so located as to stop the flow of gas to the facility.	
	b. If powered, have the ability to be manually operated.	
	c. Not stop flow of gas to the facility during switching.	
	It shall be the responsibility of the facility to inform the owner or agency performing maintenance on the supply systems of changes in the site or use pattern which would affect the performance of the vaporizers.	
4-3.1.1.5 Manifolds for Gas Cylinders without Reserve Supply *(see Figure 4-3.1.1.5)*.		4-3.1.1.5
	(a) Manifolds for Gas Cylinders without Reserve Supply shall be located per 4-3.1.1.2.	
	(b) A Manifold for Gas Cylinders shall consist of:	4-3.1.1.5(a)
	1. Two equal Headers [4-3.1.1.3(a)6]. These two assemblies shall then connect to the final line pressure regulator assembly in such a manner that either header may supply the system.	
	2. A relief valve(s) shall be provided to protect the piping between the Header pressure regulator and the line pressure regulator assembly, and the line pressure regulators from over pressure in the event of a header regulator failure. This(ese) relief valve(s) shall be piped to outside in accordance with 4-3.1.1.3(a)3.	Proposal #33 Proposal #27
	(c) An automatic means of controlling the two headers shall be provided such that:	4-3.1.1.6(a)–(b)

	1. In normal operation, one Header is the Primary and the other is the Secondary. Either Header shall be capable of either role.	4-3.1.1.6(a)–(b)
	2. When the Primary Header is supplying the system, the Secondary Header is prevented from supplying the system until the Primary Header is depleted, at which point the Secondary Header shall automatically begin to supply the system.	4-3.1.1.6(a)–(b)
	(d) Alarms shall be actuated by the manifold:	
	1. When or just before the Secondary Header begins to supply the system, indicating changeover has occurred. This Alarm shall actuate at a Local indicator and at all Master Alarms:	
	2. If the manifold requires a manual operation to exchange the role of Primary and Secondary Header, then the manifold shall include a contents indication to indicate when either header is below an average day's supply. This Alarm shall actuate at a Local indicator and at all Master Alarms. This indication is not required if the manifold is designed to automatically rotate Primary and Secondary.	Proposal #34
	(e) If manifolds are located out of doors, they shall be weather resistant.	Proposal #20
4-3.1.1.6 Manifolds for Cryogenic Liquid Cylinders *(see Figure 4-3.1.1.6).*		
	(a) Location	
	1. Manifolds for Cryogenic Liquid Cylinders shall be located per 4-3.1.1.2. If indoors, the mechanical venting system required in 4-3.1.1.2(b)4 shall be provided.	
	2. The Primary and Secondary Headers shall be located in the same enclosure. The Reserve Header may be located in the same enclosure or in another enclosure compliant with 4-3.1.1.2.	Proposal #35
	(b) A Manifold for Cryogenic Liquid Cylinders shall consist of:	4-3.1.1.6(a) and
	1. Two equal Headers [4-3.1.1.3(a)6] for Cryogenic Liquid Cylinders. These two assemblies shall connect to the Final Line Pressure Regulator Assembly in such a manner that either header may supply the system.	(b), Fig. 4-3.1.1.6
	2. A third Header [4-3.1.1.3(a)6] for Gas Cylinders connected downstream of the Primary/Secondary headers and upstream of the Final Line Pressure regulators. This Reserve Header shall include sufficient cylinder connections to provide for at least an average day's supply but not less than three cylinder connections. The appropriate number of cylinders shall be determined after consideration of delivery schedules, proximity of the facility to alternate supplies, and the facility's emergency plan.	4-3.1.1.6(a)3 Proposal #29
	3. A Pressure relief valve shall be installed in the piping after the connection of the Reserve Header and before the Final Line Pressure Regulating Assembly. This relief valve shall be set at or below the relief pressure for the Cryogenic Liquid Cylinders.	Fig. 4-3.1.1.6 Proposal #36
	(c) An automatic means of controlling the three headers shall be provided such that:	4-3.1.1.6
	1. In normal operation, one Cryogenic Liquid Header is the Primary and the other is the Secondary. Either Header shall be capable of either role. The Gas Cylinder Reserve Header operates to supply the system only in the event of depletion or failure of both Headers for Cryogenic Liquid Cylinders, and shall not be included in the rotation of Primary and Secondary.	4-3.1.1.6(a)
	2. When the Primary Header is supplying the system, the Secondary Header is prevented from supplying the system until the Primary Header is depleted, at which point the Secondary Header shall automatically begin to supply the system. Except that a means to conserve the gas produced by evaporation of the cryogenic liquid in the Secondary Header shall be provided. This mechanism shall discharge the gas into the line upstream of the final line regulator assembly.	4-3.1.1.6(a) 4-3.1.1.6(d) Proposal #37 4-3.1.1.6(d)
	3. A means shall be provided to exchange the Primary and Secondary Banks. Such means may be manual or automatic.	Fig. 4-3.1.1.6
	4. If for any reason the Primary and Secondary cannot supply the system, the Reserve Header shall automatically operate to supply the system.	4-3.1.1.6(a)3
	(d) Alarms shall be actuated by the Central Supply System:	
	1. When or just before the Secondary Header begins to supply the system, indicating Changeover at a Local indicator and at all Master Alarms:	4-3.1.1.6(a)2
	2. When or just before the Reserve Header begins to supply the system, indicating Reserve is in Use at a Local indicator and at all Master Alarms:	
	3. When or just before the Reserve Header contents fall to one day's average supply, indicating Reserve Low at a Local indicator and at all Master Alarms:	4-3.1.1.6(a)3
4-3.1.1.7 Bulk Cryogenic Liquid Systems *(see Figure 4-3.1.1.7).*		4-3.1.1.6(b)
	(a) Location	
	1. Bulk Cryogenic Liquid Systems shall be located outdoors in accordance with 4-3.1.1.2.	4-3.1.1.7
	2. Bulk Cryogenic Installations shall comply with CGA, *Guidelines for Medical Gas Installations at Consumer Sites,* and shall be sited on poured concrete, enclosed as per (c) above with the poured concrete pad (equipment pad) completely filling the enclosed space. No drain shall be located within the pad or closer than 8 ft (2.4 m) from the edge of the pad. The location intended for the delivery vehicle (the vehicle pad) shall be concrete. Drainage from the vehicle pad shall be away from the building, parked vehicles, or other potential sources of ignition. The location intended for the delivery vehicle shall comply with NFPA 50. Consideration shall be given to the consequences of a large spillage of liquid on the vehicle pad in terms of where the liquid would run, and where the very cold gas would travel as it boiled off the liquid.	Proposal #38
	(b) A Bulk Cryogenic Liquid System shall consist of:	
	1. One or more Main Supply Vessel(s), including all elements pertinent to its proper functioning. The appropriate capacity shall be determined after consideration of delivery schedules, proximity of the facility to alternate supplies, and the facility's emergency plan.	Proposal #29

	2. A Reserve Supply sized for greater than an average day's supply. The appropriate size of vessel or number of cylinders shall be determined after consideration of delivery schedules, proximity of the facility to alternate supplies, and the facility's emergency plan. Reserve Supply shall consist of either:	Proposal #29
	a. A second Cryogenic Liquid Vessel including an actuating switch/sensor monitoring internal pressure and a contents gauge and provided with a check valve to prevent backflow into the reserve system.	4-3.1.1.7(b)2
	b. A Gas Cylinder Header [4-3.1.1.3(a)6] which shall include not less than three cylinder connections, and shall include a contents pressure switch.	4-3.1.1.7(b)1
	(c) An automatic means of controlling the Main Supply(ies) and Reserve Supply shall be provided such that:	
	1. In normal operation, the Main Supply operates to serve the system. The Reserve Supply operates to supply the system only in the event of depletion or failure of the Main Supply.	4-3.1.1.7(a)2
	2. When the Main Supply is supplying the system, the Reserve Supply is prevented from supplying the system until the Main Supply fails or is depleted, at which point the Reserve Supply shall automatically begin to supply the system.	
	3. In the case of a Cryogenic Vessel used as the reserve, the Reserve Vessel shall include a means to conserve the gas produced by evaporation of the cryogenic liquid in the Reserve Vessel. This mechanism shall discharge the gas into the line upstream of the final line regulator assembly.	4-3.1.1.7(b)2
	4. Where there is more than one Main Supply Vessel, the system shall operate as described in 4-3.1.1.4(c) for Primary/Secondary/Reserve operation.	4-3.1.1.7(a)1
	(d) Alarms shall be actuated by the Central Supply System:	
	1. When or just before the Main Supply reaches an average day's supply, indicating Low Contents at a Local indicator and at all Master Alarms.	Proposal #3
	2. When or just before the Reserve Supply begins to supply the system, indicating Reserve is in Use at a Local indicator and at all Master Alarms.	4-3.1.1.7(a)
	3. When or just before the Reserve Supply contents fall to one day's average supply, indicating Reserve Low at a Local indicator and at all Master Alarms.	4-3.1.1.7(b)1 & 2
	4. If the Reserve is a Cryogenic Vessel, when or just before the Reserve Internal Pressure falls too low for the reserve to operate properly, indicating Reserve Failure at a Local indicator and at all Master Alarms.	4-3.1.1.7(b)2
	5. Where there is more than one Main Supply Vessel, when or just before the Secondary Vessel begins to supply the system, indicating Changeover at a Local indicator and at all Master Alarms.	4-3.1.1.7(a)

SUBSTANTIATION: NOTE: Supporting material is available for review at NFPA Headquarters.

COMMITTEE ACTION: Accept in Principle.
Revise as follows:

4-3.1.1.1 Central Supply System Management.		
	(a) Only cylinders and containers constructed, tested, and maintained in accordance with U.S. Department of Transportation specifications and regulations shall be permitted to be used.	4-3.1.1.1(a)
	(b) Cylinder contents shall be identified by attached labels or stencils naming the contents. Cylinders and containers shall be identified in accordance with **CGA Pamphlet C-7, Guide to the Preparation of Precautionary Labeling and Marking of Compressed Gas Containers, 1992**.	4-3.1.1.1(b)
	(c) Contents of cylinders and containers shall be identified by reading the labels prior to use. **Labels shall not be defaced, altered, or removed. Cylinders without correct markings or whose markings and gas specific fittings do not match shall not be used.**	4-3.1.1.1(c) Log #145
	(d) **Cylinders and containers shall be handled in strict accordance with 4-3.5.2.**	Log #146
	(e) Racks, shelves, and supports used in areas containing medical gas shall be constructed of non-combustible materials or limited combustible materials.	4-3.1.1.2(a)
	(f) Only medical gas cylinders, their immediate packaging materials, and their accessories shall be permitted to be stored in rooms containing central supply systems or medical gas cylinders. No flammable materials, cylinders containing flammable gases or containers containing flammable liquids shall be stored in these rooms. Wooden racks for cylinder storage are permitted.	4-3.1.1.2(a)7 4-3.1.1.2(a)11e 4-3.1.1.2(a)7
	(g) If cylinders are wrapped when received, the wrappers shall be removed prior to storage.	4-3.1.1.2(a)7
	(h) Cylinders not in use shall have their valve protection caps secured tightly in place.	4-3.1.1.2(a)8
	(i) Locations containing central supply systems or cylinders supplying same shall have their door labeled as follows: **CAUTION** **Medical Gases** **NO Smoking or Open Flame**	Log #147 Log #148
	(j) Cryogenic liquid storage units intended to supply gas to the facility shall not be used to fill other liquid storage vessels.	
	(k) Central supply systems shall be obtained from and installed in accordance with the instructions of a supplier familiar with their proper construction and use.	4-3.1.1.4(a)5
4-3.1.1.2 Central Supply Location (Level 1 and 2) (Placement, Construction, Arrangement).		Log #89
	(a) Location of Central Supply Systems. Central supply systems for medical gases and mixtures of these gases shall be located:	
	1. Systems complying with 4-3.1.1.4, 4-3.1.1.5, and 4-3.1.1.6: Outdoors in an enclosure used only for this purpose sited to comply with minimum distance requirements in **Table 2-2.4 in NFPA 50, *Standard for Bulk Oxygen Systems at Consumer Sites*.**	4-3.1.1.2(a)10a Log #149

	2. Systems complying with 4-3.1.1.8, 4-3.2.1, and 4-3.3.1: Indoors in a dedicated mechanical equipment area, adequately ventilated and with any required utilities. It is permitted to locate more than one of these systems together in the same room. These systems shall not be located in the same room with any systems complying with 4-3.1.1.4, 4-3.1.1.5, or 4-3.1.1.6, except medical air reserve headers complying with 4-3.1.1.3(a)6.	4-3.1.1.2(a)10a
	3. Systems complying with 4-3.1.1.4, 4-3.1.1.5: Indoors within a room used only for this purpose. It is permitted to locate more than one of these systems together in the same room.	
	4. Locations shall be chosen to admit access by delivery vehicles and management of cylinders (e.g., Proximity to loading docks, access to elevators, passage of cylinders through public areas).	Log #151
	5. Indoor locations for oxygen, nitrous oxide, and mixtures of these gases shall not communicate with areas involved in critical patient care, anesthetizing locations, locations storing flammables, rooms containing open electrical conductors or transformers, storage tanks for flammable or combustible liquids, engines, kitchens, **or areas with open flames.**	4-3.1.1.2(a)11b 4-3.1.1.2(a)11e Log #152
	6. Cylinders shall be prevented from reaching temperatures in excess of 54°C (130°F).	4-3.1.1.2(a)11e
	7. Central supply systems for nitrous oxide and carbon dioxide shall be prevented from reaching temperatures lower than -18°C (0°F).	Log #154
	(b) Central supply systems for oxygen complying with 4-3.1.1.6 shall comply with NFPA 50, *Standard for Bulk Oxygen Systems at Consumer Sites.*	4-3.1.1.2(b)1
	(c) Central supply systems for nitrous oxide with a total capacity connected and in storage of 1452 kg (3,200 lbs) or more shall comply with CGA G-8.1, *Standard for the Installation of Nitrous Oxide Systems at Consumer Sites.*	4-3.1.1.2(b)2
	(d) Storage locations for full or empty medical gas sylinders when not connected shall be located:	4-3.1.1.2(b)3 4-3.1.1.2(a)
	1. outdoors in an enclosure complying with 4-3.1.1.2(a)1, (e) and (f)1, or Indoors within a room complying with 4-3.1.1.2(e) and (f)1.	
	2. in the same rooms or enclosures as their respective central supply systems.	
	3. if oxygen in storage exceeds 566 m^3 (20,000 ft^3) at Standard Temperature and Pressure (STP), storage locations shall comply with 4-3.1.1.2(b).	
	4. if total nitrous oxide in storage exceeds 1452 kg (3,200 lbs) at Storage Temperature and Pressure (STP), storage locations shall comply with 4-3.1.1.2(c).	
	(e) Construction.	
	1. Locations for central supply systems and the storage of medical gases shall be:	
	a. constructed with access to move cylinders, equipment, etc. in and out.	Log #155
	b. doors or gates shall be lockable or otherwise secured.	4-3.1.1.2(a)11c
	c. outdoor locations shall be provided with an enclosure (wall or fencing) constructed of non-combustible materials.	Log #156
	d. indoor locations and their interior finishes shall be constructed of non-combustible or limited combustible materials and all walls, floors, ceilings and doors shall be of a minimum one-hour fire resistance rating.	4-3.1.1.2(b)3
	e. electrical installation shall comply with NFPA 70, NEC for ordinary locations. Electrical fixtures shall be placed at or above 1.5 m (5 ft) Above Finished Floor (AFF) to avoid physical damage.	4-3.1.1.2(a)4 4-3.1.1.2(a)11d
	f. heating shall be by indirect means (e.g., steam, hot water).	4-3.1.1.2(a)11g
	g. racks, chains, or other fastenings shall be provided to secure cylinders from falling. **Such restraints shall be provided for all cylinders, whether connected, unconnected, full, or empty.**	4-3.1.1.2(a)3 Log #157, 37, and 183
	2. Electrical supply for central supply systems shall conform to the requirements of the essential electrical systems as described in Chapter 3 of this document.	Log #182
	(f) Ventilation.	
	1. All locations containing central supply systems or used for storing medical gas containers shall be ventilated to prevent the accumulation of medical gases from leaks and operation of cylinder or manifold overpressure safety devices.	4-3.1.1.2(a)10c
	2. Indoor supply systems complying with 4-3.1.1.5 and 4-3.1.1.6 shall:	
	a. have **all** relief valves vented to outside per 4-3.1.1.3(a)3iii.	Log #158 and 38
	b. where the total gas connected and in storage is greater than 85 m^3 (3,000 ft^3), be provided with dedicated mechanical ventilation **drawing from the floor. This mechanical ventilation shall operate continuously and shall conform to the requirements of the essential electrical systems as described in Chapter 3 of this document.**	Log #159 4-3.1.1.2(b)4 Log #182
	c. where the total gas connected and in storage is less than 85 m^3 (3,000 ft^3), or the only compressed gas in the room is medical air, natural ventilation shall be permitted to be employed. A louvered opening with a minimum free area of **500 cm^2 (72 sq $in.^2$) shall be located 25 cm (1 ft) above floor level. A second vent of equal or greater free area shall be placed 25 cm (1 ft) below ceiling level.**	4-3.1.1.2(c) Log #159
	d. natural ventilation openings as in (f)2.c. above shall not open onto egress corridors. Where no alternative to an egress corridor is available, the mechanical ventilation required in (f)2.b. above shall be employed.	Log #225
	3. **Outdoor locations surrounded by impermeable walls shall have protected ventilation openings located at the base of each wall to allow free circulation of air within the enclosure.**	Log #161
	4. Locations for medical air compressors, vacuum pumps, and WAGD producers shall be adequately ventilated to prevent accumulation of heat.	4-3.1.1.2(a)10d
4-3.1.1.3 Central Supply Systems, Level 1. A central supply system shall consist of cylinder manifolds for gas cylinders per 4-3.1.1.4, manifolds for cryogenic liquid cylinders per 4-3.1.1.5, bulk cryogenic liquid systems per 4-3.1.1.6, medical air compressor systems per 4-3.1.1.8, vacuum producers per 4-3.2.1, or WAGD producers per 4-3.3.1.		4-3.1.1.4

	(a) Central Supply Systems, Level 1, Common Requirements.	
	1. Piped oxygen, medical air, nitrous oxide, carbon dioxide, nitrogen and all other medical gases shall not be piped to, or used for, any purpose except for use in patient care applications.	Log #285
	2. Materials. Materials of construction for central supply systems shall be suited to the gases and pressures conveyed, **the temperatures encountered and the environmental challenges of their location.**	4-3.1.1.3 Log #163
	a. Portions of systems intended to handle oxygen at pressures 2,070 kPa (>300 psig) shall contain no polymeric materials. All components shall be made of materials having a resistance to combustion not lower than that of red brass in ASTM STP 1197-1993.	Log #164 and 223
	b. Portions of systems intended to handle oxygen or nitrous oxide **at pressures lower than 2,070 kPa (300 psig)** shall be constructed of materials having adequate compatibility with oxygen under the temperatures and pressures to which the components may be exposed in the containment and use of oxygen, nitrous oxide, mixtures of these gases, or mixtures containing more than 23.5 percent oxygen. Components include but are not limited to containers, valves, valve seats, lubricants, fittings, gaskets, and interconnecting equipment including hoses. Easily ignitable materials shall be avoided.	4-3.1.1.3(a) Log #164
	c. **Components and controls which may be subjected to cryogenic exposure shall be designed for low temperature service.**	Log #165
	d. **Components intended for outdoor installation shall be listed and approved for outdoor use.**	Log #163
	3. Regulators and Relief Valves. *[See Figure 4-3.1.1.3(a)3.]* All positive pressure central supply systems shall:	4-3.1.1.8(c) and 4-3.1.1.9(g)
	a. be provided with duplex final line pressure regulators, installed in parallel with isolation valves before each regulator and an isolation or check valve after each regulator permitting service to either regulator without interruption of supply. (ADJUST FIGURES) **Each regulator outlet shall be provided with a pressure gauge.**	Log #168 4-3.1.1.8(e)
	b. be provided with at least one relief valve of brass, **bronze, or stainless steel construction** designed for the gas service, which:	Log #169 4-3.1.1.8(e) and
	i. is located between the source valve and the final line regulator bypass valves.	figs. 4-3.1.1.8(e)
	ii. is set at 50 percent above the normal system operating pressure (see Table 4-3.1.2.4).	4-3.1.1.8(e)
	iii. for all gases other than air, and for air where total connected cylinder capacity exceeds 85 m^3 (3,000 ft^3) of gas at Standard Temperature and Pressure, is vented to the outside of the building. **Relief valve vent lines shall be sized at least at the full size of the relief valve outlet(s). Where multiple outlets are tied to a single vent line, they shall be sized at the aggregate internal area. Materials shall comply with 4-3.1.1.3. Vent lines shall discharge in areas away from flammable materials and not where passerby may be endangered by the discharge. Vent lines shall be turned down and screened to prevent the entry of water or vermin.**	Log #170 4-3.1.1.8(c)
	4. Multiple Pressures. Where a single central supply system supplies two piped distribution networks operating at different pressures, each piped distribution network shall be separately provided with all elements in 4-3.1.1.3(a)3 and 4-3.1.1.3(a)5.	4-3.1.1.8(c) Log #171
	5. Alarms and Indicators. **Visual indicators shall be located at central supply systems complying with 4-3.1.1.4, 4-3.1.1.5, and 4-3.1.1.6. These shall be visual indicators (audible indicators are not required except as otherwise noted) labeled for the service and condition being monitored. Indicators or housings listed and approved for outdoor use shall be provided for outdoor locations.**	Log #163 4-3.1.1.5(a)
	6. Headers. *[See Figure 4-3.1.1.3(a)6.]* In central supply systems using pressurized cylinders, either gas or liquid, each header shall consist of:	4-3.1.1.6(a)3 and 4-3.1.1.7(b)1
	a. sufficient cylinder connections to provide for at least an average day's supply. The appropriate number of cylinders **shall be determined after consideration of delivery schedules, proximity of the facility to alternate supplies, and the facility's emergency plan. In no case shall fewer than** two cylinders **connections** be provided.	Log 172 and 34 4-3.1.1.8(b)
	b. a cylinder lead for each cylinder which shall be provided with end fittings complying with CGA Pamphlet V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections,* (ANSI B57.1). **Such fittings shall be permanently attached to the cylinder lead. The use of adapters or conversion fittings to adapt one gas specific fitting to another is prohibited.**	Log #173 Log #174
	c. **a filter of a material complying with 4-3.1.1.3(a) shall be provided to prevent the intrusion of debris into the manifold controls.**	Figures
	d. a header shutoff valve downstream of the nearest cylinder connection, but upstream of the point at which the header connects to the central supply system.	Log #168
	e. **a pressure gauge indicating header contents.**	Figure 4-3.1.1.5
	f. a check valve to prevent backflow into the header and to permit service to the header.	4-3.1.1.5(b)
	g. if intended for gas cylinder service:	
	i. each cylinder connection shall be provided with a check valve at the header to prevent loss of gas in the event of damage to a cylinder lead or operation of an individual cylinder relief valve.	Log #168
	ii. a pressure regulator to reduce the pressure to an intermediate pressure under 300 psig **and an intermediate pressure gauge**.	4-3.1.1.6(c)
	h. if intended for service with cryogenic liquid cylinders, the header shall include a pressure relief valve. No check valve in each cylinder lead is required.	4-3.1.1.5

4-3.1.1.4 Manifolds for Gas Cylinders without Reserve Supply *(see Figure 4-3.1.1.4)*.	
(a) Manifolds for gas cylinders without reserve supply shall be located per 4-3.1.1.2.	4-3.1.1.5(a)
(b) A manifold for gas cylinders shall consist of:	
1. two equal Headers [4-3.1.1.3(a)6] each containing an average day's supply but not fewer than two cylinders. These two assemblies shall then connect to the final line pressure regulator assembly in such a manner that either header may supply the system.	Log #176
2. an intermediate relief valve(s) shall be provided to protect the piping between the header pressure regulator and the line pressure regulator assembly, and the line pressure regulators from over pressure in the event of a header regulator failure. Relief valve(s) shall be piped to outside in accordance with 4-3.1.1.3(a)3.	Log #158 and 38 4-3.1.1.6(a)–(b)
(c) An automatic means of controlling the two headers shall be provided such that:	4-3.1.1.6(a)–(b)
1. in normal operation, one header is the primary and the other is the secondary. Either header shall be capable of either role.	4-3.1.1.6(a)–(b)
2. when the primary header is supplying the system, the secondary header is prevented from supplying the system until the primary header is depleted, at which point the secondary header shall automatically begin to supply the system.	
(d) Alarms shall be actuated by the manifold:	Log #171
1. when or just before the secondary header begins to supply the system, indicating changeover has occurred. This alarm shall actuate at a **local indicator** and at all master alarms:	Log #163
(e) If manifolds are located out of doors, they shall be listed and approved for outdoor use.	Proposal #20
4-3.1.1.5 Manifolds for Cryogenic Liquid Cylinders *(see Figure 4-3.1.1.5)*.	
(a) Location.	
1. Manifolds for cryogenic liquid cylinders shall be located per 4-3.1.1.2. If indoors, the mechanical venting system required in 4-3.1.1.2(b)4 shall be provided.	Log #178
2. The primary and secondary headers shall be located in the same enclosure. The reserve header shall be permitted to be located in the same enclosure or in another enclosure compliant with 4-3.1.1.2.	4-3.1.1.6(a) and (b), Figure 4-3.1.1.6
(b) A manifold for cryogenic liquid cylinders shall consist of:	
1. two equal headers [4-3.1.1.3(a)6] for cryogenic liquid cylinders each containing an average day's supply but not fewer than two cylinders. These two assemblies shall connect to the final line pressure regulator assembly in such a manner that either header may supply the system.	4-3.1.1.6(a)3
2. a third header [4-3.1.1.3(a)6] for gas cylinders connected downstream of the primary/secondary headers and upstream of the final line pressure regulators. This reserve header shall include sufficient cylinder connections to provide for at least an average day's supply but not less than three cylinder connections. **The appropriate number of cylinders shall be determined after consideration of delivery schedules, proximity of the facility to alternate supplies, and the facility's emergency plan.**	Log #172, 34 Figure 4-3.1.1.6 Log #179
3. A pressure relief valve shall be provided after the connection of the reserve header and before the final line pressure regulating assembly. This relief valve shall be set at or below the relief pressure for the cryogenic liquid cylinders.	4-3.1.1.6 4-3.1.1.6(a)
(c) An automatic means of controlling the three headers shall be provided such that:	
1. in normal operation, one cryogenic liquid header is the primary and the other is the secondary. Either header shall be capable of either role. The gas cylinder reserve header operates to supply the system only in the event of depletion or failure of both headers for cryogenic liquid cylinders, and shall not be included in the rotation of primary and secondary.	4-3.1.1.6(a)
2. when the primary header is supplying the system, the secondary header is prevented from supplying the system until the primary header is depleted, at which point the secondary header shall automatically begin to supply the system. Except that a means to conserve the gas produced by evaporation of the cryogenic liquid in the secondary header **shall be provided**. This mechanism shall discharge the gas into the line upstream of the final line regulator assembly.	4-3.1.1.6(d) Log #180 4-3.1.1.6(d) Figure 4-3.1.1.6 4-3.1.1.6(a)3
3. a means shall be provided to exchange the primary and secondary banks. Such means may be manual or automatic.	
4. if for any reason the primary and secondary cannot supply the system, the reserve header shall automatically operate to supply the system.	4-3.1.1.6(a)2
(d) Alarms shall be actuated by the central supply system:	
1. when or just before the secondary header begins to supply the system, indicating changeover at a **local indicator** and at all master alarms:	4-3.1.1.6(a)3
2. when or just before the reserve header begins to supply the system, indicating reserve is in use at a **local indicator** and at all master slarms:	
3. when or just before the reserve header contents fall to one day's average supply, indicating reserve low at a **local indicator** and at all master alarms:	4-3.1.1.6(b) 4-3.1.1.7
4-3.1.1.6 Bulk Cryogenic Liquid Systems *(see Figure 4-3.1.1.6)*.	
(a) Location.	Proposal missing
1. Bulk cryogenic liquid systems shall be located outdoors in accordance with 4-3.1.1.2.	
2. Bulk cryogenic installations shall comply with CGA, *Guidelines for Medical Gas Installations at Consumer Sites*, and shall be sited on poured concrete, enclosed as per (c) above with the poured concrete pad (equipment pad) completely filling the enclosed space. **No drain shall be located within the pad or closer than 2.4 m (8 ft) from the edge of the pad.** **The location intended for the delivery vehicle (the vehicle pad) shall be concrete. Drainage from the vehicle pad shall be away from the building, parked vehicles, or other potential sources of ignition.** **The location intended for the delivery vehicle shall comply with NFPA 50. Consideration shall be given to the consequences of a large spillage of liquid on the vehicle pad in terms of where the liquid would run, and where the very cold gas would travel as it boiled off the liquid.**	Log #181 Log #172 and 34

	(b) A bulk cryogenic liquid system shall consist of:	
	1. one or more main supply vessel(s), **including a contents gauge. The appropriate capacity shall be determined after consideration of delivery schedules, proximity of the facility to alternate supplies, and the facility's emergency plan.**	Log #172 and 34
	2. a reserve supply sized for greater than an average day's supply. **The appropriate size of vessel or number of cylinders shall be determined after consideration of delivery schedules, proximity of the facility to alternate supplies, and the facility's emergency plan.** Reserve supply shall consist of either:	4-3.1.1.7(b)2
	a. a second cryogenic liquid vessel including an actuating switch/sensor monitoring internal pressure and a contents gauge and provided with a check valve to prevent backflow into the reserve system.	4-3.1.1.7(b)1
	b. a gas cylinder header [4-3.1.1.3(a)6] which shall include not less than three cylinder connections, and shall include a contents pressure switch.	4-3.1.1.7(a)2
	(c) an automatic means of controlling the main supply(ies) and teserve supply shall be provided such that:	
	1. in normal operation, the main supply operates to serve the system. The reserve supply operates to supply the system only in the event of depletion or failure of the main supply.	
	2. when the main supply is supplying the system, the reserve supply is prevented from supplying the system until the main supply fails or is depleted, at which point the reserve supply shall automatically begin to supply the system.	4-3.1.1.7(b)2
	3. in the case of a cryogenic vessel used as the reserve, the reserve vessel shall include a means to conserve the gas produced by evaporation of the cryogenic liquid in the reserve vessel. This mechanism shall discharge the gas into the line upstream of the final line regulator assembly.	4-3.1.1.7(a)1
	4. where there is more than one main supply vessel, the system shall operate as described in 4-3.1.1.4(c) for primary/secondary/reserve operation.	Log #181 and 36
	(d) alarms shall be actuated by the central supply system:	
	1. **when or just before the main supply reaches an average day's supply, indicating low contents** at a **local indicator** and at all master alarms.	4-3.1.1.7(a) 4-3.1.1.7(b)1 & 2
	2. when or just before the reserve supply begins to supply the system, indicating reserve is in use at a **local indicator** and at all master alarms.	
	3. when or just before the reserve supply contents fall to one day's average supply, indicating reserve low at a **local indicator** and at all master alarms.	4-3.1.1.7(b)2
	4. if the reserve is a cryogenic vessel, when or just before the reserve internal pressure falls too low for the reserve to operate properly, indicating reserve failure at a **local indicator** and at all master alarms.	4-3.1.1.7(a)
	5. where there is more than one main supply vessel, when or just before the secondary vessel begins to supply the system, indicating changeover at a **local indicator** and at all master alarms.	4-3.1.1.3(a)
4-3.1.1.7 Emergency Oxygen Supply Connection.		
	1. emergency oxygen supply connections shall be installed for oxygen systems to permit connection of a temporary auxiliary source of supply for emergency or maintenance situations as follows:	4-3.1.1.8(h) Log #166
	a. the central supply system is outside of and remote from the building which the oxygen supply serves.	
	b. there is not in the building a connected oxygen reserve sufficient for an average day's supply. If the reserve is intended to function in the event of loss of the remote supply, the main line shall be provided with a check valve to prevent flow of gas to the remote source. This check valve shall be placed on the distribution system side of the main line valve. The reserve shall activate an alarm at the two master panels when or just before it begins to serve the system.	Log #167
	c. freestanding buildings are served from a single oxygen source such that damage to the interconnecting oxygen line could result in (a) building(s) losing oxygen supply. Each building shall be provided with a separate connection.	4-3.1.1.8(h) 4-3.1.1.8(h)3
	2. Location. Emergency oxygen supply connections shall be located:	
	a. On the exterior of the building served where it is accessible by emergency supply vehicles at all times in all weather conditions. The connection shall not be mounted on or at the main oxygen supply source.	
	b. downstream of the shutoff valve on the main supply line.	
	3. The emergency oxygen supply connection shall include:	
	a. physical protection to prevent unauthorized tampering.	
	b. necessary valves to allow emergency supply of oxygen and isolation of the piping to the normal source of supply.	
	c. one check valve in the main line between the main line shutoff valve and the tee'd connection and one check valve between the tee'd connection and the emergency supply shutoff valve.	4-3.1.1.8(h)1
	d. a relief valve of adequate size to protect the downstream piping system and related equipment from exposures to pressures in excess of 50 percent higher than normal line pressure.	4-3.1.1.8(h)2
	e. a female NPT inlet, sized for 100 percent of the system demand at the emergency source gas pressure.	

COMMITTEE STATEMENT: The committee incorporated several of the accepted proposals into this proposal to make a more comprehensive rewrite.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

COMMENT ON AFFIRMATIVE:

HOFFMAN: Remove the Note 1 and the Gas Specific Connection at the end of the header. There is no 4-3.1.1.3(a)8 and therefore no requirement that this connection be gas specific.

WAGNER: 4-3.1.1.2(a)5 "Locations shall be chosen to ~~admit~~ permit access and management...

4-3.1.1.3(a)2.a. "lower than that of ~~Red Brass~~ red brass..."

There are a number of places where words are capitalized that should not be capitalized.

(Log #167)
Committee: HEA-PIP

99- 72 - (4-3.1.1): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add new wording at end of first sentence:
"and multiple buildings are served from a single oxygen source such that damage to the interconnecting oxygen line could result in a building or buildings losing oxygen supply."
SUBSTANTIATION: The oxygen inlet is intended to provide for an alternate supply when no other means exist. In the case of a multi-building facility, a single connection may be inadequate to provide the necessary capability.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #146)
Committee: HEA-PIP

99- 73 - (4-3.1.1.1): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: In 4-3.1.1.1, refer the reader to 4-3.5.2.
SUBSTANTIATION: Many safety related elements of the standard have been moved to 4-3 for administrative reasons. However, the user of this section should be aware of these and a reference should help.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #145)
Committee: HEA-PIP

99- 74 - (4-3.1.1.1(c)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add:
"Labels shall not be defaced, altered, or removed. Cylinders without correct markings or whose markings and gas specific fittings do not match shall not be used."
SUBSTANTIATION: This is a common sense requirement but is and has been the source of cross connections and other problems which have resulted in the wrong gas being placed into systems.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #89)
Committee: HEA-PIP

99- 75 - (4-3.1.1.2): Accept in Principle
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Revise title of 4-3.1.1.2 to read as follows:
"Storage and Manifold Requirements (Location, Construction, Arrangement)."
SUBSTANTIATION: More accurate description of content of this section. Section contains more than just storage requirements.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144). Manifold requirements have been integrated into new 4-3.1.1.1.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #149)
Committee: HEA-PIP

99- 76 - (4-3.1.1.2): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Insert, with proper references, the table of distances from NFPA 50, Standard for Bulk Oxygen Systems at Consumer Sites, as a guide to the user of Chapter 4 or create a new table specific for NFPA 99.
SUBSTANTIATION: Although NFPA 50 is limited in its scope, it presents the most useful criteria available for the citing of medical gas systems. Duplication of the Table of Distances here would make it more accessible and useful for a larger number of applications. If the table is felt to be too limiting or inappropriate, a table specific to NFPA 99 should be created. The standard today offers too little guidance.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #150)
Committee: HEA-PIP

99- 77 - (4-3.1.1.2):
TCC NOTE: The Technical Correlating Committee directs the Committee to review the Committee Statement and recommends revising it to "submitter did not submit text."
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add a requirement that supply systems locations inside buildings be placed on exterior walls.
SUBSTANTIATION: Placing these locations on exterior walls will facilitate ventilation for these locations which is a prime concern.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The requirement is not mandatory and not enforceable.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #151)
Committee: HEA-PIP

99- 78 - (4-3.1.1.2): Accept in Principle in Part
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add wording:
"Locations shall be chosen to admit access by delivery vehicles and management of cylinders (e.g., proximity to loading docks, access to elevators, passage of cylinders through public areas). Bulk liquid vessels shall additionally be provided free access for the positioning and safe operation of the standard delivery vehicle during filling."
SUBSTANTIATION: This is common sense guidance of value to anyone unfamiliar with the difficulties inherent in managing a manifold.
COMMITTEE ACTION: Accept in Principle in Part.
Delete the last sentence of the proposal. The first sentence was incorporated into Proposal 99-71 (Log#144).
COMMITTEE STATEMENT: Access to bulk liquid vessels is covered by NFPA 50. See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #152)
Committee: HEA-PIP

99- 79 - (4-3.1.1.2(a)11b and e): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Insert the wording: "or areas with open flames."
SUBSTANTIATION: Throughout 4-3.1.1.2, this prohibition is implied but never clearly stated.
COMMITTEE ACTION: Accept in Principle.

COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #153)
Committee: HEA-PIP

99- 80 - (4-3.1.1.2(a)11g):
TCC NOTE: The Technical Correlating Committee directs the Committee to substantiate the Committee Statement. Supporting data is necessary, i.e., temperature and heat absorption.
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Insert the wording:
"In outdoor locations, cylinders shall be protected from direct sun."
SUBSTANTIATION: When placed out of doors and in direct sun, as might occur in a warm climate, cylinders could easily reach the 130° temperature level. The user should be cautioned against this.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Committee is not aware of any problems with cylinders stored in direct sunlight and does not feel this is a hazard.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #157)
Committee: HEA-PIP

99- 81 - (4-3.1.1.2(a)3): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add a new paragraph:
"Such restraints shall be provided for all cylinders, whether connected, unconnected, full, or empty."
SUBSTANTIATION: Cylinder restraints (where provided at all) are often provided only for the cylinders connected to the manifolds, and none are provided for the full cylinders awaiting their turn or the empties awaiting return. This additional language will make it clear that restraints are necessary in all cases.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #161)
Committee: HEA-PIP

99- 82 - (4-3.1.1.2(a)9): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add new text:
"Outdoor locations surrounded by impermeable walls shall have grated ventilation openings of 72 $in.^2$ (0.05 m^2) free area each, located at the base of each wall to allow free circulation of air within the enclosure."
SUBSTANTIATION: This addition is intended to prevent the undesirable accumulation of gases in those cases where the enclosure surrounding an outdoor central supply is a wall (as sometimes happens in locations with security concerns). By mandating a minimum ventilation, some way for the gas to ventilate is assured.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #155)
Committee: HEA-PIP

99- 83 - (4-3.1.1.2(a)10): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add a new paragraph:
"Constructed with access sufficient to move cylinders, equipment, etc. in and out."
SUBSTANTIATION: This is a common sense requirement which will be useful to users while laying out the systems and will be immensely useful to the user of the systems thereafter.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #162)
Committee: HEA-PIP

99- 84 - (4-3.1.1.2(a)10): Reject
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add new text:
"Selection between types shall be made based on owner preference, good engineering practice, and the ability of the system to meet all requirements of this standard when installed at the chosen location and in the available space."
SUBSTANTIATION: This wording is intended to give general guidance on the selection of the source type. The most important provision intended here is the implied requirement to change a source type selection if the type otherwise preferred cannot be safely installed or used. This is intended to address the practice of (for instance) placing liquid cylinders into locations suited only for gas cylinders.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The language is non mandatory and unenforceable.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #147)
Committee: HEA-PIP

99- 85 - (4-3.1.1.2(a)11): Reject
TCC NOTE: The Technical Correlating Committee directs the Committee Action be changed to Accept In Principle. The Committee Statement must provide justification for its actions.
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add wording:
"Locations containing medical gases other than Oxygen and medical air shall have their door labeled substantially as follows:
CAUTION
Medical Gases
NO Smoking or Open Flame
Room May have Insufficient Oxygen
Open door and allow room to ventilate before entering."
SUBSTANTIATION: In locations containing gases which will not sustain life, the greatest hazard is asphyxiation, not fire. The user should be so warned.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-86 (Log #148) and Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #148)
Committee: HEA-PIP

99- 86 - (4-3.1.1.2(a)11): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add wording:
"Locations containing only Oxygen and/or medical air shall have their door labeled substantially as follows:
CAUTION
Medical Gases
NO Smoking or Open Flame"
SUBSTANTIATION: In locations containing oxidizing gases the greatest hazard is fire. The user should be so warned.
COMMITTEE ACTION: Accept in Principle.
Revise to read:
"Locations containing medical gas central supply or cylinders supplying same shall have their doors labeled as follows:
CAUTION
Medical Gases
NO Smoking or Open Flame".
Incorporated into Proposal 99-71 (Log #144).
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #156)
Committee: HEA-PIP

99- 87 - (4-3.1.1.2(a)11): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add a new paragraph:
"Outdoor locations shall be provided with a substantial enclosure (wall or fencing) constructed of noncombustible or limited combustible materials."
SUBSTANTIATION: Locations for medical gases need to be secured (witness the numerous warnings about nitrous oxide abuse) and these enclosures need to be fire safe. Surrounding an oxygen manifold with a wooden fence may be aesthetically pleasing, but it is clearly inappropriate.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #182)
Committee: HEA-PIP

99- 88 - (4-3.1.1.2(a)11): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Require central supply systems to be powered off the life safety branch.
SUBSTANTIATION: Certain central supply systems require power. This is a life safety application and should be so treated.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144). The word was modified slightly.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #154)
Committee: HEA-PIP

99- 89 - (4-3.1.1.2(b)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add a new paragraph:
"Central supply systems for Nitrous Oxide and Carbon Dioxide shall be prevented from reaching temperatures lower than 0°F (–18°C)."
SUBSTANTIATION: These gases have very low vapor pressures at low ambient temperatures. This requirement will help ensure the systems operate when placed out of doors in colder climates.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #336)
Committee: HEA-PIP

99- 90 - (4-3.1.1.2(b)1): Reject
TCC NOTE: The Technical Correlating Committee directs the Committee to review the Committee Statement for rejection. The Committee's rationale should be more specific regarding the requirements of NFPA 50.
SUBMITTER: Ralph E. Oswald, Medical Gas Innovations
RECOMMENDATION: Revise text as follows:
4-3.1.1.2(b)1 – Oxygen supply systems or storage locations having a total capacity of more than ~~20,000 ft~~^{3} 30,000 ft^3 (NTP), including unconnected reserves on hand at the site, shall comply with NFPA 50, Standard for Bulk Oxygen Systems at Consumer Sites.
SUBSTANTIATION: Many sub acute-long term facilities are using oxygen manifolds that incorporate GP45 liquid oxygen cylinders containing 4500 ft^3 of oxygen. These manifolds often have two GP45s for service and two for secondary attached to the manifold. This totals to 18,000 ft^3 not counting the high pressure backup required for reserve, or unattached cylinders for other use. Many of these manifolds are supplied with headers connection points for three cylinders for service and three for secondary (27,000 ft^3) allowing for expansion. Changing to 30,000 ft^3 allows the facilities to expand their patient base and remain compliant with the intention of this guideline.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The 20,000 cu ft comes out of NFPA 50 and the committee can not change the requirement in that document.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #159)
Committee: HEA-PIP

99- 91 - (4-3.1.1.2(b)4): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add text after "dedicated mechanical ventilation": "drawing from the floor. This mechanical ventilation shall operate continuously and shall be connected to the life safety branch of the emergency electrical system."
SUBSTANTIATION: Mechanical ventilation is a step forward for the standard which has always limited itself to simple ventilation. However, it is imperative that such ventilation draw from the floor rather than any other location, as many of the gases, in a still room, will sink to the floor because they are heavier than air. This increases the hazard the ventilation was intended to eliminate. Ventilation must also be operative at all times, thus the requirement for supply from the essential electrical services.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #160)
Committee: HEA-PIP

99- 92 - (4-3.1.1.2(c)): Reject
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add text after "total free area": "Natural ventilation shall be to the outdoors wherever possible."
SUBSTANTIATION: This addition is intended to caution the user that this is the best ventilation technique, albeit not required because not always possible.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: This would be unenforceable and does not comply with the Manual of Style.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #225)
Committee: HEA-PIP

99- 93 - (4-3.1.1.2(c) and Exception (New)): Accept in Principle
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise 4-3.1.1.2(c) as follows:
(c) Storage Requirements for Nonflammable Gases Less Than 3000 ft^3 (85 m^3). Doors to such locations shall be provided with louvered openings having a minimum of 72 $in.^2$ (0.05 m^2) in total free area. ~~Where the location of the supply system door opens onto an exit access corridor, louvered openings shall not be used and the requirements of 4-3.1.1.2(b)3 and 4 and the dedicated mechanical ventilation system required in 4-3.1.1.2(b)4 shall be complied with.~~

Exception: Where the door opens onto an exit access corridor, louvered openings shall not be used and the fire resistance rating in 4-3.1.1.2(b)3 and the dedicated mechanical ventilation system in 4-3.1.1.2(b)4 shall be provided.

SUBSTANTIATION: 4-3.1.1.2(b)4 does not require a dedicated mechanical ventilation system. It permits natural venting. The requirements for when a door opens onto an exit access corridor are exceptions to 4-3.1.1.2(c).
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #163)
Committee: HEA-PIP

99- 94 - (4-3.1.1.3): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add new requirement where appropriate:
"Components and controls which are located out of doors shall be weather resistant and suited to the temperatures encountered and the environmental challenges of their site."
SUBSTANTIATION: Manifolds and other source equipment is often located out of doors. The result is premature failure where the equipment is incorrectly applied or the equipment is not suited to the heat/cold/wet environment. The user of the standard should be cautioned to apply the equipment with foreknowledge of its environmental limits.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #165)
Committee: HEA-PIP

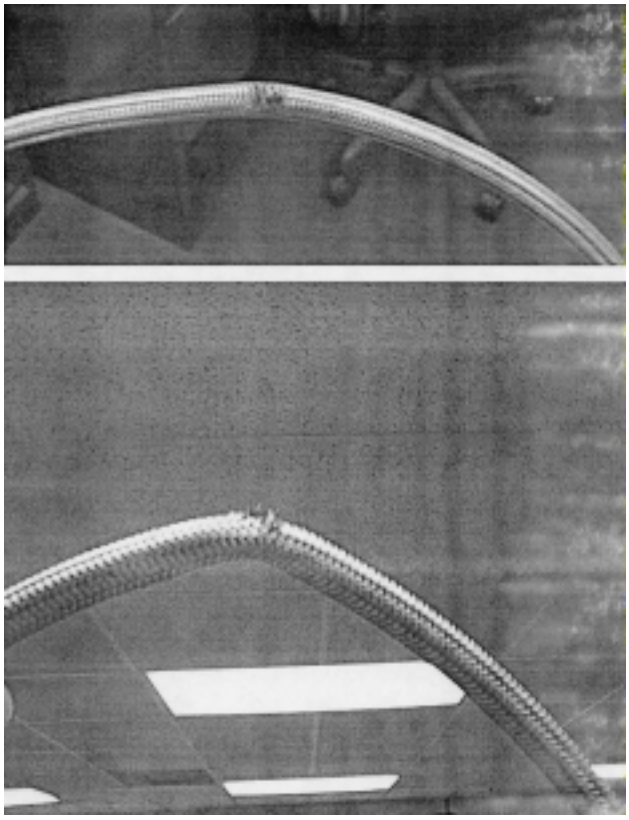
99- 95 - (4-3.1.1.3): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add new paragraph:
"Components and controls which may be subjected to cryogenic exposure shall be suitable for cryogenic service."
SUBSTANTIATION: Conversions from gas to liquid manifolds has produced issues with regulators, check valves, and other components. These were never designed for cryogenic service, and are thus subject to failure. The standard should require that components be suited to the temperatures encountered just as it requires material compatibility with oxygen.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #164)
Committee: HEA-PIP

99- 96 - (4-3.1.1.3(a)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add new text:
"Portions of systems intended to handle oxygen at high pressures >300 psig (2,070 kPa) shall contain no polymeric materials. All components shall be made of materials having a resistance to combustion not lower than that of Red Brass in ASTM STP 1197-1993."
SUBSTANTIATION: A substantial problem has been reported with 1. Flexible cylinder pigtails lined with Teflon, 2. Check valves with soft (polymeric) seats, and 3. Aluminum regulators. These problems are the result of ignition of the polymeric materials or aluminum respectively under adiabatic compression, with the probable complicating factor of particulate. These materials have been banned in other countries and may be argued to have now demonstrated their unsuitability for use with high pressure oxygen. The available literature as well as contemporary experience argue that the materials used with high pressure oxygen should be limited as proposed.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #223)
Committee: HEA-PIP

99- 97 - (4-3.1.1.3(d) (New)): Accept in Principle
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Add (d):
"Interior Teflon coated stainless steel braided flexible connectors shall not be used for connecting high pressure oxygen cylinders to the cylinder header of any gas manifold."
SUBSTANTIATION: Because of the potential of rapid oxygen compression ignition (see photo) causing connector failure, it is necessary to eliminate this type of connector from use on medical high-pressure oxygen gas manifolds.



COMMITTEE ACTION: Accept in Principle.
The committee incorporated this concept into Proposal 99-71 (Log #144).
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #176)
Committee: HEA-PIP

99- 98 - (4-3.1.1.5): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add a requirement:
"A relief valve(s) shall be provided to protect the piping between the header pressure regulator and the line pressure regulator assembly, and the line pressure regulators from over pressure in the event of a header regulator failure."
SUBSTANTIATION: This relief valve will protect the system from the consequences of a failure in the header regulator, and is common engineering practice.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #177)
Committee: HEA-PIP

99- 99 - (4-3.1.1.5):
TCC NOTE: The Technical Correlating Committee directs the Committee to reflect the submitter's substantiation in the Technical Committee Statement, being more explicit by citing reasons.
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add a requirement:
"If the manifold requires a manual operation to exchange the role of primary and secondary header, then the manifold shall activate a contents alarm to indicate when either header is below an average day's supply. This alarm shall indicate visually locally and shall activate a signal at the master alarms. This alarm is not required if the manifold is designed to automatically rotate primary and secondary."
SUBSTANTIATION: The most common mode of failure in manifolds is when a semiautomatic manifold is improperly operated and the manifold banks are both allowed to run empty. In a fully automatic manifold, this is avoided by the "rotation of stock" inherent in the device. Provision of an alarm would help compensate for this all too common operator failure.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The committee feels that the current warning requirements are sufficient.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #34)
Committee: HEA-PIP

99- 100 - (4-3.1.1.5(a)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"A cylinder manifold shall have two banks (or units) of cylinders that alternately supply the piping system, each bank having <u>cylinders connected to a common header, high pressure shutoff valve, pressure regulator and a check valve.</u> Each bank shall contain a minimum of two cylinders. <u>If two cylinders don't constitute at least an average day's supply, then an average day's supply is required</u> unless normal delivery schedules require a greater supply. When the content of the bank shall automatically operate to supply the system, an actuating switch shall be connected to the master signal panels to indicate when, or just before, the changeover to the secondary bank occurs."
SUBSTANTIATION: 1) The current drawing Figure 4-3.1.1.5 shows all the items listed above, but 4-3.1.1.5 reads that each bank shall have a common header and pressure regulator. It doesn't talk about the requirement for the high pressure shutoff valve or the check valve.
2) The way the standard reads now, it allows a single cylinder in each bank if the single cylinder supply is more than an average day's supply. In many cases I've seen partially filled or even empty cylinders sent mistakenly for full cylinders. I don't know if it was ever the committee's intent to allow a single cylinder to be used as a bank of cylinders.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #172)
Committee: HEA-PIP

99- 101 - (4-3.1.1.5(a), 4-3.1.1.6(a)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add new paragraph:
"The appropriate number of cylinders shall be determined after consideration of delivery schedules, proximity of the facility to alternate supplies, and the facility's emergency plan. In no case shall fewer than two cylinders be provided."
SUBSTANTIATION: The current language requiring two cylinders should be strengthened to require some consideration prior to selection. The above language attempts to provide this.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #174)
Committee: HEA-PIP

99- 102 - (4-3.1.1.5(a), 4-3.1.1.6 (a)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add a requirement for a sintered brass or stainless filter to prevent the intrusion of debris into the manifold controls.
SUBSTANTIATION: A common cause of failure in manifolds is the debris which results from the changing of the cylinders getting in the regulators and controls. A filter, which must be of a material suitable for the concentrations of oxygen, would go far to prevent these failures.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #179)
Committee: HEA-PIP

99- 103 - (4-3.1.1.6): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add new text:
"A pressure relief valve shall be installed in the piping after the connection of the reserve header and before the final line pressure regulating assembly. This relief valve shall be set at or below the relief pressure for the cryogenic liquid cylinders."
SUBSTANTIATION: This relief valve is shown in the figure but not required in the text. The proposal would add the requirement to the text and clarify what the relief valve should be set to protect.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #180)
Committee: HEA-PIP

99- 104 - (4-3.1.1.6): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Mandate the economiser circuit.
SUBSTANTIATION: These manifolds are notorious for bleeding off the gas as the liquid is vaporized. This leakage and its consequence of oxygen enrichment, nitrous oxide exposure, oxygen depletion, etc. in the enclosure is an unavoidable consequence of their mode of operation. Although leakage is something the standard goes to great lengths to control elsewhere, it is permitted here. The economiser, which is the only method available to minimize this wastage, is presently optional. While mandating an economiser would not solve the problem, it would reduce it.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #178)
Committee: HEA-PIP

99- 105 - (4-3.1.1.6(a)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add new requirement:
"The primary and secondary headers shall be located in the same enclosure. The reserve header may be located in the same enclosure or in another enclosure compliant with 4-3.1.1.2."
SUBSTANTIATION: The citing of these systems is sometimes problematic due to the very different nature of the two sources (liquid vs. gas cylinders). This allowance will permit more appropriate citing of the two sections of this total system by permitting the separation of the two into different locations.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #35)
Committee: HEA-PIP

99- 106 - (4-3.1.1.6(b)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"The reserve supply shall consist of three or more manifolded high-pressure cylinders connected as required under 4-3.1.1.8(b), and ~~either~~ shall be equipped with check valves as required in 4-3.1.1.5(b) ~~or shall be provided with an actuating switch that shall operate the master signals when the reserve supply drops to one day's supply.~~"
SUBSTANTIATION: NFPA should require that all pigtails be equipped with built-in check valves. This requirement is more feasible than the cost of an additional actuating switch and wiring to wire them to the two master alarm panels.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #220)
Committee: HEA-PIP

99- 107 - (4-3.1.1.6.9(c)): Reject
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Revise text as follows:
"A cryogenic liquid medical gas delivery system shall be installed either as indicated in Figure 4-3.1.1.6 or 4-3.1.1.5 with the addition of a reserve supply connected as shown in Figure 4-3.1.1.6 <u>if both primary and secondary supplies use cryogenic liquid storage vessels. Medical gas delivery systems that use cryogenic liquid for primary and high-pressure gas cylinders as secondary shall operate the master signals when the secondary supply pressure drops to one day's supply.</u>"
SUBSTANTIATION: With the advent of hybrid cryogenic liquid by high-pressure gas delivery systems, it is not necessary to have an additional high-pressure reserve cylinder supply since the secondary high-pressure supply will not inadvertently vent-off its content before it is used. A signal to the master alarm indicating that the secondary supply is low will provide the facility with adequate time to provide fresh filled high-pressure cylinders in the advent that the secondary supply pressure becomes too low due to normal use.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The committee feels that due to the nature of the design of the proposed system, it has the potential to run out of gas.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #181)
Committee: HEA-PIP

99- 108 - (4-3.1.1.7): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Mandate a main contents gauge and alarm.
SUBSTANTIATION: Presently, the standard mandates contents gauges and level alarms only on the liquid reserve. It seems appropriate that in the high use environment of today, an indication of changeover may be too minimal, and the low level indication from the main tank would be useful — as may be confirmed by the fact that it is almost universally installed.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #90)
Committee: HEA-PIP

99- 109 - (Figure 4-3.1.1.7): Accept in Principle
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: 1. In Note 7, change "4-3.1.1.7(b)3" to "4-3.1.1.7(b)2."
2. In Caption, change "4-3.1.1.7(b)2 or 3" to "4-3.1.1.7(b)1 or 2."
SUBSTANTIATION: 1. and 2. Editorial. Sections 4-3.1.1.7(b)1 and 2 were combined in revisions for 1999 edition.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #36)
Committee: HEA-PIP

99- 110 - (4-3.1.1.7(a)2): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"The continuous type with one or more units continuously supplying the piping system while another unit remains as the reserve supply and operates only in case of an emergency. <u>A low liquid level indicator shall be provided with an actuating switch which shall operate the master alarm signal when the liquid level falls to a predetermined level.</u>"
SUBSTANTIATION: This had been an industry standard and the manufacturers had been installing the low liquid level indicator on all of their cryogen oxygen vessels. Since NFPA does not require the low liquid indicator some manufacturers are not installing the indicators. Instead of the indicators, the manufacturer is sending a signal to their cryogen supplier to refill the vessel. The facility has no indication of a low liquid supply.

COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144) and Proposal 99-108 (Log #181).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #171)
Committee: HEA-PIP

99- 111 - (4-3.1.1.8): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add new paragraph:
"Visual indicators shall be located at central supply systems complying with 4-3.1.1.5, 4-3.1.1.6, and 4-3.1.1.7. These shall be visual indicators (audible indicators are not required except as otherwise noted) labeled for the service and condition being monitored."
SUBSTANTIATION: No indicators are required at the site of the central supply systems as they are for air or vacuum systems. Such indicators would be invaluable to the person checking out the system, changing cylinders, etc. There is limited value in an audible indicator, as the systems are usually not placed where an audio could be heard. However, a visual indicator would be very valuable. This is actually done today by all manufacturers.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #285)
Committee: HEA-PIP

99- 112 - (4-3.1.1.8): Accept in Principle
SUBMITTER: David Esherick, Patient Instrumentation Corp.
RECOMMENDATION: Revise text as follows:
"Piped oxygen, ~~and~~ medical air, nitrous oxide, carbon dioxide, and all other medical gases except nitrogen shall not be piped to, ...".
SUBSTANTIATION: We specifically prohibit connection and use of O_2 and medical air for anything other than patient use. We should also eliminate any questions or possible questions on the use of other medical gases. This would serve to make our document more "user friendly."
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft
COMMENT ON AFFIRMATIVE:
ESHERICK: I agree with the "Accept in Principle" committee action. However, we were unable to find the "Committee Action and Statement on Propoal 99-71 (Log #144).

(Log #37)
Committee: HEA-PIP

99- 113 - (4-3.1.1.8(a)): Reject
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Cylinders shall be designed, constructed, and maintained in accordance with 4-3.1.1.1(a). Cylinders in service shall be ~~adequately~~ individually secured. Cylinders in storage shall be secured and located to prevent them from falling or being knocked over."
SUBSTANTIATION: It was brought to the committee's attention that OSHA is requiring the individual securing of gas cylinders. This was changed in the Level 3 section of the Standard but was missed in 4-3.1.1.8(a).
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The committe does not feel that each individual cylinder needs to be secured as long as the cylinders as a whole are secured.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
SHOEMAKER: Cylinders should be individually secured for safety to the person changing the cylinders. During the changing process the caps on cylinders still in service are not installed. The possibility of in service cylinders falling over is eliminated when individually secured.
WYRICK: This should be accepted. This is an OSHA requirement for all facilities. this is to protect the person changing cylinders for any reason and prevent other cylinders falling on the person or damaging cylinder or property. OSHA will write a report if cylinders do not have the valve caps in place, full or empty. This should be opened and discussed in committee.

(Log #183)
Committee: HEA-PIP

99- 114 - (4-3.1.1.8(a)):
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Revise text as follows:
"Cylinders in service shall be ~~adequately~~ individually secured. Cylinders in storage shall be individually secured and located to prevent them from falling or being knocked over."
SUBSTANTIATION: To make it the same wording as Level 3.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-113 (Log #37) which reads as follows:
The committe does not feel that each individual cylinder needs to be secured as long as the cylinders as a whole are secured.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #173)
Committee: HEA-PIP

99- 115 - (4-3.1.1.8(b)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add after "(ANSI B57.1, CGA B-96)":
"Such fittings shall be permanently attached to the cylinder lead. The use of adapters or conversion fittings to adapt one gas specific fitting to another is prohibited."
SUBSTANTIATION: The use of "cheater" fittings and/or universal pigtails with NPT ends should and by this language would be prohibited.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #175)
Committee: HEA-PIP

99- 116 - (4-3.1.1.8(b)): Reject
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add a requirement:
"Headers shall be constructed so that each cylinder connection, connections between header sections, and connection of the header to the manifold shall be made using a non interchangeable, gas specific fitting complying with CGA Pamphlet V-1, 'Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections,' (ANSI B57.1). Such fittings shall be permanently attached to the header pipe."
SUBSTANTIATION: Currently, manifold headers are often universal between header sections even where they are specific at the cylinder connections. This is a clear hazard when multiple manifolds are being installed. Header sections should be required to be specific, as 4-3.1.1.8(b) appears to imply but does not state.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The committee feels that a CGA V-1 fitting will not pass sufficient volume of gas.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #38)
Committee: HEA-PIP

99- 117 - (4-3.1.1.8(e)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Pressure relief valves set at 50 percent above normal line pressure shall be vented to the outside from all gas systems, except medical air~~, or if the total capacity of the supply system is in excess of 3000 ft^3(85 m^3) of gas~~."
SUBSTANTIATION: This was mistakenly left in the 1999 Standard.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #158)
Committee: HEA-PIP

99- 118 - (4-3.1.1.8(e)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add a new requirement that all relief valves in a manifold be vented (when any is vented) to outside.
SUBSTANTIATION: The present language in the standard only makes it clear that the final line relief valve need be vented to outside. Given that manifolds commonly are provided with relief valves in several locations, it is only sensible that they all be piped to outside when such is required.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-162 (Log #258).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #168)
Committee: HEA-PIP

99- 119 - (4-3.1.1.8(e)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add requirements for pressure gauges with each pressure regulator to indicate regulated pressure and on each header to indicate contents.
SUBSTANTIATION: Presently, there is no requirement for gauges. Since they are necessary to adjust any element of a manifold or to determine the contents of a header, the standard should call for them.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #169)
Committee: HEA-PIP

99- 120 - (4-3.1.1.8(e)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add after "brass or bronze": "or stainless steel."
SUBSTANTIATION: Stainless would be an acceptable material under all circumstances as well.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #170)
Committee: HEA-PIP

99- 121 - (4-3.1.1.8(e)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add after "3,000 ft^3 (85 m^3) of gas" the words:
"at standard temperature and pressure. Relief valve vent lines shall be sized to prevent back pressure from rupturing the pipe when the relief valve is fully open. Materials shall comply with 4-3.1.1.3. Vent lines shall discharge in areas away from flammable materials and not where passerby may be endangered by the discharge. Vent lines shall be turned down and screened to prevent the entry of water or vermin."
SUBSTANTIATION: The standard gives no guidance on the relief piping. This statement would give the designer/installer some assistance.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #184)
Committee: HEA-PIP

99- 122 - (4-3.1.1.8(e)): Accept in Principle
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Delete text as follows:
"Pressure relief valves set at 50 percent above normal line pressure shall be vented to the outside from all gas systems~~, except medical air,~~ or if the total capacity of the supply...".
SUBSTANTIATION: If a relief valve on medical air goes off in an equipment room the room will fill with air. This by itself is not a problem. There is a safety problem with the amount of pressure (at least 75 psi) being released from the valve. Somebody could get hurt if they were to get hit with that kind of pressure.
COMMITTEE ACTION: Accept in Principle.
Revise as follows:
"Pressure relief valves set at 50 percent above normal line pressure shall be vented to the outside from all gas systems except medical air, which shall be premitted to be diffused locally."
COMMITTEE STATEMENT: This allows the option of the gas to be vented locally and not outside.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #166)
Committee: HEA-PIP

99- 123 - (4-3.1.1.8(h)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add new wording at end of first sentence:
"and there is not in the building a connected oxygen reserve sufficient for an average day's supply."
SUBSTANTIATION: The oxygen inlet is intended to provide for an alternate supply when no other means exist. In the case of a facility with a reserve capability inside the building, this need is obviated. In that case, the inlet can safely be eliminated.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #39)
Committee: HEA-PIP

99- 124 - (Figure 4-3.1.1.8(h)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: The vent to outside should not terminate into the watertight box as shown in the drawing in Figure 4-3.1.1(8)(h).

SUBSTANTIATION: Even though it states the "vent to outside," it contradicts itself by drawing the termination of the relief valve in the emergency fill box.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #40)
Committee: HEA-PIP

99- 125 - (Figure 4-3.1.1.8(h) Note): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
Note: If the relief valve on the emergency oxygen connection is moved to downstream from the check valve in the emergency oxygen line, connect it to the system with a demand check ~~valve~~ fitting.
SUBSTANTIATION: The term "demand check fitting" is used in this Standard instead of the term "demand check valve."
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #41)
Committee: HEA-PIP

99- 126 - (Figure 4-3.1.1.9):
TCC NOTE: The Technical Correlating Committee directs this proposal be returned to Committee.
a. It is not apparent where or why recommendation No. 2 was not accepted.
b. It is not clear where recommendations 4 and 5 were inserted in the document. The Committee Statement should reflect this action.
c. The Committee Statement cites a figure which was not included for review.
d. Recommendation No. 5 says the note was omitted, but the note was not included with the proposal for review.
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: 1. Eliminate the manual valve on the air receiver.
2. Eliminate the demand check fittings on the CO monitor and dew point monitor.
3. Add relief valves required on the air compressors.
4. Add the condensate traps required on the aftercoolers and air dryers.
5. Add the note omitted in 1999 Standard; Unions or other disconnect means are required for maintenance and/or replacement of each component.
SUBSTANTIATION: 1. NFPA doesn't require a manual valve on the receiver, it does require an automatic drain.
2. Demand checks are required downstream of the source valve, this is upstream.
3. Relief valves were shown on the drawing in 1996, disappeared in the 1999 drawing, are they needed?
4. Condensate traps are required on the aftercoolers and air dryers.
5. Omitted note for the need of unions for disconnecting.
COMMITTEE ACTION: Accept in Principle in Part.
1. In 4-3.1.1.9(f) add "manual drain" after the words "automatic drain".
2. Do not accept this change.
3. In 4-3.1.1.9(c) add "an relief valve" after "compressor shall have". Also revise the figure to include a relief valve as shown.
4. Accept part 4
5. Accept part 5.
Dale will provide a figure with all the changes to it.
COMMITTEE STATEMENT: 1. Wording coordinates with the figure.
2. See Committee Action and Statement on Proposal 99-156 (Log #256) which reads as follows:
Revise 4-3.1.2.2(a)6 as follows:
"All pressure switches, mainline pressure gauges, ~~analyzers,~~ and pressure sensing devices downstream of the source valve shall be provided with a gas specific demand check fitting to facilitate servicing, testing, or replacement. Demand check fittings shall be provided for all analyzers."
The rewrite makes the intent clearer.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #83)
Committee: HEA-PIP

99- 127 - (Figure 4-3.1.1.9): Reject
SUBMITTER: Christopher P. Swayze, Sherman Engineering Co.
RECOMMENDATION: Remove requirement for CO monitor.
SUBSTANTIATION: CO monitor is an added expense for hospitals that require frequent maintenance. With proper air intake location and use of approved medical air compressor, which are described in great detail in '99, meter is unnecessary.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The continuous monitoring of CO is necessary for maintaining patient safety.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ESHERICK: We have been in the testing business for over 17 years. We regularly test for carbon monoxide (CO) and have NEVER found more than 1 or 2 ppm of CO in any medical gas piping system. USP limits are 10 ppm.

(Log #313)
Committee: HEA-PIP

99- 128 - (4-3.1.1.9(a)): Accept
SUBMITTER: Howard W. Levitin, MD, Disaster Section, American College of Emergency Physicians
RECOMMENDATION: Revise text as follows:
"General. The medical air compressor shall take its source from the outside atmosphere and shall not add contaminants in the form of particulate matter, odor, or other gases. It shall be connected only to the medical air piping distribution system and shall ~~not be used for any other purpose~~ only be used for air in the application of human respiration."
SUBSTANTIATION: Changing the wording, as indicated above, will allow hospitals to continue their practice of using their medical air supply for hospital staff respiratory protection. Many hospital emergency departments seek the use of the existing medical air supply system to supply respirators used by staff in the process of decontaminating patients. This limited application would not compromise the hospital's medical air system for the following reasons:
• The hospital's medical air system is a one-way, closed system that prevents air source contamination.
• There is no danger of cross contamination because the supplied air respirator (SAR) would not be tied into any other air system (i.e., the air system used for instrumentation).
• Supplied air respirators are connected to the hospital's medical air via a NIOSH point of attachment (POA) which regulates airflow, thereby maintaining pressure throughout the system.
• The supplied air respirator is connected to a medical air outlet which is on a zoned system that has a monitoring device that measures the pressure and alarms when the pressure begins to drop. In addition, since the SAR is only used by personnel in the immediate area (using the buddy system), if a SAR became damaged or breached, personnel in the area would only need to disconnect the SAR from the POA to shut off the flow of air.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #263)
Committee: HEA-PIP

99- 129 - (4-3.1.1.9(b)): Reject
SUBMITTER: Peter Esherick, Patient Instrumentation Corp.
RECOMMENDATION: Revise text to read as follows:
"Compressor intake piping shall be as described in 4-3.1.2.2.2(a)3: "Piping shall be hard-drawn seamless medical gas tube, type K or L (ASTM B819), and bear one of the following markings..."
SUBSTANTIATION: Vacuum piping may not be cleaned for oxygen service – may have oil remaining from tube drawing and galvanized steel pipe is oily.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Clean medical gas piping is not necessary for this application because it is exposed to the atmosphere.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ESHERICK: Compressor intake piping should be cleaned for oxygen service. If the intake has oil remaining from the manufacturing process, the oil could migrate throughout the piping system and ultimately get to the patient. Oil in the lungs is very harmful.

(Log #224)
Committee: HEA-PIP

99- 130 - (4-3.1.1.9(e)): Accept
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise 4-3.1.1.9(e) as follows:
"~~4. The use of a liquid ring air compressor, as defined in 4-3.1.1.9(e)1 under medical air compressor—type (a), shall require separate compressor sensors that shut down that compressor when the water exceeds the design level in the separator and activate a local alarm. In addition, a high water level in the receiver shall activate an alarm that shuts down the liquid ring compressor system and activates the local alarm. Service water and seal water shall be as recommended by the manufacturer.~~
~~5. The use of permanently lubricated sealed bearing compressors, as defined in 4-3.1.1.9(e)1a under medical air compressor—type (a), shall require monitoring of the air temperature at the immediate outlet of each cylinder with a "high temperature" switch that shuts down the compressor and activates both master and local alarms. If the compressor has water-cooled heads, a high-water level switch in the receiver shall activate both master and local alarms and shut down the system. The temperature switch setting shall be as recommended by the manufacturer.~~
~~6. The use of a medical air compressor, as defined in 4-3.1.1.9(e)1b under medical air compressor—type (b), shall monitor air temperature at the immediate outlet of each cylinder with a "high temperature" switch that shuts down the compressor and activates both master and local alarms. If the compressor has water-cooled heads, a high-water level switch in the receiver shall activate both master and local alarms and shut down the system. The temperature switch setting shall be as recommended by the manufacturer. The compressor shall contain coalescing filters with an "element change indicator" and a charcoal filter with colormetric hydrocarbon indicator.~~"
"4. Where liquid ring air compressors or compressors having water-cooled heads are used, air receivers shall be equipped with a high water level sensor that activates the local alarm system and shuts down the compressor system.
5. Where liquid ring compressors are used, each compressor shall have a liquid level sensor that shuts down its compressor and activates the local alarm when the liquid level in the air/water separator is above the design level. Service water and seal water shall be as recommended by the compressor manufacturer.
6. Where compressors are the reciprocating piston type, the air temperature at the immediate outlet of each cylinder shall be monitored by a high temperature sensor that shuts down the compressor and activates the local alarm system. The temperature setting shall be as recommended by the compressor manufacturer.
7. Where compressors have an oil-containing section, as permitted in 4-3.1.1.9(e)1b, the final line filters shall include coalescing filters with "element change indicators" and charcoal filters with colormetric hydrocarbon indicators.
8. Local alarms for medical compressed air supply systems shall be indicated on the master alarm panels in accordance with 4-3.1.2.2(b)3.f."
SUBSTANTIATION: To delete reference to "type (a)" and "type (b)" medical air compressors, which are not defined as such. To clarify the requirements for monitors and alarms in medical compressed air supply systems.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #219)
Committee: HEA-PIP

99- 131 - (4-3.1.1.9(e)4): Reject
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Delete this entire paragraph.
SUBSTANTIATION: Liquid-ring compressors can not be used for manufacturing medical air as defined in 4-3.1.1.9(e) because of the chemicals that are in all public water systems. Since the water in the liquid-ring compressors is actually part of the working compressor, any chemicals that may be in the water will be introduced into the medical air pipeline. As stated in this section, this can not be permitted.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: There is no technical substantiation to support the deletion of this technology.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #221)
Committee: HEA-PIP

99- 132 - (4-3.1.1.9(f)): Accept in Principle
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Revise text as follows:
"Receivers. The receiver shall be equipped with a pressure relief valve, automatic drain, sight glass, and pressure gauge and shall have the capacity to ensure practical on-off operation. The receiver shall comply with Section VIII, Unfired Pressure Vessels, of the ASME Boiler and Pressure Vessel Code and shall be corrosion resistant. Piping within compressor systems upstream of the source shutoff valve shall not contribute to contaminate levels, be made of oxygen compatible material and cleaned for oxygen use."
SUBSTANTIATION: Requiring the piping within manufactured equipment to meet with the same requirements for a pipeline distribution system is not necessarily beneficial to the user or a safety issue. Soft copper that is cleaned for oxygen use can provide the supplier of the system with the ability to use copper piping that is easier to shape and install while allowing for the use of compression fittings instead of brazed or threaded connections. Compression-fittings allows for easier servicing of the equipment by the user after the system is installed and operating. The use of compression fittings also prevents the possibility of piping sealing paste to be introduced inside the piping when the system is assembled using threaded copper pipes and fittings.
COMMITTEE ACTION: Accept in Principle.
Add "manual drain" after "automatic drain".
COMMITTEE STATEMENT: This coordinates with Proposal 99-126 (Log #41).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft
COMMENT ON AFFIRMATIVE:
WAGNER: This proposal deleted reference to 4-3.1.2.7 and 4-3.1.2.8 for piping within compressor systems. However, as worded, it does not specifically exclude this piping from the requirements of 4-3.1.2.7 and 4-3.1.2.8, which are extensive. To accomplish its intent, it should list specific exceptions to 4-3.1.2.7 and 4-3.1.2.8, such as soft temper tubing, compression fittings, etc. Also, this proposal requires that the piping be cleaned for oxygen service. Proposal 99-145 (4-3.1.1.9(b) [Log #263]) proposed that compressor intake piping be medical gas tube, but was rejected as unnecessary because it is exposed to the atmosphere.

(Log #CP701)
Committee: HEA-PIP

99- 133 - (4-3.1.1.9(g)): Accept in Principle
SUBMITTER: Technical Committee on Piping Systems
RECOMMENDATION: Question: Is the use of three way ball valves acceptable for the purposes of "isolating valves to permit service" required under 4-3.1.1.9(g), paragraphs 3, 6, and 7?
Answer: Yes.
SUBSTANTIATION: The Regulations Governing Committee Projects require that a proposal be processed to clarify the text of a document on which a Formal Interpretation has been issued. After issuance of the next edition of the document, the Formal Interpretation will no longer be published.
COMMITTEE ACTION: Accept in Principle.
Add new paragraph to the end of 4-3.1.1.9(g) and 4-3.1.1.9(h) as follows:
"Three way, indexed to flow, full port ball valves shall be permitted to be used to isolate one branch or component."
COMMITTEE STATEMENT: The committee revised the wording to address the formal interpretation.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #281)
Committee: HEA-PIP

99- 134 - (4-3.1.1.9(g)): Accept
SUBMITTER: David B. Mohile, Medical Engineering Services, Inc.
RECOMMENDATION: Change next to last sentence. Paragraph will now read as follows:
"Dryer systems shall be, at a minimum, duplexed and valved to permit isolation of individual components to allow for maintenance or repair in the event of failure, while still continuing to adequately treat the flow of air. Under normal operation, only one dryer shall be open to airflow with the other dryer valved off. Each dryer system shall be designed to provide air ~~at a maximum dew point of 35°F (1.7°C) at the peak calculated demand of the system~~ below the frost point (32°F or 0°C) at any level of demand. [See 4-3.1.2.2(b)3g.] System design shall preclude formation of liquid water in the air line."
SUBSTANTIATION: Most hospitals in the U.S. have or are experiencing condensed moisture in their medical air pipelines. The most serious cases have resulted in patient deaths. The problem is that older technology dryers cannot meet the requirements of the existing standard unless they have continuous flow through their dryer systems. The reality is that seldom is there continuous demand for medical air. The requirement for air will peak and valley depending upon the demand by ventilators in critical care units. Current technology is available at comparable cost to older technology that will totally avoid this problem. We must mandate that future systems avoid this problem. As an example of a shift to avoid this problem, the Department of Veterans Affairs has for years required that the primary dryer for medical air systems in its 175 hospitals be of a type that will not permit moisture problems. Also recognizing the problem of moisture in medical air systems, many engineering specifications from major design firms mandate dryers that avoid the need for continuous flow rates. By changing the wording within the standard to "at any level of demand," we are helping facilities provide dry air to their most critical patients.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
FRANKEL: I believe that nothing is served by lowering the required dew point to 32°F from the existing 35°F. The existing dew point is adequate for all possible needs of the compressed air system. There is no portion of the piping system installed outdoors that would require such a low dew point. If it were, lower dew points would be necessary for the colder northern climates. The words "at any level of demand" are sufficient to permit the adequate selection of any type air dryer that meets the requirements of the system.
In addition, no thought has been given to revising the alarm limits. The present high dew point alarm of 39°F remains unchanged since no revision has been proposed. Secondly, if the dew point is lowered to 32°F this would now be the upper alarm limit and the air dryer must provide a lower dew point of about 28°F in order to allow a range of acceptable dew point conditions that would not cause an alarm to annunciate.

(Log #141)
Committee: HEA-PIP

99- 135 - (4-3.1.1.9(g) & (i)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: 1. Move sentence 3 of 4-3.1.1.9(i) to (g).
2. Rewrite 4-3.1.1.9(i)3 as follows:
4-3.1.1.9(i)3
3. All Medical Air systems shall include a Local Alarm indicating:
a. High Dew Point
b. High Carbon Monoxide
c. Backup Compressor Operating
Liquid Ring Compressors complying with 4-3.1.1.9(e)1a shall include a Local Alarm indicating a, b, c, and:
d. High Water Level in Separators
e. High Water Level in Receiver
Oilless Compressors complying with 4-3.1.1.9(e)1a shall include a Local Alarm indicating a, b, c, and:
f. Thermal Shutdown
g. High Water Level in Receiver (if equipped with water cooled aftercoolers or cylinders)
Oilfree Compressors complying with 4-3.1.1.9(e)1b shall include a Local Alarm indicating a, b, c, and:
f. Thermal Shutdown
g. High Water Level in Receiver (if equipped with water cooled aftercoolers or cylinders)
4. The Medical Air Compressor shall activate signals at both Master alarms [ref. 4-3.1.2.1(b)2] for either:
a. Each signal required in 3a through 3g (as required above) or
b. Dew point (3a above) and a Compressor Fault signal activated by any of 3a through 3g (as required above)
5. The Local alarm shall be mounted in the machine room at or near the compressor site. If the facility has multiple medical air systems, each shall have a separate local alarm.
SUBSTANTIATION: This paragraph is very awkward. The proposal represents an attempt at a more coherent organization.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-141 (Log #259).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #185)
Committee: HEA-PIP

99- 136 - (4-3.1.1.9(h)): Reject
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Revise text as follows:
"Dryers, filters, and regulators shall be provided with isolating valves upstream and downstream of each individual component to allow service to the component without shutting down the system."
SUBSTANTIATION: The cost of eight valves should not be a factor when people's lives could be at stake if two components on a single line go out of service simultaneously.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Current standard is adequate for a single fault failure and does not prohibit the isolation of individual components.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #186)
Committee: HEA-PIP

99- 137 - (Figure 4-3.1.1.9(h)1): Reject
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Eliminate Figure 4-3.1.1.9(h)1.
SUBSTANTIATION: If my proposal for 4-3.1.1.9(h) is accepted, Figure 4-3.1.1.9(h)1 needs to be eliminated.
COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-136 (Log #185).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #132)
Committee: HEA-PIP

99- 138 - (4-3.1.1.9(i)): Reject
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: In 1. and 2. delete:
"Carbon Monoxide" and substitute in 3., second sentence, "a test for the level of carbon monoxide shall be performed at equipment startup and once annually."
Delete 4-3.1.1.2(d)3.
In Table 4-3.4.1.4 delete "Carbon Monoxide High."
SUBSTANTIATION: The requirement for carbon monoxide monitoring has proven very problematic and costly to implement and maintain. It is also a requirement of questionable value in light of: 1. The minuscule number of facilities actually reporting problems with persistent CO, and 2. The disputable value of the 10 ppm limit (i.e., there are no known issues at 11 ppm which do not occur at 9 ppm). To ensure safe medical air, an annual test is proposed as an allowable substitute.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-127 (Log #83) which reads as follows:
The continuous monitoring of CO is necessary for maintaining patient safety.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ALLEN: The continuation of the CO monitor is not justified in light of the actual problem(s) in the field. The evidence available to the writer does not indicate that this monitor is performing a function equal to it's cost or maintenance.
ESHERICK: See my Explanation of Negative on Proposal 99-127 (Log #83).

(Log #222)
Committee: HEA-PIP

99- 139 - (4-3.1.1.9(i)): Reject
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Eliminate any reference to requiring continuous monitoring of carbon monoxide levels within this document.
SUBSTANTIATION: Carbon monoxide is not an element that is made by the medical compressed air system but a contaminate brought in through the system's fresh air intake. There is no reason to constantly monitor this contaminate over other contaminates that could also be introduced through the fresh air intake. This contaminate level along with the others must be verified during the system verification to ensure that the quality of medical air meets the requirements of USP.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-127 (Log #83).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ALLEN: The continuation of the CO monitor is not justified in light of the actual problem(s) in the field. The evidence available to the writer does not indicate that this monitor is performing a function equal to it's cost or maintenance.
ESHERICK: See my Explanation of Negative on Proposal 99-127 (Log #83).

(Log #17)
Committee: HEA-PIP

99- 140 - (4-3.1.1.9(i)3): Accept
SUBMITTER: Gerald P. Austin, Rapid City Regional Hospital
RECOMMENDATION: First paragraph, following first "a-e":
"At least one signal from the local alarm shall be connected to the two master alarm panels [4-3.1.2~~1~~2(b)2]."
SUBSTANTIATION: Just an error in referencing information elsewhere in the document. Submitted in the interest of precise accuracy. Editorial in nature.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #259)
Committee: HEA-PIP

99- 141 - (4-3.1.1.9(i)3): Accept in Principle
SUBMITTER: David B. Mohile, Medical Engineering Services, Inc.
RECOMMENDATION: Move paragraph starting with, "A local alarm panel..." as well as the list of local alarms, as well as the three following paragraphs relating to local alarms to 4-3.1.2.2(d) and insert immediately after the heading for Local Alarms. With various changes, section would then read:
(d) Local Alarms. A local alarm panel shall be mounted in the machine room in an area of responsible observation. This panel shall alarm, as a minimum, the following functions:
a. Backup compressor operating
b. High water level in receiver
c. High carbon monoxide level
d. High water level in separator (if so equipped)
e. High discharge air temperature (if so equipped)
f. Backup vacuum pump operating <u>(if so located at this machine site)</u>
At least ONE signal from the local alarm shall be connected to the two master alarm panels [4-3.1.2.1(b)2] to indicate that a problem is present with the source equipment <u>at this site</u>.
If the above signals are incorporated into the main control panel of the machinery, it shall still be required to bring one signal from the machine room to each of the master alarm panels indicating that a problem is present.
If there is more than one compressor <u>and/or vacuum pump</u> for the facility, or if the compressors <u>and/or vacuum pumps</u> are in different locations in the facility, it shall be required to either have a local alarm panel that combines all the signals from all the machinery, or have a local alarm panel at each machinery site. <u>If there is more than one machinery site, it shall be necessary for each site to have an alarm at the two master panels.</u>
~~1. An indicator shall be provided for each of the individual alarms required in 4-3.1.1.9 at the air compressor site.~~ These ~~indicators~~ <u>panels</u> shall comply with 4-3.1.2.2(a)1, 2, and 3. ~~and shall be grouped together in a single location (e.g., in an alarm panel or with the system controls).~~
~~2.~~ Dew point for medical air shall be monitored and alarmed per 4-3.1.1.9(i) to indicate a line pressure dew point above 39°F (3.9°C). (See related proposal to move.)
~~3.~~ Carbon monoxide for medical air shall be monitored and alarmed per 4-3.1.1.9(i) to indicate a level above 10 ppm.
SUBSTANTIATION: While the requirement for a local alarm panel is in the section on alarm panels, the list of signals for this panel was buried in another section of the standard. Also, for some reason the requirement for a backup vacuum pump operating alarm disappeared between the 1996 and 1999 edition of 99C.
The changes proposed above put the list of signals required on a local alarm panel in the section on local alarms and attempts to clarify some of the wording in this section.
COMMITTEE ACTION: Accept in Principle.
Modify f. (2) as follows:
"When the dew point monitor, located in the mechanical room of the medical compressed air system, does not provide an integral visual and audible alarm, the local alarm shall be used to indicate a line pressure dew point above 39°F (3.9°C)."
COMMITTEE STATEMENT: The revised wording is from Proposal 99-161a (Log#212) which is better wording.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #13)
Committee: HEA-PIP

99- 142 - (4-3.1.1.9(i)3b): Accept in Principle
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Revise the line to state the following:
b. High water level in the receiver (if so equipped).

SUBSTANTIATION: The requirement for a high water level indicator in the receiver is only required if the compressor is a liquid ring or if the compressor has a water-cooled head.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-71 (Log #144).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #143)
Committee: HEA-PIP

99- 143 - (4-3.1.1.10, 2-2 Instrument Air (New)):

TCC NOTE: Technical Correlating Committee directs the proposed definition be referred to the Technical Committee on Administration for review and action.
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add a new definition:
Instrument Air. For the purposes of this standard, Instrument Air is air that:
(a) Is intended for the powering of medical devices unrelated to human respiration (e.g., surgical tools, ceiling arms). Medical Air and Instrument Air are distinct systems for mutually exclusive applications.
(b) Complies with Instrument Air in ANSI/ISA S-7.0.01 1996 and
(c) Complies with the following:
1. is filtered to 0.01µ
2. is free of liquids (e.g., water, hydrocarbons, solvents, etc.)
3. is free of hydrocarbon vapors
4. is dry to a dew point of -40°
Add new:
4-3.1.1.10 (see Figure 4-3.1.1.10) Instrument Air. Instrument air systems shall never be interconnected with medical air systems, and shall not be used for any purpose where the air will be intentionally respired by patients or staff. Instrument air shall be permitted to be used for any medical support purpose, (e.g., to operate tools, air driven booms, pendants, or similar applications) and shall be permitted (if appropriate to the procedures) to be used in laboratories.
(a) Source.
1. Air compressors and related equipment shall be permitted to be of any type suitable for the service, capable of 200 psig (1,380 kPa) output pressure and of providing air meeting the definition of "Instrument Air" in 2-2.
2. Air compressors shall be:
a. at least duplexed complying with 4-3.1.1.9(c) and 4-3.1.1.9(d) or
b. simplex and provided with a standby header complying with 4-3.1.1.6(a)3 with attached cylinders sufficient for one hour normal operation. Cylinders attached to the reserve header shall contain Medical Air. The reserve header shall automatically serve the system in the event of a failure of the compressor and shall enter the system upstream of the final line regulators (see Figure 4-3.1.1.10).
3. Intake air for Instrument Air Compressors may be drawn from any location appropriate to the compressor. Drawing intake air from outside in compliance with 4-3.1.1.9(b) is recommended.
4. Instrument Air Sources shall comply with 4-3.1.1.9(g) except that the final filters shall be 0.01µ and the system shall be provided with charcoal filter(s) as described in 4-3.1.1.9(e)5. Sources complying with 4-3.1.1.10(a)2b shall be permitted to have a simplex aftercooler and dryer.
(b) Monitoring and Alarms.
1. Sources complying with 4-3.1.1.10(a)2a shall be provided with actuating switch(es) or sensor(s) to indicate when or just before the Second Compressor activates, indicating Reserve Compressor in Operation at a Local alarm and at all Master Alarms.
2. Sources complying with 4-3.1.1.10(a)2b shall be provided with:
a. an actuating switch or sensor to indicate when or just before the reserve begins to supply the system, indicating Reserve in Use at a Local alarm and at all Master Alarms.
b. an actuating switch or sensor to indicate when or just before the reserve falls below an average hours supply, indicating Reserve Low at a Local alarm and at all Master Alarms.
Add to Table 4-3.1.2.4:

Gas Service	Abbreviated Name	Colors	Standard Pressure
Instrument Air	—	Yellow and white Diagonal Stripe/black	160 psig + 25/-0 1145 kPa + 173/-0

Add to 4-3.4.1.3(h)3: A nitrogen or Instrument Air system shall be ...
Add to 4-3.4.1.3(h)7: Nitrogen or Instrument Air outlets shall deliver ...
Add to 4-3.4.1.3(i)3: Instrument Air 19.5 to 23.5 percent oxygen
SUBSTANTIATION: High Pressure air is being substituted for nitrogen for surgical tools. This very appropriate and often economically advantageous substitution presently is being made without guidance from the standard and thus poses a risk of being implemented in an inappropriate or unsafe manner. The proposal gives some guidance to a facility choosing this option.
NOTE: Supporting material is available for review at NFPA Headquarters.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
FRANKEL: I offer a negative vote for this log item. The introduction of a separate category of "instrument air" is unnecessary and undesirable for the following reasons:
1. A level 3 system is intended for use by dental purposes as well as pneumatic tool supply. As stated in "4", a dew point of -40°F is totally unnecessary for all of these purposes. This would result in a large increase of initial cost of dryer equipment to serve no purpose.
2. The wording in "2" states "free of water" which indicates completely dry air which is impossible to provide. This conflicts with item "4" which provides a finite figure.
3. The requirement for a filter to provide an absolute particulate level of 0.01 µ is totally too low for the intended purpose. Such a small particulate piece will not harm any known device or purpose. Log #33 also has a requirement for 1 µ which will have to be revised.
4. The title of "instrument air" duplicates an often used category of compressed air for pneumatic air used to control valves and equipment in HVAC systems. This duplication of nomenclature would increase confusion when all systems are being installed, possibly leading to cross connections.
5. A title of an air system called "compressed air to power devices" is proposed in Log #271, making this category redundant.
6. This log provides for this category of air as a definition. Definitions are properly placed in Chapter 2.

(Log #42)
Committee: HEA-PIP

99- 144 - (Figure 4-3.1.2): Accept
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Eliminate the exterior wall, pressure relief valve, and emergency piping from this figure.
SUBSTANTIATION: In 1999 a new drawing [Figure 4-3.1.1.8(h)] was included in the Standard for the emergency oxygen supply connection and any reference to this connection was supposed to be eliminated from the drawing in Figure 4-3.1.2.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #291)
Committee: HEA-PIP

99- 145 - (4-3.1.2 through 4-6.1.2.5): Accept in Principle

TCC NOTE: The Technical Correlating Committee directs the Committee to be more specific and complete in its actions.
SUBMITTER: Dale J. Dumbleton, National Inspection Testing and Certification Corp.
RECOMMENDATION: Revise text as follows:
Affected paragraphs: 4-3.1.2 through 4-6.1.2.5 (Levels 1, 2, 3, and 4 affecting piping, materials, and installation).
The left column is the complete proposed text. New material is bold. Where the text is sourced in the current document, the source paragraph is listed in the right-hand column. Where the text is new, the relevant proposal is noted.

4-3.1.2 Distribution — ~~Level 1 (Manifold, Piping, Valving/~~ Level 1, 2, 3, and 4 Gas and Vacuum Piping and Materials ~~Controls Outlets/Terminals, Alarms). See Figure 4-3.1.2.~~		
4-3.1.2.1 General Requirements.		
	(a) *Oxygen Compatibility*. Components in nonflammable medical gas and vacuum systems shall be of materials that are suitable for oxygen service. *(See 4-3.1.1.3, Material — Oxygen Compatibility.)* Pipe (tube), fittings, valves, and other components shall have been thoroughly cleaned internally to remove oil, grease, and other readily oxidizable materials, as if for oxygen service.	4-3.1.2.1(a)
	(b) *Cleanliness.* Materials that have been cleaned for use in medical gas piping systems shall be plugged, capped, or otherwise sealed until installed. Particular care shall be taken in the storage and handling of such material to maintain its clean condition. Immediately before final assembly, such material shall be visually examined internally for contamination. Material that has become contaminated and is no longer suitable for oxygen service shall not be installed.	4-3.1.2.1(b)
	(c) *On-Site Rec~~C~~leaning*. On-site <u>re</u>cleaning of the interior surfaces of tubes, valves, fittings, and other components shall be limited to recleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Such surfaces shall be cleaned by washing in a clean, hot water/alkaline solution, such as sodium carbonate or trisodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot potable water.	Proposal
4-3.1.2.7 Piping Materials. The provisions of this section apply to field-installed piping for the distribution of medical piped gases and vacuum systems.		
	(a) Tubes, valves, fittings, station outlets, and other piping components in medical gas systems shall have been cleaned for oxygen service prior to installation.	
	(b) Piping for nonflammable medical gas systems shall be suitable for oxygen service in accordance with 4-3.1.2.1. Each length of tube shall be permanently labeled and delivered plugged or capped. Fittings, valves, and other devices shall be sealed and marked. The installer shall furnish documentation certifying that all installed piping materials comply with the requirements of this paragraph.	
	(c) Piping shall be ASTM B 819 specification hard drawn seamless medical gas tubing; ASTM B 819 tubing is identified by the markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" ~~in green (Type K) or~~ blue (Type L). Main and branches shall be not less than 1/2 in. nominal size <u>for positive gases and 3/4 in. nominal for vacuum. Drops to individual outlet/inlets shall be not less than 1/2 in. nominal.</u> Factory-installed tube on station outlets extending no further than 8 in. from the outlet body shall be permitted to be 3/8 in. O.D. (1/4 in. nominal) size. Connections to gauges and alarm switches and runouts to alarm panels shall be permitted to be ~~1/4~~ <u>3/8</u> in. O.D. (~~1/8~~ <u>1/4</u> in. nominal) size.	4-3.1.2.7(c) and 4-3.2.2.2(c) Proposal
	(d) Where seismic construction is required by the building code, piping shall be properly braced.	4-3.1.2.7(d)
	<u>Exceptions: Vacuum System Piping.</u>	
	1. Seamless copper water tube (ASTM B 88), Type K, L, M copper ACR tube (ASTM B 280), or ASTM B 819 medical gas tube permitted to be used.	4-3.2.2.2(a)
	2. Soft annealed copper tubing (ASTM B 88) shall be permitted underground.	4-3.2.2.2(a)
	Exception: Nonstandard Operating Pressure Systems	
	1. Where operating pressures are 200 to 300 psig (1380 to 2068 kPa only type K medical gas tube (ASTM B 819) shall be used <u>for piping larger than 3 1/8 in. O.D. (3 in. nominal)</u>	4-3.1.2.11(b)1
4-3.1.2.8 Pipe Joints.		
	(e)* Except as provided under 4-3.1.2.7(g) and (h), joints in copper tubes shall be brazed using capillary fittings complying with ANSI B 16.22, *Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings,* or brazing fittings complying with MSS SP-73, *Brazing Joints for Wrought and Cast Copper Alloy Solder Joint Pressure Fittings.* Cast fittings shall not be used for brazed joints.	4-3.1.2.7(e)
	(f) Valves, fittings, and other piping components shall be cleaned for oxygen service by the manufacturer in accordance with CGA Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service*, except that fittings shall be permitted to be cleaned by a supplier or agency other than the manufacturer.	4-3.1.2.7(f)
	(g) Joints in medical gas tube shall be brazed except that memory-metal couplings having temperature and pressure ratings not less than that of a brazed joint shall be permitted. Flared and compression-type connections shall be prohibited throughout the piping system, including connections to station outlets, alarm devices, and other components. Unions shall not be permitted in the distribution pipeline system.	4-3.1.2.7(g)
	Exception: Threaded connections for air compressor<u>/vacuum</u> sets and devices such as manifolds, pressure regulators, relief valves, pressure<u>/vacuum</u> switches, and pressure<u>/vacuum</u> gauges.	
	(h) Listed or approved metallic gas tube fittings that, when made up, provide a permanent joint having the mechanical, thermal, and sealing integrity of a brazed joint, shall be permitted to be used in lieu of brazed joints.	4-3.1.2.7(h)
	(i) Turns, offsets, and other changes in direction in piping shall be made with fittings complying with 4-3.1.2.7(e).	4-3.1.2.7(i)
	(a)* Threaded Joints.	
	1. Threaded joints in medical gas distribution piping shall be limited to the connection of pressure<u>/vacuum</u> gauges, alarm pressure<u>/vacuum</u> switches, and similar devices.	
	2. Threads on pipe and fittings shall be tapered pipe threads complying with ANSI B 1.20.1, *Pipe Threads, General Purpose.*	
	3. Threaded joints in piping systems shall be made up with polytetrafluoroethylene (such as Teflon™) tape or other thread sealant suitable for oxygen service. Sealants shall be applied to the male threads only.	
	(b)* Brazed Joints.	

	1. Brazed tube joints shall be the socket type. Filler metals shall bond with and be metallurgically compatible with the base metals being joined. Flux shall not be used except where permitted under 4-3.1.2.8(b)1b. Brazing filler metals shall comply with ANSI/AWS A 5.8, *Specification for Brazing Filler Metal*~~, except that filler metals having compositions not conforming to the exact ANSI/AWS A5.8 classifications shall be permitted when used according to the manufacturer's instructions~~.	
	a. Copper-to-copper joints shall be brazed using a copper-phosphorous or copper-phosphorous-silver brazing filler metal (BCuP series) without flux.	
	b. Dissimilar metals, such as copper and bronze or brass, shall be brazed using an appropriate flux with a silver (BAg series) brazing filler metal.	
	2. Joints to be brazed in place shall be accessible for proper preparation, assembly, heating, filler application, cooling, cleaning, and inspection.	
	3. Tube ends shall be cut square using a sharp tubing cutter to avoid deforming the tube. The cutting wheel shall be free from grease, oil, or other lubricant not suitable for oxygen service. The cut ends of tube and pipe shall be deburred with a sharp, clean deburring tool, taking care to prevent chips from entering the tube or pipe.	
	4. The surfaces to be brazed shall be mechanically cleaned using a clean ~~stainless steel~~ wire brush or equivalent. The use of steel wool shall be prohibited due to the possible presence of oil. Mechanical cleaning shall not result in grooving of the surfaces to be joined. After mechanical cleaning, the surfaces shall be wiped using a clean, lint-free white cloth. During this cleaning, care shall be taken to avoid contamination of the "cleaned for oxygen" internal surfaces of the tube and components. Joints shall be re-cleaned if contaminated prior to brazing. Joints shall be brazed within 1 hour of being cleaned.	Proposal
	5. Where dissimilar metals, such as copper and bronze or brass, are being brazed, flux shall be applied sparingly to minimize contamination of the inside of the tube with flux. The flux shall be applied and worked over the surfaces to be brazed using a stiff ~~stainless steel~~ bristle brush to ensure adequate coverage and wetting of the surfaces with flux. Where possible, short sections of copper tube shall be brazed to the non-copper component and the interior of the sub-assembly shall be cleaned of flux prior to installation in the piping system. Flux-coated brazing rods shall be permitted to be used in lieu of the application of flux to the surfaces to be joined on tube 3/4 in. nominal size and smaller.	Proposal
	6. Tube ends shall be inserted fully into the socket of the fitting or in accordance with socket depths required by MSS SP-73 in Table A-4-3.1.2.7(e). The use of a shallow cup fitting shall be accomplished by cutting the cup to the depth required by MSS SP-73 or with a mechanical stop meeting the required depth of MSS SP-73 and not by partial insertion of tube ends into the soldering cup fittings. Where flux is permitted, the joint shall be heated slowly until the flux has liquefied. Once this has occurred, or where flux is not used, the joint shall be heated quickly to the brazing temperature, taking care not to overheat the joint. Techniques for heating the joint, applying the brazing filler metal, and making horizontal, vertical, and large-diameter joints shall be as stated in sections on "Applying Heat and Brazing" and "Horizontal and Vertical Joints" in the chapter on "Joining and Bending" in the CDA *Copper Tube Handbook*.	Proposal
	7.* While being brazed, joints shall be continuously purged with oil-free dry nitrogen NF to prevent the formation of copper oxide on the inside surface of the joint. An alarm signal shall alert the braze operator of insufficient purge gas. The flow of purge gas shall be maintained with the use of a flow meter and the flow maintained until the joint is cool to the touch.	Proposal
	Exception: A final connection to an existing pipeline shall be permitted to be made without the use of a nitrogen purge. After final connection, the affected downstream portions of the pipeline shall be tested in accordance with 4-3.4.1.3(i) with the gas of system designation.	
	8. During and after installation, openings in the piping system shall be kept capped or plugged to avoid unnecessary loss of purge gas while brazing and to prevent debris or other contaminants from entering the system, except that during brazing, a discharge opening shall be provided on the opposite side of the joint from where the purge gas is being introduced. During brazing, the purge gas flow rate shall be maintained at a level that will not produce a positive pressure in the piping system. After brazing, the discharge opening shall be plugged or capped to prevent contamination of the inside of the tube.	
	9. After brazing, the outside of all joints shall be cleaned by washing with water and a stainless steel wire brush to remove any residue and permit clear visual inspection of the joint. Where flux has been permitted, hot water shall be used.	
	10. Each brazed joint shall be visually examined after cleaning of the outside of the joint. The following conditions shall be considered unacceptable:	Proposal
	a. Flux or flux residue (BAg series rods used with dissimilar metals only)	
	b. ~~Excessive oxidation of the joint.~~ Tube or fitting melting or erosion	
	c. Presence of unmelted filler metal	
	d. Failure of the filler metal to be clearly visible all the way around the joint at the interface between the socket and the tube	
	e. Cracks in the tube or component	
	f. Cracks in the braze filler metal	
	g. Failure of the joint to hold the test pressure under 4-3.4.1.2~~(c)~~ (b) and (e)	
	11. Brazed joints that are found to be defective under 4-3.1.2.8(b)10, conditions a, c, d, f, or g, shall be permitted to be repaired, except that no joint shall be repaired more than once. Brazed joints that are found to be defective under 4-3.1.2.8(b)10, conditions b and e, shall be replaced.	
	Exceptions: Level 1, 2, 3, and 4 Vacuum and WAGD Systems.	
	1. Mechanically Formed Branch Connections. The use of drilled and extruded tee-branch connections to copper mains and branches shall be permitted. Such connections shall be made in accordance with the tool manufacturer's instructions and the joints shall be brazed.	4-3.2.2.2(f)

	2. Unions, flare nuts, and similar straight-threaded connections shall be permitted only in exposed locations and shall not be concealed in walls or ceilings.		4-3.2.2.2(h)
4-3.1.2.9 Piping Installation.			
	(a) Piping systems shall be designed and sized to deliver the required flow rates at the utilization pressures. Horizontal runouts from all mains and branches shall be taken off above the center line of the pipe and rise vertically or at an angle of not more than 45 degrees from the vertical.		Proposal
	(b) Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports — Selection and Application*. Hangers and supports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Supports — Materials, Design and Manufacture*. Hangers for copper tube shall have a copper finish. In potentially damp locations, copper tube hangers or supports shall be plastic-coated or otherwise insulated from the tube. Maximum support spacing shall be as follows:		
	$^1/_4$ in. (0.635 cm) nominal	5 ft (1.52 m)	
	$^3/_8$ in. (0.953 cm) nominal	6 ft (1.83 m)	
	$^1/_2$ in. (1.27 cm) nominal	6 ft (1.83 m)	
	$^3/_4$ in. (1.91 cm) nominal	7 ft (2.13 m)	
	1 in. (2.54 cm) nominal	8 ft (2.44 m)	
	$1^1/_4$ in. (3.175 cm) nominal	9 ft (2.74 m)	
	$1^1/_2$ in. (3.81 cm) nominal and larger	10 ft (3.05 m)	
	Vertical risers, all sizes	Every floor, but not to exceed 15 ft (4.57 m)	
	(c) Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient depth to protect the piping from excessive stresses. the minimum backfilled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in. (45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated so that the pipe has a firm, substantially continuous bearing on the bottom of the trench. Underground piping shall be installed in a continuous enclosure to protect the pipe from damage during backfilling. The enclosure shall be split or otherwise provide access at the joints during visual inspection and leak testing. Backfill shall be clean and compacted so as to protect and uniformly support the piping. A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. In addition, a continuous warning means shall be provided above the pipeline at approximately one-half the depth of bury. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping underground within buildings or embedded in concrete floors or walls shall be installed in a continuous conduit.		
	(d) Medical gas risers shall be permitted to be installed in pipe shafts if protected from physical damage, effects of excessive heat, corrosion, or contact with oil.		
	(e) Piping shall not be installed in elevator shafts, kitchens, or electrical switchgear rooms.		
	(f) Medical gas piping shall be permitted to be located in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities provided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 130°F (54°C) maximum. Medical gas piping shall not be located where subject to contact with oil, including flooding in the case of a major oil leak.		
	(g) Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be suitably protected.		
	(h) Hoses and flexible connectors, both metallic and nonmetallic, shall be no longer than necessary and shall not penetrate or be concealed in walls, floors, ceilings, or partitions. Flexible connectors, metallic or nonmetallic, shall have a minimum burst pressure of 1000 psig (6900 kPa gauge).		
	(i) Where a system originally used or constructed for use at one pressure and for a gas is converted for operation at another pressure or for another gas, all provisions of 4-3.1.2.1, 4-3.1.2.4, 4-3.1.2.8, 4-3.1.2.10, 4-3.1.2.12, 4-3.4.1, and the Exception to 4-3.1.2.7(c) shall apply as if the system were new. Vacuum systems shall never be converted for use as gas systems.		
4-3.1.2.10* Installation Requirements.			
	(a) Equipment and Component Installation.		
	1. The installation of individual components shall be made in accordance with the instructions of the manufacturer. Such instructions shall include directions and information deemed by the manufacturer to be adequate for attaining proper installation, testing, maintenance, and operation of the medical gas systems. These instructions shall be left with the owner.		
	2. The installation shall be made by qualified, competent technicians experienced in making such installations. *(See 4-3.1.2.12 for brazer performance.)*		
	3. Brazing shall be performed by individuals who are qualified under the provisions of 4-3.1.2.12.		
	(b) Health care organization personnel shall be permitted to install piping systems if all the requirements of Section 4-3 are met during installation.		
	(c) The installer of medical gas piping and equipment shall maintain on the job site documentation regarding the qualification of brazing procedures and individual brazers per 4-3.1.2.12 prior to installation.		
	(d) Two or more medical gas piping systems shall not be interconnected or testing or for any other reason. Leak testing shall be accomplished by separately charging and testing the individual piping system.		
4-3.1.2.11 Systems Having Nonstandard Operating Pressures. The following requirements apply to gas piping systems having an operating pressure other than the standard 50 to 55 psig (345 to 380 kPa) [or 160 psig (1103 kPa) for nitrogen], and are in addition to the minimum requirements listed in 4-3.1.2.3 through 4-3.1.2.9.			

	(a) Pipelines, shutoff valves, and station outlets in systems having nonstandard operating pressures shall be labeled for gas name and operating pressure.	
	(b) Where operating pressures are 200 to 300 psig (1380 to 2068 kPa), the following applies:	
	~~1. Only Type K medical gas tube (ASTM B819) shall be used.~~	(Under 4-3.1.2.7, Exception)
	~~2. Brazing procedures and brazers shall be qualified as required under 4-3.1.2.12.~~	
	(c) Station outlets in systems having nonstandard operating pressures shall meet the following additional requirements:	
	1. Be gas-specific	
	2. Be pressure-specific where a single gas is piped at more than one operating pressure [e.g., a station outlet for oxygen, 80 psig (550 kPa) shall not accept an adapter for oxygen, 50 psig (345 kPa)]	
	3. If operated at a pressure above 80 psig (550 kPa) but below 200 psig (1380 kPa), be either DISS style or comply with 4-3.1.2.4.	
	4. If operated at a pressure between 200 and 300 psig (1380 to 2068 kPa), the station outlet shall be so designed as to prevent the removal of the adapter until the pressure has been relieved, to prevent the adapter injuring the user or others when removed from the outlet.	
	5. Be labeled for the gas name and operating pressure [e.g., nitrogen, 250 psig (1725 kPa)]	
	(d) *Testing*. When systems operated at different pressures are installed, each pipeline shall be tested separately.	
4-3.1.2.12 Qualification of Brazing Procedures and Brazer Performance. Brazing procedures and brazer performance shall be qualified in accordance with either Section IX, Welding and Brazing Qualifications, of the ASME *Boiler and Pressure Vessel Code*, or AWS B2.2, *Standard for Brazing Procedure and Performance Qualifications*, both as modified below.		
	(a) Brazers shall be qualified by visual examination of the test coupon followed by sectioning ~~except that a tension test shall be permitted to be substituted for sectioning. Where tension tests are used for brazer qualification, they shall be performed in accordance with ASME IX.~~	Proposal
	(b) The Brazing Procedure Specification shall address cleaning, joint clearance, overlap, internal purge gas, purge gas flow rate, and filler metal.	
	(c) The Brazing Procedure Qualification Record and the Record of Brazer Performance Qualification shall document filler metal used, cleaning, joint clearance, overlap, internal purge gas and flow rate used during brazing of the test coupon, and no internal oxidation exhibited on the completed test coupon.	
	(d) Brazing procedures qualified by a technically competent group or agency are permitted under the following conditions:	
	1. The Brazing Procedure Specification and the Procedure Qualification Record shall meet the requirements of this standard.	
	2. The employer shall obtain a copy of both the Brazing Procedure Specification and the supporting qualification records from the group or agency and shall sign and date these records, thereby accepting responsibility for the qualifications that were performed by the group or agency.	
	3. The employer shall qualify at least one brazer following each Brazing Procedure Specification used.	
	(e) An employer shall be permitted to accept Brazer Qualification Records of a previous employer under the following conditions:	
	1. The brazer shall have been qualified following the same or an equivalent procedure as that which he/she will use for the new employer.	
	2. The new employer shall obtain a copy of the record of Brazer Performance Qualification tests from the previous employer and shall sign and date these records, thereby accepting responsibility for the qualifications performed by the previous employer.	
	(f) Performance qualification of brazers shall remain in effect indefinitely unless the brazer does not braze with the qualified procedure for a period exceeding 12 months, or there is a specific reason to question the ability of the brazer.	
4-3.1.2.13 Labeling. The gas content of medical gas piping systems shall be readily identifiable by appropriate labeling with the name and pressure of the gas contained. Such labeling shall be by means of metal tags, stenciling, stamping, or adhesive markers, in a manner that is not readily removable. Labeling shall appear on the piping at intervals of not more than 20 ft (6 m) and at least once in each room and each story traversed by the piping system. Where supplementary color identification of piping is used, it shall be in accordance with the gases and colors indicated in CGA Pamphlet C-9, *Standard Color-Marking of Compressed Gas Cylinders Intended for Medical Use*. Only those systems operating at nonstandard pressures shall be labeled with the name of the gas and the operating pressure.		Proposal
~~4-3.2.2.2 Vacuum System Piping Network.~~		Included in 4-3.1.2.7
	~~(a) *Vacuum Network Piping*. Piping shall be corrosion-resistant metal such as seamless copper water tube (ASTM B88, Types K, L, M), copper ACR tube (ASTM B280), copper medical gas tube (ASTM B819), stainless steel tube, or galvanized steel pipe [$1\frac{1}{2}$ in. minimum size] (ASTM A53). Pipe threads shall comply with ANSI B1.20.1, *Pipe Threads, General Purpose*. Copper tube shall be hard drawn temper except that annealed tube shall be permitted underground. Joints in copper tube shall be soldered or brazed. Joints in stainless steel tube shall be brazed or welded. Joints in galvanized steel pipe shall be threaded or flanged. Soldering shall be performed in accordance with ASTM B828, *Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings*. Solder metal (ASTM B32) shall contain less than 0.2 percent lead. Brazing shall be in accordance with 4-2.1.2.3(c) except that nitrogen purging while brazing shall not be required.~~	

	~~(b) *Marking*. If copper vacuum piping is installed along with any medical gas piping, either the vacuum piping or the medical gas piping shall, prior to installation, be prominently labeled or otherwise identified to preclude using materials or installation procedures in the medical gas system that are not suitable for oxygen service. If medical gas tube (ASTM B819) with brazed joints is used for the vacuum piping, such special marking shall not be required, provided that the vacuum piping installation meets all requirements for medical gas piping, including the prohibition of flux on copper-to-copper joints and the use of a nitrogen purge while brazing.~~	
	~~(c) *Minimum Sizes.* Mains and branches shall be not less than $^{7}/_{8}$ in. O.D ($^{3}/_{4}$ in. nominal) size. Drops to individual vacuum inlets shall be not less than $^{5}/_{8}$ in. O.D. ($^{1}/_{2}$ in. nominal) size (0.500 in. minimum insider), except that the tube attached immediately to the station inlet body and not extending more than 8 in. (20.3 cm) from the station inlet shall be permitted to be $^{1}/_{2}$ in. O.D. ($^{3}/_{8}$ in. nominal) size (0.400 in. minimum inside diameter). Connections to gauges and alarm switches and runouts and alarm panels shall be permitted to be $^{1}/_{4}$ in. O.D. ($^{1}/_{8}$ in. nominal) size.~~	
	~~(d) *Support*. Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports — Selection and Application*. Hangers and supports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Supports — Materials, Design, and Manufacture.* Hangers for copper tube shall have a copper finish. In potentially damp locations, copper tube hangers or supports shall be plastic coated or otherwise insulated from the tube. Maximum support spacing shall be as follows:~~	
	~~(e) *Copper Tube Fittings*. Fittings for joining copper tube shall be pressure-rated copper, brass, or bronze made especially for brazing or soldering, except as provided in 4-3.2.2.2(f) and (g). Fittings shall be wrought or cast, except that cast fittings shall not be brazed.~~	
	~~(f) *Mechanically Formed Branch Connections*. The use of drilled and extruded tee branch connections to copper mains and branches shall be permitted. Such connections shall be made in accordance with the tool manufacturer's instructions and the joint shall be brazed.~~	
	~~(g) *Shape Memory Couplings.* Memory-metal couplings providing joints equivalent to a soldered or brazed joint shall be permitted.~~	
	~~(h) *Unions.* Unions, flare nuts, and similar straight-threaded connections shall be permitted only in exposed locations and shall not be concealed in walls or ceilings.~~	
	~~(i) *Protection*. Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be suitably protected. Piping embedded in concrete floors or walls shall be installed in a continuous conduit.~~	
	~~(j) *Underground Piping*. Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient depth to protect the piping from excessive stresses. The minimum backfilled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in. (45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated so that the pipe has a firm, substantially continuous bearing on the bottom of the trench. Underground piping shall be installed in a continuous enclosure to protect the pipe from damage while backfilling. The enclosure shall be split or otherwise provide access at the joints during visual inspection and leak testing. Backfill shall be clean and compacted so as to protect and uniformly support the piping. A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. In addition, a continuous warning means shall be provided above the pipeline at approximately one-half the depth of bury. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping underground within buildings or embedded in concrete floors or walls shall be installed in a continuous conduit.~~	
	~~(k) *Penetrations*. Where piping penetrates fire barriers such as walls, partitions, or ceiling/floor assemblies having required fire resistance ratings, the penetration shall be protected in accordance with the requirements of NFPA *1-01, Life Safety Code,* and the applicable building codes.~~	
	~~(l) *Conversion*. Vacuum piping systems shall not be converted for use as a pressurized gas system.~~	
~~4-3.2.2.11 Installation of Vacuum System Piping.~~		Included in 4-3.1.2.8 and 4-3.1.2.9
	~~(a) *General.* The provisions of this section shall apply to field-installed piping for vacuum systems.~~	
	~~(b) *Materials and Joints.* Piping materials and joining methods shall be in accordance with 4-3.2.2.2.~~	
	~~(c) *Open Ends*. Care shall be taken to maintain the interior of the piping system free of debris or other foreign matter. Pipe, tube, and fittings shall be inspected visually prior to installation. During installation, open ends of piping shall be temporarily sealed.~~	
	~~(d) *Flux.* Where flux is used for soldered or brazed joints, it shall be used sparingly to avoid excess flux inside of the finished joint.~~	
	~~(e) *Cleaning.* After soldering or brazing, the outside of all joints shall be cleaned by washing with water and a stainless steel brush to remove any residue and permit clear visual inspection of the joint. If flux has been used, joints shall be washed with hot water.~~	
	~~(f) *Visual Inspection.* Each soldered or brazed joint shall be visually examined after cleaning of the outside of the joint. The following conditions shall be considered unacceptable:~~	
	~~1. Flux or flux residue~~	
	~~2. Excessive oxidation of the joint~~	
	~~3. Presence of unmelted solder or brazer filler metal~~	
	~~4. Cracks in the tube or component~~	

	5. Failure of the solder or braze filler metal to be clearly visible all the way around the joint at the interface between the socket and the tube	
	6. Cracks in the solder or brazer filler metal	
	7. Failure of the joint to hold the test pressure under 4-3.4.2.2(b)2	
	(g) *Repairs*. Soldered or brazed joints that are found to be defective under 4-3.2.2.11(f)1, 3, 4, 6, or 7 shall be permitted to be repaired, except that no joint shall be repaired more than twice. Joints that are found to be defective under 4-3.2.2.11(f)2 or 5 shall be replaced.	
	(h) *Piping Identification*. Vacuum piping shall be readily identified by appropriate labeling, such as MEDICAL SURGICAL VACUUM, or MED/SURG VAC. Labeling shall be by means of stamped metal tags, stenciling, or printed adhesive markers, and shall not be readily removable. Labels shall be spaced at intervals of not more than 20 ft (6.1 m), except that at least one label shall be visible in or above each room or area. Flow arrows (if used) shall point from the station inlets toward the receiver or pump.	
4-5.1.2.10* Gas Piping.		
	(a) *Gas Piping*. The provisions of this section apply to field-installed piping for the distribution of nonflammable medical piped gases.	Included in 4-3.1.2.7
	1. Tubes, valves, fittings, station outlets, and other piping components in medical gas systems shall have been cleaned for oxygen service prior to installation.	
	2. Piping for nonflammable medical gas systems shall be suitable for oxygen service in accordance with 4-5.1.2.10(a)3. Each length of tube shall be permanently labeled and delivered plugged or capped. Fittings, valves, and other devices shall be sealed and marked. The installer shall furnish documentation certifying that all installed piping materials comply with the requirements of this paragraph.	
	3. Piping shall be ASTM B 819 specification hard drawn seamless medical gas tubing; ASTM B 819 tubing is identified by the markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in green (Type K) or blue (Type L). Main and branches shall be not less than $1/2$ in. nominal size. Factory-installed tube on station outlets extending no farther than 8 in. from the outlet body shall be permitted to be $3/8$ in. O.D. ($1/4$ in. nominal) size. Connection to gauges and alarm switches and runouts to alarm panels shall be permitted to be $1/4$ in. O.D. ($1/8$ in. nominal) size.	
	Exception: For systems operated at pressures between 200 and 300 psig (1380 and 2070 kPa, respectively), ASTM B 819, Type K copper shall be used.	
	Copper tube shall, wherever possible, be installed overhead or below floor level. Only where the installation requires installing in a slab, exceptions below are permitted to apply:	
	a. Annealed (soft temper) ASTMB88 (Type K or L) copper tube that has been prepared for oxygen service according to CGA Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service,* shall be permitted to be used up to $1/2$ in. O.D. ($3/8$ in. nominal) size.	
	b. The tube shall be installed in conduit sufficiently large to accept the following gases (if used) O_2, N_2O, N_2, MA, DA, Level 3 vacuum.	
	c. The pipe shall be a continuous run from entry to exit of the conduit. PVC conduit shall be permitted for Level 3 vacuum only.	
	d. All station outlets (inlets) shall be permitted to be completed after the slab is complete.	
	e. All tests shall be completed per 4-5.4.1.2.	
	4. Except as provided under 4-5.1.2.10(a)8 and 9, joints in copper tubes shall be brazed using capillary fittings complying with ANSI B16.22, *Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings*, or brazing fittings complying with MSS SP-73, *Brazing Joints for Wrought and Cast Copper Alloy Solder Joint Pressure Fittings*. Cast fittings shall not be used for brazed joints.	
	Exception: Flared connections shall be permitted where exposed at station outlets and manifold connections.	
	5. Valves, fittings, and other piping components shall be cleaned for oxygen service by the manufacturer in accordance with CGA Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service,* except that fittings shall be permitted to be cleaned by a supplier or agency other than the manufacturer.	
	6. Piping systems shall be designed and sized to deliver the required flow rates at the utilization pressures.	
	7. Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports Selection and Application*. Hangers and supports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Supports Materials, Design and Manufacture*. Hangers for copper tube shall have a copper finish. In potentially damp locations, copper tube hangers or supports shall be plastic-coated or otherwise insulated from the tube. Maximum support spacing shall be as follows:	
	8. Joints in medical gas tube shall be brazed except that memory-metal couplings having temperature and pressure ratings not less than that of a brazed joint shall be permitted. Compression-type connections shall be prohibited throughout the piping system, including connections to station outlets, alarm devices, and other components. Unions shall not be permitted in the distribution pipeline system.	
	Exception: Threaded connections for air compressor sets and devices such as manifolds, pressure regulators, relief valves, pressure switches, and pressure gauges.	
	9. Listed or approved metallic gas tube fittings that, when made up, provide a permanent joint having the mechanical, thermal, and sealing integrity of a brazed joint shall be permitted to be used in lieu of brazed joints.	
	10. Turns, offsets, and other changes in direction in piping shall be made with fittings complying with 4-5.1.2.10(a)4.	

	~~11. Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient depth to protect the piping from excessive stresses. The minimum backfilled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in. (45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated so that the pipe has a firm, substantially continuous bearing on the bottom of the trench. Underground piping shall be installed in a continuous enclosure to protect the pipe from damage while backfilling. The enclosure shall be split or otherwise provide access at the joints during visual inspection and leak testing. Backfill shall be clean and compacted so as to protect and uniformly support the piping. A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. In addition, a continuous warning means shall be provided above the pipeline at approximately one half the depth of bury. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping underground within buildings or imbedded in concrete floors or walls shall be installed in a continuous conduit.~~	
	~~12. Medical gas risers shall be permitted to be installed in pipe shafts if protected from physical damage, effects of excessive heat, corrosion, or contact with oil.~~	
	~~13. Piping shall not be installed in kitchens or electrical switchgear rooms.~~	
	~~14. Medical gas piping shall be permitted to be located in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities provided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 130°F (54°C) maximum. Medical gas piping shall not be located where subject to contact with oil, including flooding in the case of a major oil leak.~~	
	~~15. Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equip or vehicles shall be suitably protected.~~	
	~~16. Where a system originally used or constructed for use at one pressure and for a gas is converted for operation at another pressure or for another gas, all provisions of 4-5.1.2.12, 4-5.1.2.10(b), 4-5.4, and the exception to 4-5.1.2.10(a)3 shall apply as if the system were new. Vacuum systems shall never be converted for use as gas systems.~~	
	~~(b) *Brazed Joints.*~~	
	~~1. Brazed tube joints shall be the socket type. Filler metals shall bond with and be metallurgically compatible with the base metals being joined. Flux shall not be used except where permitted under 4-5.1.2.10(b)1b. Brazing filler metals shall comply with ANSI/AWS A5.8, *Specification for Brazing Filler Metal,* except that filler metals having compositions not conforming to the exact ANSI/AWS A5.8 classifications shall be permitted when used according to the manufacturer's instructions.~~	
	~~a. Copper to copper joints shall be brazed using a copper phosphorus or copper phosphorus silver brazing filler metal (BCuP series) without flux.~~	
	~~b. Dissimilar metals, such as copper and bronze or brass, shall be brazed using an appropriate flux with a silver (Bag series) brazing filler metal.~~	
	~~2. Joints to be brazed in place all be accessible for proper preparation, assembly, heating, filler application, cooling, cleaning, and inspection.~~	
	~~3. Tube ends shall be cut square using a sharp tubing cutter to avoid deforming the tube. The cutting wheel shall be free from grease, oil, or other lubricant not suitable for oxygen service. The cut ends of tube and pipe shall be deburred with a sharp, clean deburring tool, taking care to prevent chips from entering the tube or pipe.~~	
	~~4. The surfaces to be brazed shall be mechanically cleaned using a clean stainless steel wire brush or equivalent. The use of steel wool shall be prohibited due to the possible presence of oil.~~	
	~~Mechanical cleaning shall not result in grooving of the surfaces to be joined. After mechanical cleaning, the surfaces shall be wiped using a clean, lint free white cloth. During this cleaning, care shall be taken to avoid contamination of the cleaned item for oxygen internal surfaces of the tube and components. Joints shall be recleaned if contaminated prior to brazing. Joints shall be brazed within 1 hour of being cleaned.~~	
	~~5. Where dissimilar metals, such as copper and bronze or brass, are being brazed, flux shall be applied sparingly to minimize contamination of the inside of the tube with flux. The flux shall be applied and worked over the surfaces to be brazed using a stiff stainless steel bristle brush to ensure adequate coverage and wetting of the surfaces with flux. Where possible, short sections of copper tube shall be brazed to the noncopper component and the interior of the subassembly shall be cleaned of flux prior to installation in the piping system. Flux coated brazing rods shall be permitted to be used in lieu of the application of flux to the surfaces to be joined on tube $^{3}/_{4}$ in. nominal size and smaller.~~	
	~~6. Tube ends shall be inserted fully into the socket of the fitting. Where flux is permitted, the joint shall be heated slowly until the flux has liquefied. Once this has occurred, or where flux is not used, the joint shall be heated quickly to the brazing temperature, taking care not to overheat the joint. Techniques for heating the joint, applying the brazing filler metal, and making horizontal, vertical, and large diameter joints shall be as stated in sections on "Applying Heat and Brazing" and "Horizontal and Vertical Joints" in the chapter on "Joining and Bending" in the CDA *Copper Tube Handbook.*~~	
	~~7.* While being brazed, joints shall be continuously purged with oil-free dry nitrogen to prevent the formation of copper oxide on the inside surface of the joint. The flow of purge gas shall be maintained until the joint is cool to the touch.~~	

	~~*Exception: A final connection to an existing pipeline shall be permitted to be made without the use of a nitrogen purge. After final connection, the affected downstream portions of the pipeline shall be tested in accordance with 4-5.4.1.3 with the gas of system designation.*~~	
	~~8. During and after installation, openings in the piping system shall be kept capped or plugged to avoid unnecessary loss of purge gas while brazing and to prevent debris or other contaminants from entering the system; except that during brazing, a discharge opening shall be provided on the opposite side of the joint from where the purge gas is being introduced. During brazing, the purge gas flow rate shall be maintained at a level that will not produce a positive pressure in the piping system. After brazing, the discharge opening shall be plugged or capped to prevent contamination of the inside of the tube.~~	
	~~9. After brazing, the outside of all joints shall be cleaned by washing with water and a stainless steel wire brush to remove any residue and permit clear visual inspection of the joint. Where flux has been permitted, hot water shall be used.~~	
	~~10. Each brazed joint shall be visually examined after cleaning of the outside of the joint. The following conditions shall be considered unacceptable:~~	
	~~a. Flux or flux residue~~	
	~~b. Excessive oxidation of the joint~~	
	~~c. Presence of unmelted filler metal~~	
	~~d. Failure of the filler metal to be clearly visible all the way around the joint at the interface between the socket and the tube~~	
	~~e. Cracks in the tube or component~~	
	~~f. Cracks in the braze filler metal~~	
	~~g. Failure of the joint to hold the test pressure under 4-5.4.1.2~~	
	~~11. Brazed joints that are found to be defective under 4-5.1.2.10(b)10 conditions a, c, d, f, or g, shall be permitted to be repaired, except that no joint shall be repaired more than once. Brazed joints that are found to be defective under 4-5.1.2.10(b)10, conditions b and e, shall be replaced.~~	
	~~(c)* *Threaded Joints.*~~	
	~~1. Threaded joints in medical gas distribution piping shall be limited to the connection of pressure gauges, alarm pressure switches, and similar devices.~~	
	~~2. Threads on pipe and fittings shall be tapered pipe threads complying with ANSI B1.20.1, *Pipe Threads, General Purpose.*~~	
	~~3. Threaded joints in piping systems shall be made up with polytetrafluoroethylene (such as Teflon®) tape or other thread sealant suitable for oxygen service. Sealants shall be applied to the male threads only.~~	
	~~(d) *Manufactured Equipment and Component Installation.*~~	
	~~1. The installation of individual components shall be made in accordance with the instructions of the manufacturer. Such instructions shall include directions and information deemed by the manufacturer to be adequate for attaining proper installation, testing, maintenance, and operation of the medical gas systems. These instructions shall be left with the owner.~~	
	~~2. The installation shall be made by qualified, competent technicians experienced in making such installations.~~	
	~~(e) *Prohibited Interconnections.* Two or more medical gas piping systems shall not be interconnected for testing or for any other reason. Leak testing shall be accomplished by separately charging and testing the individual piping system.~~	
	~~(f)* *Fittings.* Fittings shall be manufactured from metallic corrosion resistant materials suitable for the system pressures [not to exceed 160 psig (1103 kPa)].~~	
	~~(g) *Connectors and Joints.* Connectors and joints shall be brazed or threaded NPT.~~	
	~~(h) *General Requirements.*~~	
	~~1. *Oxygen Compatibility.* Components in nonflammable medical gas systems shall be of materials that are suitable for oxygen service. *(See 4-3.1.1.3, Material — Oxygen Compatibility.)* Pipe (tube), fittings, valves, and other components shall have been thoroughly cleaned internally to remove oil, grease, and other readily oxidizable materials, as if for oxygen service.~~	
	~~2. *Cleanliness.* Materials that have been cleaned for use in medical gas piping systems shall be plugged, capped, or otherwise sealed until installed. Particular care shall be taken in the storage and handling of such material to maintain its clean condition. Immediately before final assembly, such material shall be visually examined internally for contamination. Material that has become contaminated and is no longer suitable for oxygen service shall not be installed.~~	
	~~3. *On Site Cleaning.* On site cleaning of the interior surfaces of tubes, valves, fittings, and other components shall be limited to recleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Such surfaces shall be cleaned by washing in a clean, hot water/alkaline solution, such as sodium carbonate or trisodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot potable water.~~	
~~4-5.1.3 Distribution for Gas-Powered Devices — Level 3.~~		Included in 4-3.1.2.7
~~4-5.1.3.1 The provisions of this section apply to field-installed piping for the distribution of gases to power devices.~~		
	~~(a) Piping shall be Type K or L copper (hard drawn or annealed) or brass (schedule 40 or 80). If Level 3 system dynamic gas piping is installed simultaneously with other patient gas piping systems, either the Level 3 system piping shall be labeled or otherwise identified prior to installation in order to preclude inadvertent inclusion in a nonflammable medical gas piping system, or the Level 3 system piping shall be cleaned and degreased in accordance with 4-5.4.1.~~	

	~~(b)* Fittings shall be manufactured from corrosion resistant materials suitable for the system pressures [not to exceed 160 psig (1103 kPa)].~~	
	~~(c) Connectors and joints shall be brazed, or threaded NPT.~~	
	~~(d) Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports — Selection and Application*. Hangers and supports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Support — Materials, Design and Manufacture*.~~	
	~~(e) Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient depth to protect the piping from excessive stresses. The minimum backfilled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in. (45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated so that the pipe has a firm, substantially continuous bearing on the bottom of the trench. Underground piping shall be installed in a continuous enclosure to protect the pipe from damage while backfilling. The enclosure shall be split or otherwise provide access at the joints during visual inspection and leak testing. Backfill shall be clean and compacted so as to protect and uniformly support the piping. A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. In addition, a continuous warning means shall be provided above the pipeline at approximately one half the depth of bury. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping underground within buildings or imbedded in concrete floors or walls shall be installed in a continuous conduit.~~	
	~~(f) Gas piping shall be permitted to be located in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities provided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 130°F (54°C) maximum. Gas piping shall not be located where subject to contact with oil, including flooding in the case of a major oil leak.~~	
	~~(g) Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be suitably protected.~~	
~~4-6.1.2.3 Piping systems for nonflammable gases shall comply with Level 1 gas systems as specified in this chapter.~~		(Included in 4-3.1.2)

SUBSTANTIATION: This is an attempt to meld the vacuum and positive gas piping systems. NFPA eliminated the vacuum subcommittee a number of years ago with the intention of bringing two sections into one document. This is just a continued effort to accomplish this goal.

COMMITTEE ACTION: Accept in Principle.

Revise the proposal as follows:

Affected Paragraphs: 4-3.1.2 through 4-6.1.2.5 (Level 1,2,3,and 4 affecting piping, materials and installation). This is an attempt to meld the vacuum and positive gas piping systems. NFPA eliminated the vacuum subcommittee a number of years ago with the intention of bringing the two sections into one document. This is just a continued effort to accomplish this goal.

The Left Column is the complete proposed text. New material is **Bold.** Where the text is sourced in the current document, the source paragraph is listed in the right-hand column. Where the text is new, the relevant proposal is noted.

4-3.1.2 Distribution — ~~Level 1 (Manifold, Piping, Valving/~~ **Level 1, 2, 3, and 4 Gas and Vacuum Piping and Materials** ~~Controls, Outlets/Terminals, Alarms). See Figure 4-3.1.2.~~	
4-3.1.2.1 General Requirements.	
(a) *Oxygen Compatibility.* Components in nonflammable medical gas and vacuum systems shall be of materials that are suitable for oxygen service. *(See 4-3.1.1.3, Material — Oxygen Compatibility.)* Pipe (tube), fittings, valves, and other components shall have been thoroughly cleaned internally to remove oil, grease, and other readily oxidizable materials, as if for oxygen service.	4-3.1.2.1(a)
(b) *Cleanliness.* Materials that have been cleaned for use in medical gas piping systems shall be plugged, capped, or otherwise sealed until installed. Particular care shall be taken in the storage and handling of such material to maintain its clean condition. Immediately before final assembly, such material shall be visually examined internally for contamination. Material that has become contaminated and is no longer suitable for oxygen service shall not be installed.	4-3.1.2.1(b)
(c) *On-Site* ***Rec*** *~~C~~leaning.* On-site **re**cleaning of the interior surfaces of tube ends, valves, fittings, and other components shall be limited to recleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Such surfaces shall be cleaned by washing in a clean, hot water/alkaline solution, such as sodium carbonate or trisodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot potable water.	AIP Log #43
(e) *Pressure Gauges for Gases.* The scale range of positive pressure analog gauges shall be such that the normal reading falls within the middle 50 percent of the scale. The scale range of digital gauges shall be not more than two times the working pressure. The rated accuracy of pressure gauges used for testing shall be one percent (full scale) or better at the point of reading. Pressure gauges shall be in compliance with ANSI/ASME B-40.1, *Gauges, Pressure Indicating Dial-Type, Elastic Element*s.	
1.* A pressure gauge shall be installed in the main line adjacent to the actuating switch required in 4-3.1.2.2(b)3e. It shall be appropriately labeled and shall be readily visible from a standing position.	
2.* An appropriately identified pressure gauge, connected to the line being monitored, shall be installed at each area alarm panel location. It shall be appropriately labeled and shall be readily visible from a standing position.	
(f) Vacuum System Gauges.	
(a) ***Main-Line Gauge.*** **A vacuum gauge shall be provided in the main vacuum line adjacent to the actuator (vacuum switch) for the master alarms, with this gauge located immediately upstream (on the terminal or inlet side) terminal or inlet of the source valve (the main line valve, if so equipped). Those with normal range display shall indicate normal only between 12 and 19 in. Hg (vacuum).**	4-3.2.2.10
(b) ***Area Gauge.*** **Vacuum gauges shall be located at each area vacuum alarm signal location, with this gauge connected upstream (on the terminal or inlet side) of any valve controlling that area. Those with normal range display shall indicate normal only between 12 and 19 in. Hg (vacuum).**	
(c)*Vacuum Gauge Identification. All permanently installed vacuum gauges and manometers for the vacuum system shall be continuous reading, manufactured expressly for vacuum, and labeled: VACUUM.	
4-3.1.2.7 Piping Materials. The provisions of this section apply to field-installed piping for the distribution of medical piped gases and vacuum systems.	
(a) Tubes, valves, fittings, station outlets, and other piping components in medical gas systems shall have been cleaned for oxygen service prior to installation.	
(b) Piping for nonflammable medical gas systems shall be suitable for oxygen service in accordance with 4-3.1.2.1. Each length of tube shall be permanently labeled and delivered plugged or capped. Fittings, valves, and other devices shall be sealed and marked. The installer shall furnish documentation certifying that all installed piping materials comply with the requirements of this paragraph.	
(c) Piping shall be ASTM B 819 specification hard drawn seamless medical gas tubing; ASTM B 819 tubing is identified by the markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" ~~in green (Type K) or~~ blue (Type L). Main and branches shall be not less than 1/2 in. nominal size **for positive gases and 3/4 in. nominal for vacuum**. **Drops to individual outlet/inlets shall be not less than 1/2 in. nominal.** Factory-installed tube on station outlets extending no further than 8 in. from the outlet body shall be permitted to be 1/2 in. O.D. (3/8 in. nominal) size. **Connecting tubing for** gauges and alarm switches and runouts to alarm panels shall be permitted to be ~~1/4~~ **3/8** in. O.D. (~~1/8~~ **1/4** in. nominal) size.	4-3.1.2.7(c) and 4-3.2.2.2(c) AIP Log #229 AIP Log #62 4-3.1.2.7(d)
(d) Where seismic construction is required by the building code, piping shall be properly braced.	
(e)*Except as provided under 4-3.1.2.7(g) and (h), joints in copper tubes shall be brazed using capillary fittings complying with ANSI B16.22, *Wrought Copper and Copper Alloy Solder Joint Pressure Fittings,* or brazing fittings complying with *MSS SP-73, Brazing Joints for Wrought and Cast Copper Alloy Solder Joints Pressure Fittings.* Cast fittings shall not be used for brazed joints.	

(f) Valves, fittings, and other piping components shall be cleaned for oxygen service by the manufacturer in accordance with CGA Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service,* except that fittings shall be permitted to be cleaned by a supplier or agency other than the manufacturer.	
(g) Joints in medical gas tube shall be brazed except that memory-metal couplings having temperature and pressure ratings not less than that of a brazed joint shall be permitted. Flared and compression fittings shall be prohibited throughout the piping system, including connections to station outlet**/inlet** alarm devices, and other components. Unions shall not be permitted in the distribution pipeline system.	
Exception:	
1. Threaded connections for air compressor sets and devices such as manifolds, pressure regulators, relief valves, pressure switches, and pressure gauges.	
2. Dielectric fittings at equipment requiring isolation between the piping distribution system and the equipment.	AIP Log #77
(h) Listed or approved metallic gas tube fittings that, when made up, provide a permanent joint having the mechanical, thermal, and sealing integrity of a brazed joint shall be permitted to be used in lieu of brazed joints.	
(i) Turns, offsets, and other changes in direction in piping shall be made with fittings complying with 4-3.1.2.7(e).	
Vacuum System Piping	
1. Seamless copper water tube (ASTM B88), Type K,L,M copper ACR tube, (ASTM B280), or (ASTM B819) medical gas tube shall be permitted to be used.	4-3.2.2.2(a)
~~*2. Soft annealed copper tubing (ASTM B88) shall be permitted underground*~~	AIP Log #192
Exception: Nonstandard Operating Pressure Systems	
1. Where operating pressures are ~~200 to 300 psig (1380 to 2068)~~ **above 185 psig (1,276** kPa) only Type K medical gas tube (ASTM B819) shall be used **for piping larger than 3 1/8 in. O.D. (3 in. nominal)**	AIP Log #48 Proposal (sent 6/30 not in ROP's)
4-3.1.2.8 Pipe Joints.	
(a)* *Threaded Joints.*	
1. Threaded joints in medical gas distribution piping shall be limited to the connection of pressure**/vacuum** gauges, alarm pressure**/vacuum** switches, and similar devices.	
2. Threads on pipe and fittings shall be tapered pipe threads complying with ANSI B1.20.1, *Pipe Threads, General Purpose*.	
3. Threaded joints in piping systems shall be made up with polytetrafluoroethylene (such as Teflon™) tape or other thread sealant suitable for oxygen service. Sealants shall be applied to the male threads only.	
(b)**Brazed Joints.*	
1. Brazed tube joints shall be the socket type. Filler metals shall bond with and be metallurgically compatible with the base metals being joined. Flux shall not be used except where permitted under 4-3.1.2.8(b)1b. Brazing filler metals shall comply with ANSI/AWS A5.8, *Specification for Brazing Filler Metal*~~, except that filler metals having compositions not conforming to the exact ANSI/AWS A5.8 classifications shall be permitted when used according to the manufacturer's instructions~~.	Accept Log #289
a. Copper-to-copper joints shall be brazed using a copper- phosphorus or copper-phosphorous-silver brazing filler metal (BCuP series) without flux.	
b. Dissimilar metals, such as copper and bronze or brass, shall be brazed using an appropriate flux with a silver (BAg series) brazing filler metal.	
2. Joints to be brazed in place shall be accessible for proper preparation, assembly, heating, filler application, cooling, cleaning, and inspection.	
3. Tube ends shall be cut square using a sharp tubing cutter to avoid deforming the tube. The cutting wheel shall be free from grease, oil, or other lubricant not suitable for oxygen service. The cut ends of tube and pipe shall be deburred with a sharp, clean deburring tool, taking care to prevent chips from entering the tube or pipe.	
4. The **fitting** surfaces to be brazed shall be **pre-cleaned by the manufacturer and the tube ends to be brazed shall be cleaned with a non-abrasive pad**. The use of steel wool shall be prohibited due to the possible presence of oil. Mechanical cleaning shall not result in grooving of the surfaces to be joined. After mechanical cleaning, the surfaces shall be wiped using a clean, lint-free white cloth. During this cleaning, care shall be taken to avoid contamination of the "cleaned for oxygen" internal surfaces of the tube and components. Joints shall be re-cleaned if contaminated prior to brazing. Joints shall be brazed within 1 hour of being cleaned.	Accept Log #50

5. Where dissimilar metals, such as copper and bronze or brass, are being brazed, flux shall be applied sparingly to minimize contamination of the inside of the tube with flux. The flux shall be applied and worked over the surfaces to be brazed using a stiff ~~stainless steel~~ bristle brush to ensure adequate coverage and wetting of the surfaces with flux. Where possible, short sections of copper tube shall be brazed to the non-copper component and the interior of the sub-assembly shall be cleaned of flux prior to installation in the piping system. Flux-coated brazing rods shall be permitted to be used in lieu of the application of flux to the surfaces to be joined on tube 3 /4 in. nominal size and smaller.	AIP Log #64
6. Tube ends shall be inserted fully into the socket of the fitting. Where flux is permitted, the joint shall be heated slowly until the flux has liquefied. Once this has occurred, or where flux is not used, the joint shall be heated quickly to the brazing temperature, taking care not to overheat the joint. Techniques for heating the joint, applying the brazing filler metal, and making horizontal, vertical, and large-diameter joints shall be as stated in sections on "Applying Heat and Brazing" and "Horizontal and Vertical Joints" in the chapter on "Joining and Bending" in the CDA *Copper Tube Handbook*.	
7.* While being brazed, joints shall be continuously purged with oil-free dry nitrogen **NF** to prevent the formation of copper oxide on the inside surface of the joint. **The purge gas shall be monitored and audibly alert the brazer of low content of purge gas .** The flow of purge gas shall be maintained **with the use of a flow meter** until the joint is cool to the touch.	Accept Log #52
*Exception: A final connection to an existing pipeline shall be permitted to be made without the use of a nitrogen purge. After final connection, ~~the affected downstream portions of the pipeline shall be tested in accordance with 4-3.4.1.3(i)~~ **twenty-five percent of the existing zones downstream from the connection shall be tested for particulate matter in accordance with the piping purge test in 4-3.4.1.3(e)** ~~with~~ **using** the gas of system designation.*	AIP Log #230
8. During and after installation, openings in the piping system shall be kept capped or plugged to avoid unnecessary loss of purge gas while brazing and to prevent debris or other contaminants from entering the system, except that during brazing, a discharge opening shall be provided on the opposite side of the joint from where the purge gas is being introduced. During brazing, the purge gas flow rate shall be maintained at a level that will not produce a positive pressure in the piping system. After brazing, the discharge opening shall be plugged or capped to prevent contamination of the inside of the tube.	
9. After brazing, the outside of all joints shall be cleaned by washing with water and a ~~stainless steel~~ wire brush to remove any residue and permit clear visual inspection of the joint. Where flux has been permitted, hot water shall be used.	
10.Each brazed joint shall be visually examined after cleaning of the outside of the joint. The following conditions shall be considered unacceptable:	
a. Flux or flux residue **(BAg series rods used with dissimilar metals only)**	Accept Log #291
b. ~~Excessive oxidation of the joint~~. **Tube or fitting melting or erosion**	
c. Presence of unmelted filler metal	
d. Failure of the filler metal to be clearly visible all the way around the joint at the interface between the socket and the tube	
e. Cracks in the tube or component	
f. Cracks in the braze filler metal	
g. Failure of the joint to hold the test pressure under 4-3.4.1.2~~(c)~~ **(b) and (e)**	
11. Brazed joints that are found to be defective under 4-3.1.2.8(b)10, conditions a, c, d, f, or g, shall be permitted to be ~~repaired~~ **reheated**, except that no joint shall be repaired more than once **before being replaced**. Brazed joints that are found to be defective under 4-3.1.2.8(b)10, conditions b and e, shall be replaced.	Accept Log #231
Exceptions: Level 1 and 2 Vacuum and WAGD Systems	
1. Mechanically Formed Branch Connections. The use of drilled and extruded tee-branch connections to copper mains and branches shall be permitted. Such connections shall be made In accordance with the tool manufacturer's instructions and the joints shall be brazed.	4-3.2.2.2(f)
2. Unions, flare nuts, and similar straight-threaded connections shall be permitted only in exposed locations and shall not be concealed in walls or ceilings.	4-3.2.2.2(h)
4-3.1.2.9 Piping Installation.	
(a) Piping systems shall be designed and sized to deliver the required flow rates at the utilization pressures. **Horizontal runouts from all mains and branches shall be taken off above the center line of the pipe and rise vertically or at an angle of not more than 45° from the vertical.**	
(b) Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports — Selection and Application*. Hangers and supports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Supports — Materials, Design and Manufacture*. Hangers for copper tube shall have a copper finish. In potentially damp locations, copper tube hangers or supports shall be plastic-coated or otherwise insulated from the tube. Maximum support spacing shall be as follows:	

1/4 in. (0.635 cm) nominal	5 ft (1.52 m)	
3/8 in. (0.953 cm) nominal	6 ft (1.83 m)	
1/2 in. (1.27 cm) nominal	6 ft (1.83 m)	
3/4 in. (1.91 cm) nominal	7 ft (2.13 m)	
1 in. (2.54 cm) nominal	8 ft (2.44 m)	
1 1/4 in. (3.175 cm) nominal	9 ft (2.74 m)	
1 1/2 in. (3.81 cm) nominal	10 ft (3.05 m) and larger	
Vertical risers, all sizes	Every floor, but not to exceed 15 ft (4.57 m)	
(c) Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient depth to protect the piping from excessive stresses. The minimum backfilled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in.(45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated so that the pipe has a firm, substantially continuous bearing on the bottom of the trench.		
Underground piping shall be installed in a continuous enclosure to protect the pipe from damage during backfilling. The enclosure shall be split or otherwise provide access at the joints during visual inspection and leak testing. Backfill shall be clean and compacted so as to protect and uniformly sup-port the piping. A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. In addition, a continuous warning means shall be provided above the pipeline at approximately one-half the depth of bury. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping underground within buildings or embedded in concrete floors or walls shall be installed in a continuous conduit.		
(d) Medical gas risers shall be permitted to be installed in pipe shafts if protected from physical damage, effects of excessive heat, corrosion, or contact with oil.		
(e) Piping shall not be installed in **elevator shafts,** kitchens or electrical switch gear rooms.		Tabled Log #290
(f) Medical gas piping shall be permitted to be located in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities provided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 130°F (54°C) maximum. Medical gas piping shall not be located where subject to contact with oil, including flooding in the case of a major oil leak.		
(g) Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be suitably protected.		
(h) Hoses and flexible connectors, both metallic and non-metallic, shall be no longer than necessary and shall not penetrate or be concealed in walls, floors, ceilings, or partitions. Flexible connectors, metallic or nonmetallic, shall have a minimum burst pressure of 1000 psig (6900 kPa gauge).		
(i) Where a system originally used or constructed for use at one pressure and for a gas is converted for operation at another pressure or for another gas, all provisions of 4-3.1.2.1,4-3.1.2.4, 4-3.1.2.8, 4-3.1.2.10, 4-3.1.2.12, 4-3.4.1, and the Exception to 4-3.1.2.7(c) shall apply as if the system were new. **Vacuum systems shall never be converted for use as gas systems.**		Exhisting bold
4-3.1.2.10* Installation Requirements**.**		
(a) *Equipment and Component Installation.*		
1. The installation of individual components shall be made in accordance with the instructions of the manufacturer. Such instructions shall include directions and information deemed by the manufacturer to be adequate for attaining proper installation, testing, maintenance, and operation of the medical gas systems. These instructions shall be left with the owner.		
2. The installation shall be made by qualified, competent technicians experienced in making such installations and meeting the requirements of ANSI/ASSE Series 6000, Standard 6010. *(See 4-3.1.2.12 for brazer performance.)*		
3. Brazing shall be performed by individuals who are qualified under the provisions of 4-3.1.2.12.		
(b) Health care organization personnel shall be permitted to install piping systems if all the requirements of Section 4-3are met during installation.		
(c) The installer of medical gas piping and equipment shall maintain on the job site documentation the qualification of brazing procedures and individual brazers per 4-3.1.2.12prior to installation.		
(d) Two or more medical gas piping systems shall not be interconnected for testing or for any other reason. Leak testing shall be accomplished by separately charging and testing the individual piping system.		

4-3.1.2.11 Systems Having Nonstandard Operating Pressures. The following requirements apply to gas piping systems having an operating pressure other than the standard 50to 55 psig (345 to 380 kPa) [or 160 psig (1103 kPa) fornitrogen], and are in addition to the minimum requirements listed in 4-3.1.2.3 through 4-3.1.2.9.	
(a) Pipelines, shutoff valves, and station outlets in systems having nonstandard operating pressures shall be labeled for gas name and operating pressure.	
(b) Where operating pressures are ~~200 to 300~~ **above 185** psig ~~(1380 to 2068~~ **1276** kPa), the following applies:	AIP Log #48
~~1. Only Type K medical gas tube (ASTM B819) shall be used.~~	Proposal (sent 6/30 not in ROP's)
2. Brazing procedures and brazers shall be qualified as required under 4-3.1.2.12.	
(c) Station outlets in systems having nonstandard operating pressures shall meet the following additional requirements:	
1. Be gas-specific	
2. Be pressure-specific where a single gas is piped at more than one operating pressure [e.g., a station outlet for oxygen, 80 psig (550 kPa) shall not accept an adapter for oxygen, 50 psig (345 kPa)]	
3. If operated at a pressure above 80 psig (550 kPa) but below ~~200~~ **185** psig ~~(1380~~ **1276** kPa), be either DISS style or comply with 4-3.1.2.4	AIP Log #48
4. If operated at a pressure ~~between 200 and 300 psig (1380 to 2068~~ **above 185 psig (1276** kPa), the station outlet shall be so designed as to prevent the removal of the adapter until the pressure has been relieved, to prevent the adapter injuring the user or others when removed from the outlet.	AIP Log #48
5. Be labeled for the gas name and operating pressure [e.g., nitrogen, 250 psig (1725 kPa)]	
(d) *Testing*. When systems operated at different pressures are installed, each pipeline shall be tested separately.	
4-3.1.2.12 Qualification of Brazing Procedures and Brazer Performance. Brazing procedures and brazer performance shall be qualified in accordance with either Section IX, Welding and Brazing Qualifications, of the ASME *Boiler and Pressure Vessel Code*, or AWS B2.2, *Standard for Brazing Procedure and Performance Qualification*s, both as modified below.	
(a) Brazers shall be qualified by visual examination of the test coupon followed by sectioning ~~except that a tension test shall be permitted to be substituted for sectioning. Where tension tests are used for brazer qualification, they shall be performed in accordance with ASME IX.~~	Accept Log #56
(b) The Brazing Procedure Specification shall address cleaning, joint clearance, overlap, internal purge gas, purge gas flow rate, and filler metal.	
(c) The Brazing Procedure Qualification Record and the Record of Brazer Performance Qualification shall document filler metal used, cleaning, joint clearance, overlap, internal purge gas and flow rate used during brazing of the test coupon, and no internal oxidation exhibited on the completed test coupon.	
(d) Brazing procedures qualified by a technically competent group or agency are permitted under the following conditions:	
1. The Brazing Procedure Specification and the Procedure Qualification Record shall meet the requirements of this standard.	
2. The employer shall obtain a copy of both the Brazing Procedure Specification and the supporting qualification records from the group or agency and shall sign and date these records, thereby accepting responsibility for the qualifications that were performed by the group or agency.	
3. The employer shall qualify at least one brazer following each Brazing Procedure Specification used.	
(e) An employer shall be permitted to accept Brazer Qualification Records of a previous employer under the following conditions:	
1. The brazer shall have been qualified following the same or an equivalent procedure as that which he/she will use for the new employer.	
2. The new employer shall obtain a copy of the record of Brazer Performance Qualification tests from the previous employer and shall sign and date these records, thereby accepting responsibility for the qualifications performed by the previous employer.	
(f) Performance qualification of brazers shall remain in effect indefinitely unless the brazer does not braze with the qualified procedure for a period exceeding 12 months, or there is a specific reason to question the ability of the brazer.	
4-3.1.2.13 Labeling. The gas content of medical gas piping systems shall be readily identifiable by appropriate labeling with the name ~~and pressure~~ of the gas contained. Such labeling shall be by means of metal tags, stenciling, stamping, or adhesive markers, in a manner that is not readily removable. Labeling shall appear on the piping at intervals of not more than 20 ft (6 m)and at least once in each room and each story traversed by the piping system. where supplementary color identification of piping if used, it shall be in accordance with the gases and colors indicated in CGA Pamphlet C-9, *Standard Color-Marking of Compressed Gas Cylinders Intended for Medical Use.* Only those systems operating at nonstandard pressures shall be labeled with the name of the gas and the operating pressure.	Accept Log #57

4-5.1.2.10* Gas Piping.	
(a) *Gas Piping.* The provisions of this section apply to field-installed piping for the distribution of nonflammable medical piped gases	
1. Tubes, valves, fittings, station outlets, and other piping components in medical gas systems shall have been cleaned for oxygen service prior to installation.	
2. Piping for nonflammable medical gas systems shall be suitable for oxygen service in accordance with 4-5.1.2.10(a)3. Each length of tube shall be permanently labeled and delivered plugged or capped. Fittings, valves, and other devices shall be sealed and marked. The installer shall furnish documentation certifying that all installed piping materials comply with the requirements of this paragraph.	
3. Piping shall be ASTM B-819 specification hard-drawn seamless medical gas tubing; ASTM B-819 tubing is identified by the markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in green (Type K) or blue (Type L). Main and branches shall be not less than 1-/2 in. nominal size. Factory-installed tube on station outlets extending no farther than 8 in. from the outlet body shall be permitted to be 3-/8 in. O.D. (-1-/4 in. nominal) size. Connection to gauges and alarm switches and runouts to alarm panels shall be permitted to be 1-/4 in. O.D. (-1-/8 in. nominal) size.	
Exception: For systems operated at pressures between 200 and 300 psig (1380 and 2070 kPa, respectively), ASTM B-819, Type K copper shall be used.	
Copper tube shall, wherever possible, be installed overhead or below floor level. Only where the installation requires installing in a slab, exceptions below are permitted to apply:	
a. Annealed (soft temper) ASTM B-88 (Type K or L) copper tube that has been prepared for oxygen service according to CGA Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service*, shall be permitted to be used up to 1-/2 in. O.D. (-3-/8 in. nominal) size.	
b. The tube shall be installed in conduit sufficiently large to accept the following gases (if used) O_2, N_2O, N_2, MA, DA, Level 3 vacuum.	
c. The pipe shall be a continuous run from entry to exit of the conduit. PVC conduit shall be permitted for Level 3 vacuum only.	
d. All station outlets (inlets) shall be permitted to be completed after the slab is complete.	
e. All tests shall be completed per 4-5.4.1.2.	
4. Except as provided under 4-5.1.2.10(a)8 and 9, joints in copper tubes shall be brazed using capillary fittings complying with ANSI B16.22, *Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings*, or brazing fittings complying with MSS SP-73, *Brazing Joints for Wrought and Cast Copper Alloy Solder-Joint Pressure Fittings*. Cast fittings shall not be used for brazed joints.	
Exception: Flared connections shall be permitted where exposed at station outlets and manifold connections.	
5. Valves, fittings, and other piping components shall be cleaned for oxygen service by the manufacturer in accordance with CGA Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service*, except that fittings shall be permitted to be cleaned by a supplier or agency other than the manufacturer.	
6. Piping systems shall be designed and sized to deliver the required flow rates at the utilization pressures.	
7. Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports Selection and Application*. Hangers and supports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Supports Materials, Design and Manufacture*. Hangers for copper tube shall have a copper finish. In potentially damp locations, copper tube hangers or supports shall be plastic coated or otherwise insulated from the tube. Maximum support spacing shall be as follows:	
8. Joints in medical gas tube shall be brazed except that memory metal couplings having temperature and pressure ratings not less than that of a brazed joint shall be permitted. Compression type connections shall be prohibited throughout the piping system, including connections to station outlets, alarm devices, and other components. Unions shall not be permitted in the distribution pipeline system.	
Exception: Threaded connections for air compressor sets and devices such as manifolds, pressure regulators, relief valves, pressure switches, and pressure gauges.	
9. Listed or approved metallic gas tube fittings that, when made up, provide a permanent joint having the mechanical, thermal, and sealing integrity of a brazed joint shall be permitted to be used in lieu of brazed joints.	
10. Turns, offsets, and other changes in direction in piping shall be made with fittings complying with 4-5.1.2.10(a)4.	

~~11. Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient depth to protect the piping from excessive stresses. The minimum back filled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in. (45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated so that the pipe has a firm, substantially continuous bearing on the bottom of the trench. Underground piping shall be installed in a continuous enclosure to protect the pipe from damage while backfilling. The enclosure shall be split or otherwise provide access at the joints during visual inspection and leak testing. Backfill shall be clean and compacted so as to protect and uniformly support the piping. A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. In addition, a continuous warning means shall be provided above the pipeline at approximately one half the depth of bury. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping underground within buildings or imbedded in concrete floors or walls shall be installed in a continuous conduit.~~	
~~12. Medical gas risers shall be permitted to be installed in pipe shafts if protected from physical damage, effects of excessive heat, corrosion, or contact with oil.~~	
~~13. Piping shall not be installed in kitchens or electrical switch gear rooms.~~	
~~14. Medical gas piping shall be permitted to be located in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities pro vided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 130°F (54°C) maximum. Medical gas piping shall not be located where subject to contact with oil, including flooding in the case of a major oil leak.~~	
~~15. Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be suitably protected.~~	
~~16. Where a system originally used or constructed for use at one pressure and for a gas is converted for operation at another pressure or for another gas, all provisions of 4 5.1.2.12, 4 5.1.2.10(b), 4 5.4, and the Exception to 4 5.1.2.10(a)3 shall apply as if the system were new. Vacuum systems shall never be converted for use as gas systems.~~	
~~(b) *Brazed Joints.*~~	
~~1. Brazed tube joints shall be the socket type. Filler metals shall bond with and be metallurgically compatible with the base metals being joined. Flux shall not be used except where permitted under 4 5.1.2.10(b)1b. Brazing filler metals shall comply with ANSI/AWS A5.8, *Specification for Brazing Filler Metal*, except that filler metals having compositions not conforming to the exact ANSI/AWS A5.8 classifications shall be permitted when used according to the manufacturer's instructions.~~	
~~a. Copper to copper joints shall be brazed using a cop per–phosphorous or copper phosphorous–silver brazing filler metal (BCuP series) without flux.~~	
~~b. Dissimilar metals, such as copper and bronze or brass, shall be brazed using an appropriate flux with a silver (Bag series) brazing filler metal.~~	
~~2. Joints to be brazed in place shall be accessible for proper preparation, assembly, heating, filler application, cooling, cleaning, and inspection.~~	
~~3. Tube ends shall be cut square using a sharp tubing cutter to avoid deforming the tube. The cutting wheel shall be free from grease, oil, or other lubricant not suitable for oxygen service. The cut ends of tube and pipe shall be deburred with a sharp, clean deburring tool, taking care to prevent chips from entering the tube or pipe.~~	
~~4. The surfaces to be brazed shall be mechanically cleaned using a clean stainless steel wire brush or equivalent. The use of steel wool shall be prohibited due to the possible presence of oil. Mechanical cleaning shall not result in grooving of the surfaces to be joined. After mechanical cleaning, the surfaces shall be wiped using a clean, lint free white cloth. During this cleaning, care shall be taken to avoid contamination of the cleaned item for oxygen internal surfaces of the tube and components. Joints shall be recleaned if contaminated prior to brazing. Joints shall be brazed within 1 hour of being cleaned.~~	
~~5. Where dissimilar metals, such as copper and bronze or brass, are being brazed, flux shall be applied sparingly to minimize contamination of the inside of the tube with flux. The flux shall be applied and worked over the surfaces to be brazed using a stiff stainless steel bristle brush to ensure adequate coverage and wetting of the surfaces with flux. Where possible, short sections of copper tube shall be brazed to the noncopper component and the interior of the subassembly shall be cleaned of flux prior to installation in the piping system. Flux coated brazing rods shall be permitted to be used in lieu of the application of flux to the surfaces to be joined on tube 3 /4 in. nominal size and smaller.~~	
~~6. Tube ends shall be inserted fully into the socket of the fit ting. Where flux is permitted, the joint shall be heated slowly until the flux has liquefied. Once this has occurred, or where flux is not used, the joint shall be heated quickly to the brazing temperature, taking care not to overheat the joint. Techniques for heating the joint, applying the brazing filler metal, and making horizontal, vertical, and large diameter joints shall be as stated in sections on "Applying Heat and Brazing" and "Horizontal and Vertical Joints" in the chapter on "Joining and Bending" in the CDA *Copper Tube Handbook*.~~	
~~7.* While being brazed, joints shall be continuously purged with oil free dry nitrogen to prevent the formation of copper oxide on the inside surface of the joint. The flow of purge gas shall be maintained until the joint is cool to the touch.~~	

~~*Exception: A final connection to an existing pipeline shall be permitted to be made without the use of a nitrogen purge. After final connection, the affected downstream portions of the pipeline shall be tested in accordance with 4-5.4.1.3 with the gas of system designation.*~~	
~~8. During and after installation, openings in the piping system shall be kept capped or plugged to avoid unnecessary loss of purge gas while brazing and to prevent debris or other contaminants from entering the system; except that during brazing, a discharge opening shall be provided on the opposite side of the joint from where the purge gas is being introduced. During brazing, the purge gas flow rate shall be maintained at a level that will not produce a positive pressure in the piping system. After brazing, the discharge opening shall be plugged or capped to prevent contamination of the inside of the tube.~~	
~~9. After brazing, the outside of all joints shall be cleaned by washing with water and a stainless steel wire brush to remove any residue and permit clear visual inspection of the joint. Where flux has been permitted, hot water shall be used.~~	
~~10. Each brazed joint shall be visually examined after cleaning of the outside of the joint. The following conditions shall be considered unacceptable:~~	
~~a. Flux or flux residue~~	
~~b. Excessive oxidation of the joint~~	
~~c. Presence of unmelted filler metal~~	
~~d. Failure of the filler metal to be clearly visible all the way around the joint at the interface between the socket and the tube~~	
~~e. Cracks in the tube or component~~	
~~f. Cracks in the braze filler metal~~	
~~g. Failure of the joint to hold the test pressure under~~	
~~11. Brazed joints that are found to be defective under 4-5.1.2.10(b)10 conditions a, c, d, f, or g, shall be permitted to be repaired, except that no joint shall be repaired more than once. Brazed joints that are found to be defective under 4-5.1.2.10(b)10 conditions b and e, shall be replaced~~	
~~*(c)* Threaded Joints.*~~	
~~1. Threaded joints in medical gas distribution piping shall be limited to the connection of pressure gauges, alarm pressure switches, and similar devices.~~	
~~2. Threads on pipe and fittings shall be tapered pipe threads complying with ANSI B1.20.1, *Pipe Threads, General Purpose.*~~	
~~3. Threaded joints in piping systems shall be made up with polytetrafluoroethylene (such as Teflon*) tape or other thread sealant suitable for oxygen service. Sealants shall be applied to the male threads only.~~	
~~(d) *Manufactured Equipment and Component Installation.*~~	
~~1. The installation of individual components shall be made in accordance with the instructions of the manufacturer. Such instructions shall include directions and information deemed by the manufacturer to be adequate for attaining proper installation, testing, maintenance, and operation of the medical gas systems. These instructions shall be left with the owner~~	
~~2. The installation shall be made by qualified, competent technicians experienced in making such installations.~~	
~~(e) *Prohibited Interconnections.* Two or more medical gas piping systems shall not be interconnected for testing or for any other reason. Leak testing shall be accomplished by separately charging and testing the individual piping system.~~	
~~(f)* *Fittings.* Fittings shall be manufactured from metallic corrosion-resistant materials suitable for the system pressures [not to exceed 160 psig (1103 kPa)].~~	
~~(g) *Connectors and Joints.* Connectors and joints shall be brazed or threaded NPT.~~	
~~(h) *General Requirements.*~~	
~~1. *Oxygen Compatibility.* Components in nonflammable medical gas systems shall be of materials that are suitable for oxygen service. *(See 4-3.1.1.3, Material — Oxygen Compatibility.)* Pipe (tube), fittings, valves, and other components shall have been thoroughly cleaned internally to remove oil, grease, and other readily oxidizable materials, as if for oxygen service.~~	
~~2. *Cleanliness.* Materials that have been cleaned for use in medical gas piping systems shall be plugged, capped, or otherwise sealed until installed. Particular care shall be taken in the storage and handling of such material to maintain its clean condition. Immediately before final assembly, such material shall be visually examined internally for contamination. Material that has become contaminated and is no longer suitable for oxygen service shall not be installed.~~	
~~3. *On Site Cleaning.* On site cleaning of the interior surfaces of tubes, valves, fittings, and other components shall be limited to recleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Such surfaces shall be cleaned by washing in a clean, hot water/alkaline solution, such as sodium carbonate or trisodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot potable water.~~	
~~4-5.1.3 Distribution for Gas-Powered Devices — Level 3.~~	Included in 4-3.1.2.7
~~4-5.1.3.1 The provisions of this section apply to field-installed piping for the distribution of gases to power devices. (a) Piping shall be Type K or L copper (hard drawn or annealed) or brass (schedule 40 or 80). If Level 3 system dynamic gas piping is installed simultaneously with other patient gas piping systems, either the Level 3 system piping shall be labeled or otherwise identified prior to installation in order to preclude inadvertent inclusion in a nonflammable medical gas piping system, or the Level 3 system piping shall be cleaned and degreased in accordance with 4-5.4.1.~~	

~~(b)*Fittings shall be manufactured from corrosion resistant materials suitable for the system pressures [not to exceed 160 psig (1103 kPa)].~~	
~~(c) Connectors and joints shall be brazed, or threaded NPT.~~	
~~(d) Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports — Selection and Application*. Hangers and sup ports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Support — Materials, Design and Manufacture*.~~	
~~(e) Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient depth to protect the piping from excessive stresses. The minimum backfilled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in. (45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated w<u>s</u>o that the pipe has a firm, substantially continuous bearing on the bottom of the trench. Underground piping shall be installed in a continuous enclosure to protect the pipe from damage while backfilling. The enclosure shall be split or otherwise provide access at the joints during visual inspection and leak testing. Backfill shall be clean and compacted so as to protect and uniformly sup port the piping. A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. In addition, a continuous warning means shall be provided above the pipeline at approximately one-half the depth of bury. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping underground within buildings or imbedded in concrete floors or walls shall be installed in a continuous conduit.~~	
~~(f) Gas piping shall be permitted to be located in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities provided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 130° F (54° C) maximum. Gas piping shall not be located where subject to contact with oil, including flooding in the case of a major oil leak.~~	
~~(g) Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be suitably protected.~~	
~~4-6.1.2.3 Piping systems for nonflammable gases shall comply with Level 1 gas systems as specified in this chapter.~~	Included in 4-3.1.2

COMMITTEE STATEMENT: The revised proposal incorporated the accepted proposal and inserted.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
WYRICK: As I understand this proposal, we eliminate Level 3 paragraph 4-5.1.2.10*. Why are we changing what has worked and Level 3 users understand? Reminder, this is not Level 1 and we do not want to be referred back to some place else in the document.
COMMENT ON AFFIRMATIVE:
ESHERICK: The exception AIP (Log #230) is not the direct quote of committee action on Log #230 which AIP.
FRANKEL: 1. In title and other places delete reference to level 4 systems which are no longer part of this committee's responsibility.
2. C, 3 and 4, clarify the language to include 185 psig. The way the paragraphs are written, paragraph 3 states "...but below 185 psig". Paragraph 4 states ...above 185 psig. Revise paragraph to read: "...185 psig and above".
SHOEMAKER: The committee rejected all items regarding Level 3 in this Log. Assure that the original committee conclusion that all matters included with this proposal that apply to Level 3 not be added back into this proposal.
WAGNER: 1. In 4-3.1.2.7(c), why is the reference to Type K copper deleted? Its use is permissible.
2. In 4-3.1.2.8(b)7, it is not clear whether the low content of purge gas is in the tube being brazed or in the nitrogen cylinder.
3. The changes to the Exception following 4-3.1.2.8(b)7 do not agree with AIP Log #230.
4. 4-3.1.2.11(b)2 is no longer necessary if the tension test is removed from 4-3.1.2.12(a).

(Log #43)
Committee: HEA-PIP

99- 146 - (4-3.1.2.1(c)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"On-Site <u>Re</u>cleaning. On-site <u>re</u>cleaning of the interior surface of tubes, valves, fittings, and other components shall be limited to recleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Such surfaces shall be cleaned by washing in a clean, hot water/alkaline solution, such as sodium carbonate or trisodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot potable water."
SUBSTANTIATION: Since on-site cleaning has been prohibited since 1990, it was the committee's call in 1999 to change the wording from on-site cleaning to on-site recleaning. This change missed the 1999 Standard.
COMMITTEE ACTION: Accept in Principle.
Revise as follows:
"...interior surface of tube ends,...".
COMMITTEE STATEMENT: Editorial. See Committee Action and Statement on Proposal 99-145 (Log #291).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #268)
Committee: HEA-PIP

99- 147 - (4-3.1.2.1(c)): Reject
SUBMITTER: Peter Esherick, Patient Instrumentation Corp.
RECOMMENDATION: In third sentence, delete "...~~or trisodium phosphate~~...".
SUBSTANTIATION: For quite a few years, the US government has been trying to eliminate phosphates in our daily lives. Most detergents no longer contain phosphates, for example. Hence, we should eliminate references to TSP (Trisodium phosphate).
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The material is readily available, and cleans equally as well as presenting a limited environmental impact.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ESHERICK: As expressed in subject substantiation: Since the Federal Government has succeeded in eliminating phosphates from detergents, fertilizer, etc., I strongly feel that we should eliminate recommending tri-sodium phosphate.
Note: Sodium carbonate is NOT lye and it also is readily available.

(Log #CP716)
Committee: HEA-PIP

99- 148 - (4-3.1.2.1(c)): Accept
SUBMITTER: Technical Committee on Piping Systems
RECOMMENDATION: Modify 4-3.1.2.1 c as follows:
c. On-Site Re-Cleaning. On-site re-cleaning of the interior surfaces of tube ends, valves, fittings, and other components shall be limited to recleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Such surfaces shall be cleaned by washing in an aqueous cleaning solution as recommended in CGA Pamphlet G-4.1-1996, "Cleaning Equipment for Oxygen Service" and listed in CGA Pamphlet O2-DIR- 2000, "2000 Directory of Cleaning Agents for Oxygen Service" a clean, hot water/alkaline solution, such as sodium carbonate or trisodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot potable water.
Note: This proposal will be incorporated into 99-145 (Log #291).
SUBSTANTIATION: Solutions such as sodium carbonate or trisodium phosphate are require to be dissolved into, and used with water having a minimum temperature of 140°F. If inadequately heated and/or temperature not maintained, cleaning will not be accomplished. If inadequately rinsed the sodium carbonate or trisodium phosphate will crystallize during drying and attach to the surfaces of object cleaned.
This changes allows the use of new aqueous cleaning solutions that are recommended to the manufacturers of "oxygen cleaned" equipment.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #81)
Committee: HEA-PIP

99- 149 - (4-3.1.2.2(a)4a): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst./National ITC
RECOMMENDATION: Delete the following text:
~~4a. At least one panel shall be connected directly to the sensor(s) or switch(es).~~
SUBSTANTIATION: This sentence should be removed to eliminate confusion regarding the requirement for alarm wiring for the master alarm sensor or switch.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-152 (Log #226) and Proposal 99-219 (Log #233).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #93)
Committee: HEA-PIP

99- 150 - (4-3.1.2.2(a)4a and b): Accept in Principle
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: 1. Delete 4-3.1.2.2(a)4a.
2. Renumber 4-3.1.2.2(a)4 accordingly.
SUBSTANTIATION: Subparagraph 4a appears to contradict Subparagraph 4b with respect to master alarm panels. The only situation where Subparagraph 4a would be applicable would be a local or area alarm panel that was duplexed. But these panels are not intended to cover such large areas or where more than one alarm panel would be necessary.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-152 (Log #226) and Proposal 99-219 (Log #233).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #44)
Committee: HEA-PIP

99- 151 - (4-3.1.2.2(a)6): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"All pressure switches, pressure gauges, and pressure-sensing devices downstream of the source valve <u>except gauges in area alarm panels and zone valve boxes</u> shall be provided with a gas specific demand check fitting to facilitate servicing, testing, or replacement."
SUBSTANTIATION: As the Standard reads now it requires even the gauges in area alarm panels and all zone valve box gauges to have a demand check fitting. I don't think it was the intent of the committee to require demand check fitting on these gauges.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-156 (Log #256).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #226)
Committee: HEA-PIP

99- 152 - (4-3.1.2.2(a)4): Accept in Principle
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise text as follows:
4-3.1.2.2(a)4. Where multiple panels are intended to indicate the same condition(s):
a. <u>Except for master alarm panels,</u> at least one panel shall be connected directly to the sensor(s) or switch(es). <u>Signals from this panel may be relayed to other panels.</u>
b. ~~Both master alarms required by 4-3.1.2.2(b)2 shall be connected by dedicated wiring directly to the sensor(s) or switch(es).~~ <u>Master alarm panels shall each connect directly and independently to the alarm initiating devices that they monitor. Master alarms shall not be relayed from one master alarm panel to another. Alarm initiating devices for master alarms shall have electrically isolated outputs. Where multi-pole alarm relays are used, the control power source shall be independent of any master alarm panel. The master alarms shall activate upon loss of control power or an open circuit condition.</u>
c. ~~Other panels~~ <u>Panels other than master alarm panels</u> shall be permitted to be connected through indirect means such as data transmission lines provided that such indirect means are fully supervised and failure of such indirect means is indicated at all panels so connected. <u>Such panels shall be designed and manufactured specifically to monitor medical gas systems.</u>

SUBSTANTIATION: The existing language is not clear on how to connect master alarm panels to their alarm initiating devices. Connecting two master alarm panels to the same alarm contacts creates a cross-connection between two independent power sources. This decreases, not increases, the reliability of the system. A fault in one panel could take down both panels. Alarm initiating devices with dual contacts or dual outputs, or the use of multi-pole alarm relays will keep the master alarm panels electrically isolated from one another.

If indirect means are used to connect alarm panels other than master alarm panels, they should be pre-engineered for such applications rather than be custom-engineered on each particular project.

COMMITTEE ACTION: Accept in Principle.

Replace existing 4-3.1.2.2, 4-3.2.2.8, 4-3.2.2.9, 4-3.2.2.10 with the following:

5.1.4.4 Warning Systems (Level 1)

5.1.4.4.1 General

5.1.4.4.1.1 All local, area, and master alarm systems used for medical gas and vacuum systems shall provide the following: *[was 4-3.1.2.2(a)1 + Log #233]*

(1) separate visual indicators for each condition monitored, except as permitted in 5.1.4.4.2.8(i) and (j). *[was 4-3.1.2.2(a)1a + Log #233]*

(2) visual and audible indication that the monitored condition has occurred. *[was 4-3.1.2.2(a)2a + Log #233]*

(3) cancelable audible indication of an alarm condition, producing a minimum of 80 dBA measured at 3 ft (1 m). *[was 4-3.1.2.2(a)1b + Log #233]*

(4) re-initiation of the audible signal if a second alarm condition occurs while the audible alarm is silenced. *[was 4-3.1.2.2(a)1b + Log #233]*

(5) a means to visually indicate a lamp or LED failure. *[was 4-3.1.2.2(a)1c + Log #233]*

(6) visual and audible indication that the wiring to an alarm initiating device is disconnected. *[was 4-3.1.2.2(a)2b + Log #233]*

(7) labeling of each indicator, indicating the condition monitored, (e.g. O_2, medical air, vacuum, etc.) *[was 4-3.1.2.2(a)3 + Log #233]*

(8) labeling of each alarm panel for its area of surveillance. *[Log #226 + Log #233]*

(9) automatic restart after a power loss for 10 seconds (e.g. during generator startup) without giving false signals or requiring manual reset. *(Log #131)*

5.1.4.4.1.2 Where multiple local and area alarm panels are intended to indicate the same condition(s), *[was 4-3.1.2.2(a)4]*

(a) at least one panel shall be connected directly to the alarm initiating device. *(was 4-3.1.2.2(a)4a]*

(b) an alarm signal from a panel connected to an alarm initiating device shall be permitted to be relayed to other panels. *[Log #226 + Log #233]*

5.1.4.4.1.3 Local and area alarm panels shall be permitted to be connected through indirect means such as data transmission lines, provided that: *[was 4-3.1.2.2(a)4c + Log #233]*

(a) the indirect means are fully supervised and failure of such indirect means is indicated at all panels so connected. *[was 4-3.1.2.2(a)4c]*

(b) the panels are designed and manufactured specifically to monitor medical gas and vacuum systems. *[Log #226]*

(c) the panels are dedicated to monitoring only medical gas and vacuum systems. *[Log #226]*

5.1.4.4.1.4 Electrical power sources for local, area, and master alarms shall be in accordance with Chapter 3, "Electrical Systems". *[was 4-3.1.2.2(a)8 + Log #233]*

5.1.4.4.1.5 The responsible authority of the facility shall ensure that the labeling of alarms, where room numbers or designations are used, is accurate and up-to-date. *[was 4-3.1.2.2(a)7 + Log #233]*

5.1.4.4.1.6 All wiring from alarm initiating devices shall be supervised or protected as required by Section 517-30 (c)(3) of NFPA 70, National Electrical Code, for emergency system circuits. *[was 4-3.1.2.2(a)8 + Log #233]*

5.1.4.4.1.7 A centralized computer system (e.g., a building management system) shall not substitute for any required medical gas or vacuum alarm panel, but shall be permitted to be used to supplement the medical gas and vacuum alarm system. *[was 4-3.1.2.2(a)9 + Log #233]*

5.1.4.4.2 Master Alarms

5.1.4.4.2.1 A master alarm system shall be provided to monitor the operation and condition of the source of supply, the reserve source (if any), and the pressure ~~of~~ in the main lines of each ~~all~~ medical gas and medical-surgical vacuum piping system. *[was 4-3.1.2.2(b)1, 4-3.2.2.8, & Log #233]*

5.1.4.4.2.2 Master alarm systems shall comply with the general requirements of 5.1.4.4.1.1. *[was 4-3.1.2.2(a) + Log #233]*

5.1.4.4.2.3 Master alarm systems shall consist of at least two master alarm panels located in at least two separate locations as follows: *[was 4-3.1.2.2(b)2 + Log #227 + Log #233]*

(a) One master alarm panel shall be located in the principal working area of the individual responsible for the maintenance of the medical gas and vacuum pipeline systems. *[was 4-3.1.2.2(b)2 + 4-3.2.2.8]*

(b) One or more other master alarm panels shall be installed in locations that assure continuous surveillance during the working hours of the facility (e.g., the telephone switchboard, security office, or other continuously staffed location). *[was 4-3.1.2.2(b)2, 4-3.2.2.8, and Log #227]*

5.1.4.4.2.4 The master alarm panels required in 5.1.4.4.2.3 shall connect directly to the alarm initiating devices that they monitor. *[was 4-3.1.2.2(a)4 + Log #233]*

5.1.4.4.2.7 Where multi-pole alarm relays are used to isolate the alarm initiating signals to master alarm panels, the control power source for the relays shall be independent of any of the master alarm panels. *[Log #226 + Log #233]*

5.1.4.4.2.8 Master alarm panels monitoring medical gas piping systems shall each include the following:

(a) a separate visual and audible alarm indicator for the source equipment in each medical gas system. *[was 4-3.1.2.2(b)1]*

(b) an alarm indication when, or just before, changeover occurs in a medical gas system that is supplied by a manifold or an alternating-type bulk system that has as part of its normal operation a changeover from one portion of the operating supply to another portion. *[was 4-3.1.2.2(b)3a]*

(c) an alarm indication when, or just before, the changeover to the reserve supply occurs in a medical gas system that consists of one or more units that continuously supply the piping system while another unit remains as the reserve supply and operates only in case of an emergency. *[was 4-3.1.2.2(b)3b]*

(d) an alarm indication when the reserve supply is reduced to one average day's supply where check valves are not provided for each cylinder lead of the reserve supply for a manifold or bulk supply system. These alarms are not required if check valves are provided in each cylinder lead. *[was 4-3.1.2.2(b)3c]*

(e) an alarm indication when the contents of the reserve is reduced to one average day's supply where a cryogenic liquid storage unit is used as a reserve for a bulk supply system. *[was 4-3.1.2.2(b)3d]*

(f) an alarm indication when the gas pressure available in the reserve unit is below that required for the medical gas system to function properly. *[was 4-3.1.2.2(b)3d]*

(g) an alarm indication when the pressure in the main line of each separate medical gas system increases 20 percent or decreases 20 percent from the normal operating pressure. *[was 4-3.1.2.2(b)3e]*

(h) high and low pressure alarm initiating devices installed in the main lines immediately downstream (on the terminal or outlet side) of the main line shutoff valves (if installed) or the source shutoff valves if main line shutoff valves are not installed. *[was 4-3.1.2.2(b)3e]*

(i) an alarm indication(s) for the local alarms required for medical air systems in 4-3.1.2.2(d)1, either by separate indications for individual conditions or as one or more group alarms. *[was 4-3.1.2.2(b)3f]*

(j) group alarms (if used) labeled "Medical Air System Fault – (indicate site)" or similar wording that indicates that one in a group of monitored conditions has occurred at a particular site. *[was 4-3.1.2.2(b)3f]*

(k) a medical air dew point alarm per 4-3.1.1.9(i)1. *[was 4-3.1.2.2(b)3g + Log #253]]*

5.1.4.4.2.9 Master alarm panels monitoring medical-surgical vacuum system source equipment shall each include the following:

(a) an alarm indication when the vacuum in the main line drops to or below 12 in. Hg of vacuum. *[was 4-3.2.2.8]*

(b) the alarm initiating device connected to the main line immediately upsteam (on the terminal or inlet side) of the main line shutoff valve (if installed) or the source shutoff valve if a main line shutoff valve is not installed. *[was 4-3.2.2.8]*

(c) an alarm indication when the reserve or off-duty vacuum pump is in operation. *[was 4-3.2.2.8]*

5.1.4.4.2.10 Master alarms for medical-surgical vacuum systems shall be permitted to be displayed on the same master alarm panels as medical gas alarms. *[Log #233]*

5.1.4.4.3 Area Alarms

5.1.4.4.3.1 Area alarms shall be provided where a piped medical gas and vacuum systems serve anesthetizing locations and other vital life support and critical care areas such as post-anesthesia recovery, intensive care units, and coronary care units. *[was 4-3.1.2.2(c)1 + 4-3.2.2.9]*

5.1.4.4.3.2 Area alarm panels shall be located at the nurse's station or other location that will provide for responsible surveillance. *[was 4-3.1.2.2(c)2 + 4-3.2.2.9(c)]*

5.1.4.4.3.3 Area alarm panels shall comply with the general requirements of 5.1.4.4.1. *[was 4-3.1.2.2(a) + Log #233]*

5.1.4.4.3.4 Area alarms for medical gas systems shall indicate if the pressure in the local line increases 20 percent or decreases 20 percent from the normal line pressure. *[was 4-3.1.2.2(c)3]*

5.1.4.4.3.5 Area alarms for medical vacuum systems shall indicate if the vacuum in the local line drops to or below 12 in. Hg of vacuum. *[was 4-3.2.2.8]*

5.1.4.4.3.6 Alarm initiating devices for critical care areas shall ~~be placed in~~ monitor the individual line supplying each such specific area. *[was 4-3.1.2.2(c)4 & 4-3.2.2.9(d)]*

5.1.4.4.3.7 No valve, other than valves located in areas accessible only to authorized personnel, shall intervene between alarm initiating devices and the outlets intended to be monitored by the device. *[was 4-3.1.2.2(c)4 & 4-3.2.2.9(d)]*

5.1.4.4.3.8 Alarm initiating devices for anesthetizing areas shall be placed in the individual line supplying each such specific area, with the individual room shutoff valve being the only valve between the alarm actuating device and the outlets. *[was 4-3.1.2.2(c)5 & 4-3.2.2.9(d)]*

5.1.4.4.4 Local Alarms

5.1.4.4.4.1 Local alarms shall comply with the general requirements of 5.1.4.4.1. *[was 4-3.1.2.2(a)1]*

5.1.4.4.4.2 Local alarms, where required, shall be grouped together in a single location (e.g., in an alarm panel or with the system controls) at the source equipment site(s) for each system.,. *[was 4-3.1.2.2(d)1]*

5.1.4.4.4.3 Local alarms for medical air compressor systems shall provide individual indication of the following conditions in accordance with 4-3.1.1.9(i): *[see 4-3.1.1.9(I)]*

(a) High water level in receiver (if so equipped). *[Log 13, 259]*
(b) High water level in air/water separator (if so equipped).
(c) High discharge air temperature (if so equipped).
(d) High carbon monoxide level.
(e) High dew point temperature.
(f) Backup compressor operating.

5.1.4.4.4.4 Local alarms for medical-surgical vacuum systems shall include individual indication of the following conditions in accordance with 4-3.2.1.2:

(a) Reserve or off-duty pump is in operation. *[see 4-3.2.1.2]*

5.1.4.4.5 Waste Anesthetic Gas Disposal (WAGD) Alarms

Alarms or other automatic mechanisms shall be provided to inform the user when the WAGD system is ~~operational~~ not functioning properly. *[was 4-3.3.2.4, see Log #95]*

5.2.4.4 Warning Systems (Level 2)

5.2.4.4.1 General

5.2.4.4.1.1 All local, area, and master alarm systems used for Level 2 medical gas and vacuum systems shall provide the following: *[was 4-3.1.2.2(a)1 + Log #233]*

(1) separate visual indicators for each condition monitored. *[was 4-3.1.2.2(a)1a + Log +233]*

(2) visual and audible indication that the monitored condition has occurred. *[was 4-3.1.2.2(a)2a + Log +233]*

(3) cancelable audible indication of an alarm condition, producing a minimum of 80 dBA measured at 3 ft (1 m). *[was 4-3.1.2.2(a)1b + Log +233]*

(4) re-initiation of the audible signal if a second alarm condition occurs while the audible alarm is silenced. *[was 4-3.1.2.2(a)1b + Log +233]*

(5) a means to visually indicate a lamp or LED failure. *[was 4-3.1.2.2(a)1c + Log +233]*

(6) visual and audible indication that the wiring to an alarm initiating device is disconnected. *[was 4-3.1.2.2(a)2b + Log +233]*

(7) labeling of each indicator, indicating the condition monitored, (e.g. O_2, medical air, vacuum, etc.) *[was 4-3.1.2.2(a)3 + Log #233]*

(8) labeling of each alarm panel for its area of surveillance. *[Log #226 + Log #233]*

(9) automatic restart after a power loss for 10 seconds (e.g. during generator startup) without giving false signals or requiring manual reset. *(Log #131)*

5.2.4.4.1.2 Where multiple local and area alarm panels are intended to indicate the same condition(s), *[was 4-3.1.2.2(a)4]*

(a) at least one panel shall be connected directly to the alarm initiating device. *(was 4-3.1.2.2(a)4a]*

(b) an alarm signal from a panel connected to an alarm initiating device shall be permitted to be relayed to other panels. *[Log #226 + Log #233]*

5.2.4.4.1.3 Local and area alarm panels shall be permitted to be connected through indirect means such as data transmission lines, provided that: *[was 4-3.1.2.2(a)4c + Log #233]*

(a) the indirect means are fully supervised and failure of such indirect means is indicated at all panels so connected. *[was 4-3.1.2.2(a)4c]*

(b) the panels are designed and manufactured specifically to monitor medical gas and vacuum systems. *[Log #226]*

(c) the panels are dedicated to monitoring only the medical gas and vacuum systems. *[Log #226]*

5.2.4.4.1.4 Electrical power sources for local, area, and master alarms shall be in accordance with Chapter 3, "Electrical Systems". *[was 4-3.1.2.2(a)8 + Log #233]*

5.2.4.4.1.5 The responsible authority of the facility shall ensure that the labeling of alarms, where room numbers or designations are used, is accurate and up-to-date. *[was 4-3.1.2.2(a)7 + Log #233]*

5.2.4.4.1.6 All wiring from alarm initiating devices shall be supervised or protected as required by Section 517-30 (c)(3) of NFPA 70, National Electrical Code, for emergency system circuits. *[was 4-3.1.2.2(a)8 + Log #233]*

5.2.4.4.1.7 A centralized computer system (e.g., a building management system) shall not substitute for any required medical gas or vacuum alarm panel, but shall be permitted to be used to supplement the medical vacuum alarm system. *[was 4-3.1.2.2(a)9 + Log #233]*

5.2.4.4.2 Master Alarms

5.2.4.4.2.1 A master alarm panel shall be provided to monitor the operation and condition of the pressure ~~of~~ in the main lines of each ~~all~~ medical gas and medical-surgical vacuum piping system. *[was 4-3.1.2.2(b)1, 4-3.2.2.8, & Log #233]*

5.2.4.4.2.2 Master alarm panels shall comply with the general requirements of 5.2.4.4.1.1. *[was 4-3.1.2.2(a) + Log #233]*

5.2.4.4.2.3 At least one master alarm panel shall be installed in a location(s) that is under continuous surveillance during the working hours of the facility (e.g., the telephone switchboard, security office, or other continuously staffed location). *[was 4-3.1.2.2(b)2 + Log #227 + Log #233]*

5.2.4.4.2.4 The master alarm panel required in 5.2.4.4.2.3 shall connect directly to the alarm initiating devices that it monitors. *[was 4-3.1.2.2(a)4 + Log #233]*

5.2.4.4.2.7 Where multi-pole alarm relays are used to isolate the alarm initiating signals to master alarm panels, the control power source for the relays shall be independent of any of the master alarm panels. *[Log #226 + Log #233]*

5.2.4.4.2.8 Master alarm panels monitoring medical gas piping systems shall each include the following:

(a) a separate visual and audible alarm indicator for the source equipment in each medical gas system. *[was 4-3.1.2.2(b)1]*

(b) an alarm indication when, or just before, changeover occurs in a medical gas system that is supplied by a manifold or an alternating-type bulk system that has as part of its normal operation a changeover from one portion of the operating supply to another portion. *[was 4-3.1.2.2(b)3a]*

(c) an alarm indication when, or just before, the changeover to the reserve supply occurs in a medical gas system that consists of one or more units that continuously supply the piping system while another unit remains as the reserve supply and operates only in case of an emergency. *[was 4-3.1.2.2(b)3b]*

(d) an alarm indication when the reserve supply is reduced to one average day's supply where check valves are not provided for each cylinder lead of the reserve supply for a manifold or bulk supply system. These alarms are not required if check valves are provided in each cylinder lead. *[was 4-3.1.2.2(b)3c]*

(e) an alarm indication when the contents of the reserve is reduced to one average day's supply where a cryogenic liquid

storage unit is used as a reserve for a bulk supply system. *[was 4-3.1.2.2(b)3d]*

(f) an alarm indication when the pressure in the main line of each separate medical gas system increases 20 percent or decreases 20 percent from the normal operating pressure. *[was 4-3.1.2.2(b)3e]*

(g) high and low pressure alarm initiating devices mounted at the source equipment. *[was 4-4.1 , Exception No.5]* (h) a pressure gauge or readout at the master alarm panel. *[was 4-4.1, Exception No.5]*

5.2.4.4.2.9 Master alarm panels monitoring medical-surgical vacuum system source equipment shall each include the following:

(a) an alarm indication when the vacuum in the main line drops to or below 12 in. Hg of vacuum. *[was 4-3.2.2.8 + Log #233]*

(b) the alarm initiating device connected to the main line immediately upsteam (on the terminal or inlet side) of the main line shutoff valve (if installed) or the source shutoff valve if a main line shutoff valve is not installed. *[was 4-3.2.2.8 + Log #233]*

5.2.4.4.2.10 Master alarms for medical-surgical vacuum systems shall be permitted to be displayed on the same master alarm panels as medical gas alarms. [*Log #233]*

5.2.4.4.3 Area Alarms

5.2.4.4.3.1 Area alarms shall be provided where a piped medical gas and vacuum systems serve anesthetizing locations and other vital life support and critical care areas such as post-anesthesia recovery, intensive care units, and coronary care units. *[was 4-3.1.2.2(c)1 & 4-3.2.2.9]*

5.2.4.4.3.2 Area alarm panels shall be located at the nurse's station or other location that will provide for responsible surveillance. *[was 4-3.1.2.2(c)2 & 4-3.2.2.9(c)]*

5.2.4.4.3.3 Area alarm panels shall comply with the general requirements of 5.2.4.4.1. *[was 4-3.1.2.2(a) + Log #233]*

5.2.4.4.3.4 Area alarms for medical gas systems shall indicate if the pressure in the local line increases 20 percent or decreases 20 percent from the normal line pressure. *[was 4-3.1.2.2(c)3]*

5.2.4.4.3.5 Area alarms for medical vacuum systems shall indicate if the vacuum in the local line drops to or below 12 in. Hg of vacuum. *[was 4-3.2.2.8]*

5.2.4.4.3.6 Alarm initiating devices for critical care areas shall ~~be placed in~~ monitor the individual line supplying each such specific area. *[was 4-3.1.2.2(c)4 & 4-3.2.2.9(d)]*

5.2.4.4.3.7 No valve, other than valves located in areas accessible only to authorized personnel, shall intervene between alarm initiating devices and the outlets intended to be monitored by the device. *[was 4-3.1.2.2(c)4 & 4-3.2.2.9(d)]*

5.2.4.4.3.8 Alarm initiating devices for anesthetizing areas shall be placed in the individual line supplying each such specific area, with the individual room shutoff valve being the only valve between the alarm actuating device and the outlets. *[was 4-3.1.2.2(c)5 & 4-3.2.2.9(d)]*

5.2.4.4.4 Local Alarms

5.2.4.4.4.1 Local alarms shall comply with the general requirements of 5.2.4.4.1. *[was 4-3.1.2.2(a)1]*

5.2.4.4.4.2 Local alarms, where required, shall be grouped together in a single location (e.g., in an alarm panel or with the system controls) at the source equipment site(s) for each system. *[was 4-3.1.2.2(d) 1]*

5.2.4.4.4.3 Local alarms for medical air compressor systems shall provide individual indication of the following conditions in accordance with 4-3.1.1.9(i): *[see 4-3.1.1.9(I)] [Log #13, #259]*

(a) High water level in receiver (if so equipped).
(b) High water level in air/water separator (if so equipped).
(c) High discharge air temperature (if so equipped).
(d) High carbon monoxide level.
(e) High dew point temperature.

5.2.4.4.5 Waste Anesthetic Gas Disposal (WAGD) Alarms. Alarms or other automatic mechanisms shall be provided to inform the user when the WAGD system is not functioning normally. *[was 4-3.3.2.4, see Log #95]*

5.3.4.4 Warning Systems (Level 3)

5.3.4.4.1 A warning system shall be installed in each single treatment facility served by a Level 3 ~~medical~~ patient gas supply system or Level 3 compressed air supply system. *[was 4-5.1.2.8(b), Log #238]*

5.3.4.4.2 The warning system shall include audible and non-cancelable visual alarm indications that can be seen and heard at a continually attended location during the time of operation of the facility. *[was 4-5.1.2.8(b)]*

5.3.4.4.3 Alarms shall indicate when the pressure in the main line of each monitored pressurized gas system increases 20 percent or decreases 20 percent from the normal operating pressure. *[was 4-5.1.2.8(d)]*

5.3.4.4.4 High and low pressure alarm initiating devices shall be connected to the main line in each monitored pressurized gas system immediately downstream (on the piping distribution side) of the main line shutoff valve (if installed) or the source shutoff valve is a main line shutoff valve is not installed. *[was 4-5.1.2.8(d)]*

5.3.4.4.5 Where facilities include monitored source equipment that provides automatic changeover to secondary or reserve sources, an alarm shall be provided for each system indicating when automatic changeover has occurred or is about to occur. *[was 4-5.1.2.8(b), Log #238]*

5.3.4.4.6 The alarm initiating devices for changeover alarms shall be independent of the alarm initiating devices for high or low line pressure. *[was 4-5.1.2.8(c)]*

5.3.4.4.7 Where two treatment facilities are served by a common monitored supply system, automatic changeover alarms shall indicate in both facilities. *[was 4-5.1.2.8(c)]*

5.3.4.4.8 Visual changeover alarms shall remain un-cancelable until the secondary or reserve supply source is replenished. *[was 4-5.1.2.8(c)]*

5.3.4.4.9 Warning systems shall not be required for Level 3 gas powered systems, Level 3 vacuum systems, and Level 3 WAGD (scavenging) systems. *[was 4-5.1.3.4]*

COMMITTEE STATEMENT: Portions of the proposal would have created requirements that did not increase reliabilities of the systems installed.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 20
NEGATIVE: 2
NOT RETURNED: 1 Bancroft

EXPLANATION OF NEGATIVE:

FAN: The negative vote does not directly reflect the decision taken by the Committee on Log #225 but rather the Committee action taken in response to Log #226 and others (e.g., Log #238) cumulated actions taken on 5.3.4.4 Warning Systems (Level 3) in the document accompanying Log #226.

There are contradictions that need to be resolved as follows:

5.3.4.4.1 A warning systems shall be installed in each single treatment facility served by a Level 3 ~~medical~~ patient gas supply or Level 3 compressed air supply system [was 4-5.1.2.8(b), Log #238]

5.3.4.4.9 Warning system shall not be required for Level 3 gas powered systems, Level 3 vacuum systems, and Level 3 WAGD (scavenging) systems. [was 4-5.1.3.4]

Section 5.3.4.4.1 requires a warning system when a facility is served by a Level 3 compressed air supply system. However, Log #CP710 defines compressed air systems as "A Level 3 gas distribution system comprises of component parts, including, but not limited to, air compressor, motor, receiver, controls, filters, dryers, valves and piping, that delivers compressed air (gauge pressure < 160 psi (1100 kPa)) to power devices (e.g., hand pieces, syringes, cleaning devices as a power source." Furthermore section 5.3.4.4.9 indicates that "warning systems shall not be required for Level 3 gas powered systems, Level 3 vacuum systems, and Level 3 WAGD (scavenging) systems."

This apparent contradiction needs to be resolved.

Thus a suggested change to eliminate the apparent contradiction (deletion indicated as ~~strikethrough~~, addition indicated as underline) is presented below.

5.3.4.4.1 A warning system shall be installed in each single treatment facility served by a Level 3 ~~medical~~ patient gas supply or Level 3 compressed air supply system [was 4-5.1.2.8(b), Log #238]

5.3.4.4.9 Warning systems shall not be required for Level 3 compressed air systems, Level 3 gas powered systems, Level 3 vacuum systems, and Level 3 WAGD (scavenging) systems. [was 4-5.1.3.4]

WYRICK: Item 5-3.4.4.1 would require an alarm for the Level 3 compressed air supply system. Why would we require an alarm on a power source, it is not critical or have any concern for patient safety. No manufacturer of Level 3 air compressors supplies or never has supplied or required an alarm. This is then removed in 5.3.4.4.9

COMMENT ON AFFIRMATIVE:

HOFFMAN: Replace the word "condition" with "service". The monitored condition is required to be alarmed in (2). The examples in the () of (7), (e.g., 02, medical air, vacuum, etc.) are "services" not conditions.

SHOEMAKER: Is it the opinion of the committee that with approval Log #226 would require an alarm system on Level 3 Compressed Air Supply Systems?

There is no substantiation for alarms on these systems. Life support is not an indication.

(Log #131)
Committee: HEA-PIP

99- 153 - (4-3.1.2.2(a)5): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add the wording:
"Alarms shall be able to withstand power loss for 10 seconds (e.g., during generator startup) without giving false signals or requiring manual reset."
SUBSTANTIATION: Medical gas alarms are subject to loss of power during generator testing, which must be considered a normal operation. They must be able to recover without falling into a false state, locking up, or giving false readings.
COMMITTEE ACTION: Accept in Principle.
Revise as follows:
"Alarms shall be able to automaticaly restart after a power loss for 10 seconds (e.g. during generator startup) without giving false signals or requiring manual reset."
COMMITTEE STATEMENT: New language clearly identifies there is not a need for battery backup.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #8)
Committee: HEA-PIP

99- 154 - (4-3.1.2.2(a).6):
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Revise text:
"All pressure switches and pressure sensing devices downstream of the source valve shall be provided with a gas specifice demand check fitting to facilitate servicing, testing or replacement."
SUBSTANTIATION: The 1999 edition of NFPA 99 appears to have incorrectly included gauges with pressure switches and sensors. Since this was not part of the original proposal it should be eliminated.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-156 (Log #256) which reads as follows:
Revise 4-3.1.2.2(a)6 as follows:
"All pressure switches, mainline pressure gauges, ~~analyzers,~~ and pressure sensing devices downstream of the source valve shall be provided with a gas specific demand check fitting to facilitate servicing, testing, or replacement. Demand check fittings shall be provided for all analyzers."
The rewrite makes the intent clearer.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #187)
Committee: HEA-PIP

99- 155 - (4-3.1.2.2(a)6):
TCC NOTE: The Technical Correlating Committee directs that this proposal be returned to Committee for reconsideration. The Committee Action states Accept in Principle; the statement refers to Log # 256. Log #256 does not address zone valves. The action is not consistent with the Committee Statement.
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Revise text as follows:
"All pressure switches, pressure gauges (except on zone valves), and pressure-sensing devices downstream of the source valve shall be provided with a gas specific demand check fitting to facilitate servicing, testing, or replacement."
SUBSTANTIATION: If you install a gas specific demand check fitting on the gauge in a zone valve box the gauge will be outside of the box and the cover will not fit on the box. If the gauge needs to be serviced, tested, or replaced the zone valve can be shut off without too much difficulty.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-156 (Log #256) which reads as follows:
Revise 4-3.1.2.2(a)6 as follows:
"All pressure switches, mainline pressure gauges, ~~analyzers,~~ and pressure sensing devices downstream of the source valve shall be provided with a gas specific demand check fitting to facilitate servicing, testing, or replacement. Demand check fittings shall be provided for all analyzers."
The rewrite makes the intent clear.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #256)
Committee: HEA-PIP

99- 156 - (4-3.1.2.2(a)6):
TCC NOTE: The Technical Correlating Committee directs the Committee to review and be more specific about what is being revised and why.
SUBMITTER: David B. Mohile, Medical Engineering Services, Inc.
RECOMMENDATION: Revise paragraph to read:
"All pressure switches, pressure gauges, analyzers, and pressure sensing devices ~~downstream of the source valve~~ shall be provided with a gas specific demand check fitting to facilitate servicing, testing, or replacement."
SUBSTANTIATION: By not requiring demand check devices on mandatory analyzers such as carbon monoxide and dew point, in some instances it is necessary to shut down to the entire plant in order to repair or replace these units. Since many manufacturers have gone to a combination unit, or have one line going to both units, this would be a minimal cost change to the code.
COMMITTEE ACTION: Accept in Principle.
Revise 4-3.1.2.2(a)6 as follows:
"All pressure switches, mainline pressure gauges, ~~analyzers,~~ and pressure sensing devices downstream of the source valve shall be provided with a gas specific demand check fitting to facilitate servicing, testing, or replacement. Demand check fittings shall be provided for all analyzers."
COMMITTEE STATEMENT: The rewrite makes the intent clearer.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #228)
Committee: HEA-PIP

99- 157 - (4-3.1.2.2(b)3f): Accept in Principle
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise 4-3.1.2.2(b)3f as follows:
f. ~~Each of the individual alarms required in 4-3.1.2.2(d)1 shall be indicated. This shall be either by a separate indicator for each condition monitored or with a single indicator labeled "Medical Air System Fault" or similar wording that indicates when any of the conditions monitored occurs.~~
The local alarms required in 4-3.1.2.2(d)1 shall be indicated on the master alarm panels. This shall be either by separate indicators for individual conditions or by a single indicator labeled "Medical Air System Fault" or similar wording that indicates that one in a group of the monitored conditions has occurred.
SUBSTANTIATION: The present text requires that "each of the individual" alarms be indicated, but permits a single alarm indication.
COMMITTEE ACTION: Accept in Principle.
Add new text to read:
"The local alarms required in 4-3.1.2.2(d)1 shall be indicated on the master alarm panels. This shall be either by separate indicators for individual conditions or by a single indicator labeled "Medical Air System Fault (state site(s))" or similar wording that indicates that one in a group of the monitored conditions has occurred."
COMMITTEE STATEMENT: This adds more information to the user.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #253)
Committee: HEA-PIP

99- 158 - (4-3.1.2.2(b)3g, and 4-3.1.2.2 (d)2): Accept
SUBMITTER: David B. Mohile, Medical Engineering Services, Inc.
RECOMMENDATION: Move and restructure contents of 4-3.1.2.2(b)3g, Master Alarms, and 4-3.1.2.2(d)2, Local Alarms, to 4-3.1.2.2(g). (g) would then read as follows:
"A separate indicator shall be provided for dew point of the medical air. Dew point shall be monitored continuously per 4-3.1.1.9(i)1 and alarmed to indicate a line pressure dew point above 39°F (3.9°C)."
SUBSTANTIATION: There has been confusion as to where the dew point signal should alarm. Since elevated dew point levels need to be addressed immediately, the TC has for many years mandated an alarm on the master panels. Almost all dew point analyzers have their own built in alarm, so requiring an alarm on the local panel has not been necessary, and in point, the list of local alarms [4-3.1.1.9(i)3] in the standard has for years not included a signal for dew point high.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #227)
Committee: HEA-PIP

99- 159 - (4-3.1.2.2(b)2): Accept
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise 4-3.1.2.2(b)2 as follows:
2. The master alarm system shall consist of ~~two or more~~ at least two alarm panels located in at least two separate locations. One panel shall be located in the principle working area of the individual responsible for the maintenance of the medical gas piping systems. ~~and one or more panels shall be located to assure~~ One or more other panels shall be installed in locations that assure continuous surveillance during the working hours of the facility (e.g., the telephone switchboard, security office, or other continuously staffed location).
SUBSTANTIATION: Master alarm panels could be located in three (3) or more locations.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #5)
Committee: HEA-PIP

99- 160 - (4-3.1.2.2(b)3 g): Accept in Principle
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Revise text:
"Dew point for medical air shall be monitored and alarmed per 4-3.1.1.9(i) to indicate a line pressure dew point above 3.9°C."
SUBSTANTIATION: This statement was mistakenly placed into the Local alarm area 4-3.1.2.2(d)2. An alarm at the local alarm for high dew point is not required.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-158 (Log #253).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
FRANKEL: If Log #281 is accepted, revise the alarm limits. The present high dew point alarm of 39°F remains unchanged since no revision has been proposed. Secondly, if the dew point is lowered to 32°F this would now be the upper alarm limit and the air dryer must provide a lower dew point of about 28°F in order to allow a range of acceptable dew point conditions that would not cause an alarm to annunciate.

(Log #4)
Committee: HEA-PIP

99- 161 - (4-3.1.2.2(d)2): Accept in Principle
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Delete paragraph 2 entirely under Local Alarms.
SUBSTANTIATION: This Local Alarm requirement was never proposed and should have had the text used under Local Alarm Paragraph 4-3.1.2.2(d)2 placed correctly under Master Alarms Paragraph 4-3.1.2.2(b)3g.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-113 (Log #37) which reads as follows:
The committe does not feel that each individual cylinder needs to be secured as long as the cylinders as a whole are secured.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft
COMMENT ON AFFIRMATIVE:
ESHERICK: I agree with the "Accept in Principle". If "see Committee Action and Statement on Proposal 99-113 (Log #37)" is changed to "...(Log #253)".

(Log #212)
Committee: HEA-PIP

99- 161a - (4-3.1.2.2(d)2): Accept in Principle
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Revise text to read as follows:
When the dew point monitor, located in the mechanical room of the medical compressed air system, does not provide an integral visual and audible alarm, the local alarm shall be used to indicate a line pressure dew point above 39°F (3.9°C).
SUBSTANTIATION: Dew point alarms, as stated in Section 4-3.1.1.9(i)3 shall be alarmed in the machine room and at each of the two master alarm panels. Paragraph 4-3.1.2.2(d)2 would indicate that the dew point alarm must be wired to the local alarm panel regardless of whether the dew point alarm already has an audible and visual indication.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action on Proposal 99-141 (Log #259).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #258)
Committee: HEA-PIP

99- 162 - (4-3.1.2.3): Accept in Principle
SUBMITTER: David B. Mohile, Medical Engineering Services, Inc.
RECOMMENDATION: Revise entire section on valves to eliminate duplication and awkward wording. Revised wording would then read as follows:
4-3.1.2.3* Gas Shutoff Valves. Shutoff valves accessible to other than authorized personnel shall be installed in valve boxes with frangible or removable windows large enough to permit manual operation of valves.
All valves except valves in zone valve box assemblies shall be located in secured areas such as locked piped chases or shall be locked in their operating position and labeled as to gas supplied and the area(s) controlled.
Exception: Shutoff valves for use in certain areas, such as psychiatric or pediatric, shall be permitted to be secured with the approval of the authority having jurisdiction to prevent inappropriate access.
(a) Source Valve. A shutoff valve shall be placed at the immediate outlet of ~~the~~ each source of supply to permit the entire source of supply, including all accessory devices (such as air dryers, final line regulators, etc.), to be isolated from the piping system. The source valve shall be located in the immediate vicinity of the source equipment. It shall be labeled "SOURCE VALVE FOR THE (SOURCE NAME)."
(b) Main Valve. The main supply line shall be provided with a shutoff valve. The valve shall be located to permit access by authorized personnel only (e.g., by locating in a ceiling or behind a locked access door). The main supply line valve shall be located downstream of the source valve and outside of the source room,

enclosure, or where the main line first enters the building. This valve shall be ~~identified~~ labeled, "MAIN VALVE FOR THE (GAS NAME) SERVING THE (NAME OF THE BUILDING)." A main line valve shall not be required where the source shutoff valve is accessible from within the building.

(c) Riser Valve. Each riser supplied from the main line shall be provided with a shutoff valve adjacent to the riser connection. Riser valves shall remain accessible and shall not be obstructed. This valve shall be labeled, "RISER FOR THE (GAS NAME) SERVING THE (NAME OF THE AREA SERVED BY THE PARTICULAR RISER)."

(d) Shutoff Valves (Service). Service shutoff valves shall be placed where the lateral branches off of the riser prior to any zone valve box assembly on that branch. Only one valve shall be required for each branch off of a riser regardless of how many zone valve boxes are installed on that lateral. These valves shall be installed to allow a facility to make changes in piping in individual areas without shutting down an entire riser or facility. These valves shall be installed in a locked chase or shall be located in a secure area, latched locked open and identified in accordance with 4-3.5.4.2.

(e) Zone Valve. Station outlets shall not be supplied directly from a riser unless a manual shutoff valve located in the same story is installed between the riser and the outlet with a wall intervening between the valve and the outlet (see Figure 4-3.1.2). This valve shall be readily operable from a standing position in the corridor on the same floor it serves. Each lateral branch line serving patient rooms shall be provided with a shutoff valve that controls the flow of medical gas to the patient rooms. Zone valves shall be so arranged that shutting off the supply of medical gas to one zone will not affect the supply of medical gas to the rest of the system. A pressure gauge shall be provided downstream of each zone valve.

~~(e) Service Valves. Service shutoff valves shall be placed where the lateral branches off of the riser prior to any zone valve box assembly on that branch. Only one valve shall be required for each branch off of a riser regardless of how many zone valve boxes are installed on that lateral. These valves shall be installed to allow a facility to make changes in piping in individual areas without shutting down an entire riser or facility.~~

(f) In-Line Valves. In-line shutoff valves intended for use to isolate piping for maintenance or modification shall be located in a secure area, be ~~latched or~~ locked open, and be identified in accordance with 4-3.5.4.2. The addition of in-line valves in secured areas does not affect the location of sensors for area alarm panels as required in 4-3.1.2.2(c)4 or 5.

(g) ~~Shutoff Valves.~~ Shutoff valves provided for the connection of future piping shall be located in a secure area, and be latched or locked closed. Downstream piping shall be closed with a brazed cap with tubing allowance for removal and rebrazing.

(h) ~~Shutoff Valves (New or Replacement).~~ New or replacement pipeline shutoff valves shall be of a quarter-turn ball type manufactured with extensions for brazing, ~~and~~ with an indicating handle and shall be of ~~metallic~~ brass or bronze construction. Valves shall be the three-piece type with full-size ports and be cleaned for oxygen service. Valves for vacuum shall be permitted to be ball or butterfly per 4-3.2.2.6(i).

(i) ~~Shutoff Valves (Manual).~~ Manual shutoff valves in boxes shall be installed where they are visible and accessible at all times. The boxes shall not be installed behind normally open or normally closed doors, or otherwise hidden from plain view. The boxes shall not be located in closed rooms or closets.

(j) ~~Medical gases~~ Valves for nonflammable medical gases shall not be installed in the same zone valve box assembly with flammable gases.

~~(k) Anesthetizing locations and other vital life support and critical areas, such as postanesthesia recovery, intensive care units, and coronary care units, shall be supplied directly from the riser without intervening valves except as provided in 4-3.1.2.3(f), 4-3.1.2.3(l), or 4-3.1.2.3(m).~~

(k) A shutoff valve shall be located immediately outside each vital life-support, ~~or~~ critical care ~~area~~ and anesthesia location in each medical gas and/or vacuum line, and located so as to be readily accessible in an emergency. Valves shall be protected and marked in accordance with 4-3.5.4.2. All gas-delivery columns, hose reels, ceiling tracks, control panels, pendants, booms, ~~alarm panels,~~ or other special installations shall be located downstream of this valve.

(l) A shutoff valve shall be located outside each anesthetizing location in each medical gas line, so located as to be readily accessible at all times for use in an emergency. These valves shall be so arranged that shutting off the supply of gas to any one operating room or anesthetizing location will not affect the others. ~~Valves shall be of an approved type, mounted on a pedestal or otherwise properly safeguarded against physical damage, and marked in accordance with 4-3.5.4.2.~~

SUBSTANTIATION: When the changes for the 1999 edition were compiled editorial errors caused duplication in wording. Additionally, changes over the years have left some wording which was subject to misinterpretation. This revision of the entire section is a cleaner way to resolve the problems. Useless titles to paragraphs have been dropped and the numbering of the paragraphs has been updated. Also, the sequence of the valves from source to inline has been changed to reflect actual installation sequence.

COMMITTEE ACTION: Accept in Principle.

Revise as shown on the following pages:

COMMITTEE STATEMENT: Editorially revised.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #188)

Committee: HEA-PIP

99- 163 - (4-3.1.2.3(b)): Reject

SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering

RECOMMENDATION: Delete the last sentence in the paragraph:

"~~A main line valve shall not be required where the source shutoff valve is accessible from within the building.~~"

SUBSTANTIATION: If there is a fire in the source room and there is no main line valve there is no way of shutting down the source without going into the source room.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: The main valve is not intended to be shut off in an emergency .

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #45)

Committee: HEA-PIP

99- 164 - (4-3.1.2.3(d)): Accept in Principle

SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.

RECOMMENDATION: Revise text as follows:

"Zone Valve. Station outlets shall not be supplied directly from a riser unless a manual shutoff valve located in the same story is installed between the riser and the outlet with a wall intervening between the valve and the outlet (see Figure 4-3.1.2). This valve shall be readily operable from a standing position in the corridor on the same floor it serves. This valve shall be visible and accessible at all times. The boxes shall not be installed behind normally open or normally closed doors, or otherwise hidden from plain view. Each lateral branch line serving patient rooms shall be provided with a shutoff valve that controls the flow of medical gas to the patient rooms. Zone valves shall be so arranged that shutting off the supply of medical gas to one zone will not affect the supply of medical gas to the rest of the system. A pressure gauge shall be provided downstream of each zone valve."

SUBSTANTIATION: This is now included in (i) which is a duplication of a zone valve but is called a shutoff valve (Manual), which now can be eliminated.

COMMITTEE ACTION: Accept in Principle.

COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-162 (Log #258).

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

4-3.1.2.3 Gas/Vacuum Shutoff Valves

(a) General. Shutoff valves shall be provided to isolate appropriate sections or portions of the piping system for maintenance, repair, or planned future expansion need, and to facilitate periodic testing. All valves, other than those in valve boxes, (with frangible or removable windows large enough to permit manual operation of valves,) shall be located in a secure area accessible to authorized personnel only, or be locked open (or closed) and labeled as to gas supplied and area(s) controlled. 4-3.2.2.6(a) 4-3.2.2.6(i)

(b) Valve Types. Pipeline shutoff valves shall be a quarter-turn ball type manufactured with extensions for brazing, and with an indicating handle and shall be of ~~metallic construction~~ brass or bronze body construction. Ball valves shall be three-piece type with full-size ports, permitting inline serviceability. Vacuum valves shall be permitted to be ball or butterfly. 4-3.2.2.6(i)

Exception: Shutoff valves for use in certain areas, such as psychiatric or pediatric, shall be permitted to be secured to prevent inappropriate access.

~~(a)~~ (c) Source Valve. A shutoff valve shall be placed at the immediate outlet of the source of supply to permit the entire source of supply, include all accessory devices (such as air dryers, final line regulators, etc.), to be isolated from the piping system. The source valve shall be located in the immediate vicinity of the source equipment. It shall be labeled "SOURCE VALVE FOR THE (SOURCE NAME)."

~~(b)~~ (d) Main Valve. The main supply line shall be provided with a shutoff valve. The valve shall be located to permit access by authorized personnel only (e.g., by locating in a ceiling or behind a locked access door). The main supply line valve shall be located downstream of the source valve and outside of the source room, enclosure, or where the main line first enters the building. This valve shall be labeled, main valve for the (gas name) serving the [name of the building(s).] A main line valve shall not be required where the source shutoff valve is accessible from within the building.

~~(c)~~ (e) Riser Valve. Each riser supplied from the main line shall be provided with a shutoff valve adjacent to the riser connection. Riser valves shall remain accessible and shall not be obstructed. These valves shall be labeled, riser for the (GAS NAME) serving the [floor(s)] and the [name(s)] of the area served by the particular riser.

~~(d)~~ (f) Service Valves. Service shutoff valves shall be placed where the lateral branches off of the riser prior to any zone valve box assembly on that branch. Only one valve shall be required for each branch off of a riser regardless of how many zone valve boxes are installed on that lateral. These valves shall be installed to allow a facility to make changes in piping in individual areas. Without shutting down an entire riser or facility. These valves shall be installed in a locked chase or shall be located in a secure area, locked opened and identified in accordance with 4-3.5.4.2.

~~(e)~~ (g) Zone Valve. Station outlets/inlets shall not be supplied directly from a riser unless a manual shutoff valve located in the same story is installed between the riser and the outlet/inlet with a wall intervening between the valve and the outlet/inlet (see Figure 4-3.1.2). This valve shall be readily operable from a standing position in the corridor on the same floor it serves. Each lateral branch line serving patient rooms shall be provided with a shutoff valve that controls the flow of medical gas to the patient rooms. Zone valves shall be so arranged that shutting off the supply of medical gas to one zone will not affect the supply of medical to the rest of the system. A pressure/vacuum gauge shall be provided (on the patient side) of each zone valve. These boxes shall not be located in closed rooms or closets, nor behind normally open or normally closed doors, or otherwise hidden from plain view. 4-3.1.2.3(h)

~~(m)~~ ~~(k)~~ A ~~shutoff~~ zone valve shall be located immediately outside each vital life-support or critical care ~~area~~ in each medical gas and/or vacuum line, and located so as to be readily accessible in an emergency. Valves shall be protected and marked in accordance with 4-3.5.4.2. All gas-delivery columns, hose reels, ceiling tracks, control panels, pendants, booms, alarm panels, or other special installations shall be located downstream of this valve.

~~(n)~~ (l) A ~~shutoff~~ zone valve shall be located outside each anesthetizing location in each medical gas line, so located as to be readily accessible at all times for use in an emergency. These valves shall be so arranged that shutting off the supply of gas to any one operating room or anesthetizingation will not affect the others. ~~Valves shall be of an approved type, mounted on a pedestal or otherwise properly safeguarded against physical damage, and marked in accordance with 4-3.5.4.2.~~

All gas-delivery columns, hose reels, ceiling tracks, control panels, pendants, booms, alarm panels, or other special installations shall be located ~~downstream~~ patient side of the valve.

~~(f)~~ (h) In-Line Valves. In-line shutoff valves intended for use to isolate piping maintenance or modification shall be located in a secure area, be ~~latched or~~ locked open, and be identified in accordance with 4-3.5.4.2. In-line valves in secured areas shall not affect the location of sensors for area alarm panels as required in 4-3.1.2.2(c)4 or 5.

~~(g)~~ (i) Shutoff Valves. Shutoff valves provided for the connection of future piping shall be located in a secure area, and be locked closed. Downstream piping shall be closed with a brazed cap with tubing allowance for removal and re-brazing.

~~(h) Shutoff Valves (New or Replacement). New or replacement pipeline shutoff valves shall be of a quarter-turn ball type manufactured with extensions for brazing, and with an indicating handle and shall be of metallic construction. Valves shall be the three-piece type with full-size ports.~~ Included in 4-3.1.2.3(b)

~~(i) Shutoff Valves (manual). Manual shutoff valves in boxes shall be installed where they are visible and accessible at all times. The boxes shall installed behind normally open or normally closed doors, or otherwise hidden from plain view.~~ Included in 4-3.1.2.3(e)

~~(j) Shutoff Valves (Service). Service shutoff valves shall be placed where the lateral branches off of the riser prior to any zone valve box assembly on that branch. Only one valve shall be required for each branch off of a riser regardless of how many zone valve boxes are installed on that lateral. These valves shall be installed to allow a facility to make changes inpiping in individual areas without shutting down an entire riser or facility. These valves shall be installed in a locked chase or shall be located in a secure area, latched locked open and identified in accordance with 4-3.5.4.2.~~ Duplication of 4-3.1.2.3(d)

~~(k)~~ (j) Valves for nonflammable medical gases ~~Medical gases~~ shall not be installed in the same zone valve box assembly with flammable gases.

~~(l) Anesthetizing locations and other vital life support and critical areas, such as postanesthesia recovery, intensive care units, and coronary care units, shall be supplied directly from the riser without intervening valves et as provided in 4-3.1.2.3(f), 4-3.1.2.3(m), or 4-3.1.2.3(n).~~ Included in 4-3.1.2.3(i)

~~(n) A shutoff zone valve shall be located outside each anesthetizing location in each medical gas line, so to be readily accessible at all times for use in an emergency. These valves shall be so arranged that shutting off the supply of gas to any one operating room or anesthetizing location will not affect the others. Valves shall be of an approved type, mounted on a pedestal or otherwise properly safeguarded against physical damage, and marked in accordance with 4-3.5.4.2.~~ Included in 4-3.1.2.3(j)

(Log #136)
Committee: HEA-PIP

99- 165 - (4-3.1.2.3(d) and (i)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Consolidate these two paragraphs.
SUBSTANTIATION: These two paragraphs deal with zone valves, are partially redundant, and should be consolidated.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-162 (Log #258).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #135)
Committee: HEA-PIP

99- 166 - (4-3.1.2.3(e) and (j)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Consolidate these two paragraphs.
SUBSTANTIATION: These two paragraphs are redundant.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-162 (Log #258).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #46)
Committee: HEA-PIP

99- 167 - (4-3.1.2.3(i)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Delete the following text:
"~~Shutoff Valves (Manual). Manual shutoff valves in boxes shall be installed where they are visible and accessible at all times. The boxes shall not be installed behind normally open or normally closed doors, or otherwise hidden from plain view.~~"
SUBSTANTIATION: Shutoff Valves (Manual) are also covered in 4-3.1.2.3(d) of this Standard. I incorporated this section into 4-3.1.2.3(d) with another proposal.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-162 (Log #258).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #47)
Committee: HEA-PIP

99- 168 - (4-3.1.2.3(j)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Delete the following text:
~~(j) Shutoff Valves (Service). Service shutoff valves shall be placed where the lateral branches off of the riser prior to any zone valve box assembly on that branch. Only one valve shall be required for each branch off of a riser regardless of how many zone valves boxes are installed on that lateral. These valves shall be installed to allow a facility to make changes in piping in individual areas without shutting down an entire riser or facility.~~
SUBSTANTIATION: Delete in its entirety, it is a duplication of 4-3.1.2.3(e).
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-162 (Log #258).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #7)
Committee: HEA-PIP

99- 169 - (Table 4-3.1.2.4): Accept
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Include MedAir as the abbreviated name for Medical Air and MedVac for the abbreviated name for Medical-surgical vacuum.
SUBSTANTIATION: These two abbreviated names were not included for this table but are included in the table used for Level 3 gas and vacuum systems.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #48)
Committee: HEA-PIP

99- 170 - (Table 4-3.1.2.4, Table 4-5.1.2.12): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Abbreviated name for Nitrogen should be N_2 ~~or HPN$_2$~~, metric conversion for nitrogen should be 1103 kPa and not 1145, and color for a mixture of oxygen and carbon dioxide should be green background with grey text. Add:

Gas Service	Abbreviated Name	Colors (Background/Text)	Standard Pressure
Nitrogen	N_2 ~~or HPN$_2$~~	Black/white	160 psig + 25/-0 1145~~03~~ kPa + 173/-0
	Non-standard pressure	Black/white	200 psig + 100/-0 1379 kPa + 690/-0
	O_2/CO_2 *n*%	~~Green/white~~ Green background/grey text	

SUBSTANTIATION: The term high pressure nitrogen was changed for non-standard pressure in the last code revision. The table, as it stands, recognizes that nitrogen and high pressure nitrogen, as it is called, are within the same standard pressure limits. The conversion from psig to kPa is to multiply psig by 6.895. To change 160 psig to kPa would be 160 x 6.895 = 1103 kPa and not 1145 kPa.
COMMITTEE ACTION: Accept in Principle.
Revise table as shown:

Gas Service	Abbreviated Name	Colors (Background/Text)	Standard Pressure
Nitrogen	N_2	Black/white	160 psig + 25/-0 1103 kPa + 173/-0
	Non-standard pressure	Black/white	185 psig + 300/-0 ~~1379 kPa + 690/-0~~
	O_2/CO_2 *n*%	Green/grey	

COMMITTEE STATEMENT: The changes were made for consistency.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #134)
Committee: HEA-PIP

99- 171 - (4-3.1.2.4(a)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Change the last sentence here to:
"Symbols and abbreviations shall comply with Table 4-3.1.2.4."
SUBSTANTIATION: The reference to the P-2 is no longer necessary.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-145 (Log #291).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #94)
Committee: HEA-PIP

99- 172 - (4-3.1.2.4(a), 4-3.1.2.13, 4-3.1.2.14): Accept in Principle
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Correlate these three sections on labeling of piping.
In 4-3.1.2.13, sentence 1, after "labeling with the name" add the following: "or chemical symbol."
SUBSTANTIATION: Change will make wording consistent for these three sections with respect to the labeling (i.e., name or chemical symbol).
COMMITTEE ACTION: Accept in Principle.
See Proposal 99-171 (Log #134) for the correlation recommendation and accept the change to 4-3.1.2.13.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-171 (Log #134).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #213)
Committee: HEA-PIP

99- 173 - (4-3.1.2.4(c)): Reject
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Add a new sentence to 4-3.1.2.4(c) to read as follows:
"Outlets shall be listed/certified by a recognized testing agency as meeting the requirements of this paragraph."
SUBSTANTIATION: All manufacturers of gas outlets in North America submit their outlets for design certification by test agencies such as UL and CSA. Some third party verification inspectors are making individual judgments regarding outlet design.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: No testing agency currently tests to the NFPA 99 standard for medical gas outlets.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
HOFFMAN: I disagree with the Committee's action rejecting this proposal. Throughout the document references are made to "listed" or "approved". If the committee does not wish to site UL or CSA then have the sentence read: "Outlets shall be listed or approved and meeting the requirements of this paragraph".

(Log #142)
Committee: HEA-PIP

99- 174 - (4-3.1.2.6(a)1): Accept
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: 1. Change the parenthetic from "(i.e., can be manipulated..." to "(i.e., cannot be manipulated...)"
2. Add a sentence prior to the last sentence to read: "At the terminal where the user makes connection, which shall be fully and immediately accessible, a second primary check, omitting the secondary check as above shall be provided. The connection between the two terminals shall be considered a semi-permanent connection (see Figure 4-3.1.2.6)."
3. In 4-3.1.2.6(a)3, delete 4-3.1.2.4(a).
SUBSTANTIATION: 1. The sense of the parenthetic does not agree with the previous statement and the intent of the requirement.
2/3. The original intent of this allowance was to permit a special variation on a standard terminal outlet when used within Manufactured Assemblies. The allowance is incomplete without these modifications.
NOTE: Supporting material is available for review at NFPA Headquarters.
COMMITTEE ACTION: Accept.
In recommendation 3) the deletion is for "(a)" only. 4-3.1.2.4(b), (c) and (d) shall remain.

COMMITTEE STATEMENT: Clarity.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft
COMMENT ON AFFIRMATIVE:
HOFFMAN: The left illustration showing Terminals in Manufactured Assemblies shows two "Primary Checks". The top check should be labeled as a "Gas Specific Secondary Check". The text should require gas specific checks but not mandate the use of DISS. There are many ways to achieve gas specificity and mandating the use of DISS as the only way is design restrictive.

(Log #49)
Committee: HEA-PIP

99- 175 - (4-3.1.2.7(c)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Piping shall be ASTM B819 specification hard drawn seamless medical gas tubing; ASTM B819 tubing is identified by the markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in green (Type K) or blue (Type L). Main and branches shall be not less than 1/2 in. nominal size. Factory-installed tube on station outlets extending no further than 8 in. from the outlet body shall be permitted to be 3/8 in. O.D. (1/4 in. nominal) size. Connections to gauges and alarm switches and runouts to alarm panels shall be permitted to be ~~1/4 in. O.D. (1/8 in. nominal)~~ 3/8 in. O.D. (1/4 in. nominal) size."
SUBSTANTIATION: 1/4 in. O.D. (1/8 in. nominal) used for gauges, alarm switches, and runouts is not made in B819 tubing.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-145 (Log #291).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #229)
Committee: HEA-PIP

99- 176 - (4-3.1.2.7(c)): Accept in Principle
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise 4-3.1.2.7(c) as follows:
(c) Piping shall be ASTM B819 specification hard copper seamless medical gas tubing; ASTM B819 tubing is identified by the markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in green (Type K) or blue (Type L). Mains and branches shall be not less than 1/2 in. nominal size. Factory-installed tube on station outlets (or inlets) shall be permitted to be 3/8 in. O.D. (1/4 in. nominal) size. ~~Connections to~~ Connecting tubing for gauges and alarm switches and runouts to alarm panels shall be permitted to be 1/4 in. O.D. (1/8 in. nominal) size.
Exception: For systems operated at pressures between 200 and 300 psig (1380 and 2070 kPa, respectively), ASTM B819, Type K copper shall be used.
SUBSTANTIATION: The 1/4 in. O.D. size applies to the connecting tubing for gauges and alarm switches, not the connection itself.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-145 (Log #291).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft
COMMENT ON AFFIRMATIVE:
WAGNER: Approved portions of this proposal do not appear have been incorporated into Proposal 99-145 (Log #291).
"Mains and branches..." . "Factory-installed tube on station outlets/ inlets shall be...".

(Log #77)
Committee: HEA-PIP

99- 177 - (4-3.1.2.7(g) Exception): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst./National ITC
RECOMMENDATION: Add to existing Exception:
"Dielectric unions are allowed at equipment requiring isolation between the piping distribution system and the equipment."
SUBSTANTIATION: There is an ongoing problem between the requirements of NFPA about not being able to use unions in the piping distribution system and the manufacture of MRI units. The isolation is to obtain the necessary picture quality. Distortion or poor picture quality is caused from interference from outside, ungrounded sources such as the medical gas piping distribution system. MRI manufacturers are voiding warranties without the use of dielectric unions on piping entering the units.
COMMITTEE ACTION: Accept in Principle.
Make this a new paragraph and not part of the existing exception as follows:
"Dielectric fittings shall be permitted at equipment requiring isolation between the piping distribution system and the equipment."
COMMITTEE STATEMENT: This change made it mandatory and conforms to the manual of style.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #CP713)
Committee: HEA-PIP

99- 178 - (4-3.1.2.8(b)1): Accept
SUBMITTER: Technical Committee on Piping Systems
RECOMMENDATION: 1. Add the following sentence onto the end of 4-3.1.2.8(b)1 as follows:
"All brazed joints shall be made using a brazing alloy exhibiting a melting temperature in excess of 1,000 degrees F (538 degrees C) to retain the integrity of the piping system in the event of fire exposure."
2. Delete A-4-3.1.2.8(b).
SUBSTANTIATION: Although this sentence has appeared in the "A" appendix for many years, it was felt to contain information important enough by the committee to be moved to the main body of the standard. There has been considerable confusion in the field recently caused by various manufacturer's labeling of brazing products and the use of trade names. This should clear up the problem by stating the minimum temperature at which the product will melt.
Regarding the deletion, when the information is moved from the "A" appendix to the body of the standard it will not be necessary to repeat it in the appendix.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #53)
Committee: HEA-PIP

99- 179 - (4-3.1.2.8(b)10): Accept
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Each brazed joint shall be visually examined after cleaning of the outside of the joint. The following conditions shall be considered unacceptable:
a. Flux or flux residue (BAg series rods used with dissimilar metals only)
b. ~~Excessive oxidation of the joint~~ Base metal melting or erosion
c. Presence of unmelted filler metal
d. Failure of the filler metal to be clearly visible all the way around the joint at the interface between the socket and the tube
e. Cracks in the tube or component
f. Cracks in the braze filler metal
g. Failure of the joint to hold the test pressure under 4-3.4.1.2~~(c)~~ (b) and (e)"
SUBSTANTIATION: The reason for adding a. "BAg series rods with dissimilar metals only," is because that flux can only be used with dissimilar metals.
b. The term used by the American Welding Society when too much heat is added to the base metal in a brazed assembly is erosion and melting, not oxidation. The term oxidation is used in reference to the black flaking of the base metal caused by the presence of oxygen.
g. In 4-3.4.1.2, (c) refers to the cross connection test. (b) refers to the initial pressure test, and (e) refers to the standing pressure test.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #50)
Committee: HEA-PIP

99- 180 - (4-3.1.2.8(b)4): Accept
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"The fitting surfaces to be brazed shall be pre-cleaned by the manufacturer ~~mechanically cleaned using a clean stainless steel wire brush or equivalent~~ and the tube ends to be brazed shall be cleaned with a nonabrasive pad."
SUBSTANTIATION: Copper fittings cleaned for oxygen service according to CGA is degreased and sealed nitrogen purged atmosphere bags. Common practice is to use a nonabrasive pad. Making it mandatory will eliminate the use of sand cloth which could induce contamination in the piping system.
COMMITTEE ACTION: Accept.
COMMITTEE STATEMENT: The remaider of the section to remain. The revision is to the first sentence only.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #51)
Committee: HEA-PIP

99- 181 - (4-3.1.2.8(b)6): Reject
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Tube ends shall be inserted fully into the socket of the fitting or in accordance with socket depths required by MSS SP-73 in Table A-4-3.1.2.7(e). The use of a shallow cup fitting shall be accomplished by cutting the cup to the depth required by MSS SP-73 or with a mechanical stop meeting the requirements of MSS SP-73 and not by partial insertion of tube ends into the soldering cup fittings."
SUBSTANTIATION: The copper fittings used for medical gas installations are the same fittings used for soft solder in the plumbing industry. The fitting cup depth is designed for soldering; brazing does not require the same cup depth. In the 1996 standard a table was, and is still, part of the 1999 standard which designates the minimum cup depth for each size of copper tubing for brazing.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: These fittings are not manufactured at this time. Fittings are not currently manufactured to MSS SP-73 and the proposed method would create non-uniform installation procedures in violation of current requirements.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #52)
Committee: HEA-PIP

99- 182 - (4-3.1.2.8(b)7): Accept
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"While being brazed, joints shall be continuously purged with oil-free dry nitrogen NF to prevent the formation of copper oxides on the inside surface of the joint. The purge gas shall be monitored and audibly alarmed to alert the brazer of low content of purge gas. The flow of purge gas shall be maintained with the use of a flow meter until the joint is cool to the touch."
SUBSTANTIATION: NF oil-free dry is required for the purging of medical gas systems. The monitoring of the purge gas will eliminate copper oxides from forming on the interior of the medical gas piping due to a cylinder running empty. In many cases the installer/contractor will try to use a nitrogen regulator to maintain a low flow of purge gas. Regulators are not designed to be used to maintain low flow, they're designed to regulate from a high pressure to a lower pressure and not the low flow used in the purging of medical gas systems.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #289)
Committee: HEA-PIP

99- 183 - (4-3.1.2.8(b)1): Accept
SUBMITTER: Dale J. Dumbleton, National Inspection, Testing and Certification
RECOMMENDATION: Revise text as follows:
"Brazed tube joints shall be the socket type. Filler metals shall bond with and be metallurgically compatible with the base metals being joined. Flux shall not be used except where permitted under 4-3.1.2.8(b)1b. Brazing filler metals shall comply with ANSI/AWS A5.8, Specification for Brazing Filler Metal, ~~except that filler metals having compositions not conforming to the exact ANSI/AWS A5.8 classifications shall be permitted when used according to the manufacturer's instructions.~~"
SUBSTANTIATION: Allowing filler metals that do not conform to a standard opens the door for manufacturers to use whatever composition of alloys they desire, whether it meets a standard or not.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #189)
Committee: HEA-PIP

99- 184 - (4-3.1.2.8(b)4):
TCC NOTE: The Technical Correlating Committee directs the Technical Committee to clarify which items were not accepted by the Technical Committee. The Committee Statement is not explicit, with specific information related to the submitter's recommendation.
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Revise text as follows:
"The surfaces to be brazed shall be mechanically cleaned. The fittings shall be cleaned using a clean stainless steel wire brush or equivalent. The use of steel wool and sandcloth shall be prohibited. ~~due to the possible presence of oil.~~ Mechanical cleaning of the tube shall be done with a nonabrasive pad (such as Scotchbrite™). ~~not result in the grooving of the surfaces to be joined.~~"
SUBSTANTIATION: The process for cleaning the fittings is different from the tube and the text needs to be a little clearer. Sandcloth usually puts grooves in the surface of the tube and should be prohibited along with steel wool. Scotchbrite does not put grooves in the surface of the tube.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-180 (Log #50) which reads as follows:
The remaider of the section to remain. The revision is to the first sentence only.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #230)
Committee: HEA-PIP

99- 185 - (4-3.1.2.8(b)7 Exception): Accept in Principle
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise 4-3.1.2.8(b)7, Exception, as follows:
Exception: A final connection to an existing pipeline shall be permitted to be made without the use of a nitrogen purge. After final connection, ~~the affected downstream portions of the existing pipeline shall be tested in accordance with 4-3.4.1.3(i)~~ twenty-five percent of the existing zones downstream from the connection

shall be tested for particulate matter in accordance with the piping purge test in 4-3.4.1.3(e) ~~with~~, using the gas of system designation.
SUBSTANTIATION: The zones downstream from a final connection to an existing system that has not been purged should be tested for particulate matter, not gas concentration.
COMMITTEE ACTION: Accept in Principle.
Revise 4-3.1.2.8(b)7, Exception, as follows:
Exception: A final connection to an existing pipeline shall be permitted to be made without the use of a nitrogen purge. After final connection, ~~the affected downstream portions of the existing pipeline shall be tested in accordance with 4-3.4.1.3(i)~~ and shall also be tested for particulate matter in accordance with the piping purge test in 4-3.4.1.3(e) ~~with~~, using the gas of system designation.
COMMITTEE STATEMENT: Change mandates testing for particulate matter on tie-ins done without nitrogen. Testing for the 25 percent of the zones downstream is considered excessive.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft
COMMENT ON AFFIRMATIVE:
WAGNER: It is not clear whether the intent of the Committee Action was to substitute the purge test for particulates for the gas concentration test in 4-3.4.1.3(i) or require it in addition to gas concentration. Should the second sentence be changed to read as follows:?
"After final connection, the affected downstream portions of the existing pipeline shall be tested ~~in accordance with 4-3.4.1.3(i)~~ for particulate matter in accordance with the piping purge test in 4-3.4.1.3(e) ~~with~~ using the gas of system designation."

(Log #231)
Committee: HEA-PIP
99- 186 - (4-3.1.2.8(b)11): Accept
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise text as follows:
"11. Brazed joints that are found to be defective under 4-3.1.2.8(b)10, conditions a, c, d, f, or g, shall be permitted to be repaired, except that no joint shall be ~~repaired~~ reheated more than once before being replaced. Brazed joints that are found to be defective under 4-3.1.2.8(b)10, conditions b and e, shall be replaced."
SUBSTANTIATION: To indicate that joints must be replaced if they cannot be repaired after one attempt at reheating.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #138)
Committee: HEA-PIP
99- 187 - (4-3.1.2.9(e)): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add the wording:
"...electrical switchgear rooms or locations with open flames."
SUBSTANTIATION: The intent of the prohibition against locating medical gases in kitchens appears to be prevention of exposure to flame. As there are other locations where open flames may present the same hazard (e.g., boiler rooms, locations with decorative fireplaces, closets with gas water heaters, etc.) it seems useful to include this prohibition.
COMMITTEE ACTION: Accept in Principle.
Revise as follows:
"...electrical switchgear rooms or areas with open flames."
COMMITTEE STATEMENT: This change was for consistency. See Committee Action and Statement on Proposal 99-79 (Log #152).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft
COMMENT ON AFFIRMATIVE:
WAGNER: This proposal is not incorporated in Log #291.

(Log #290)
Committee: HEA-PIP
99- 188 - (4-3.1.2.9(e)): Accept
SUBMITTER: Dale J. Dumbleton, National Inspection, Testing and Certification
RECOMMENDATION: Revise text as follows:
"Piping shall not be permitted to be installed in elevator shafts, kitchens, or electrical switchgear rooms."
SUBSTANTIATION: The addition of elevator shafts should be added to the existing prohibited areas for the installation of medical gas piping.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #312)
Committee: HEA-PIP
99- 189 - (4-3.1.2.9(e)): Reject
SUBMITTER: Julie Moen, Medical Gas Testing & Certification, Inc.
RECOMMENDATION: Add "confined space areas" following "kitchens or electrical switchgear."
SUBSTANTIATION: Confined space areas are not presently addressed by NFPA 99 in regards to medical gas systems.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Medical gas piping is run through areas defined as confined spaces without presenting any fire hazards. This proposal is too restrictive in running piping through a healthcare facility.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #54)
Committee: HEA-PIP
99- 190 - (4-3.1.2.9(i)): Accept
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Add the following text:
"Horizontal runouts from all mains and branches shall be taken off above the center line of the pipe and rise vertical or at an angle of not more than 45° from the vertical...".
SUBSTANTIATION: This is a common practice in many piping systems where foreign matter within the piping systems could cause an adverse effect on the overall performance of the system's operation. This requirement would not increase the cost of construction but would increase the purity of gases administered to the patient outlets.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ESHERICK: Vertical up and 45° up take offs from the center line of the pipe is not desirable because:
1. More fittings-more labor and more material-more costs.
2. Workmanship, sizing and testing makes a good installation.
3. If it is not broken, then leave it alone.
4. There is no significant benefit to this recommendation.

(Log #190)
Committee: HEA-PIP

99- 191 - (4-3.1.2.10(a)2): Accept in Principle
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Revise text as follows:
"The installation shall be made by qualified, competent technicians experienced in making such installations and meeting the requirements of ANSI/ASSE Series 6000, Standard 6010."
SUBSTANTIATION: Until the ANSI/ASSE Series 6000 became available there were no professional qualification standards for the installer. I believe we should take advantage of and use this standard.
COMMITTEE ACTION: Accept in Principle.
The committee agrees with the recommendation and will incorporate into 99-145 (Log #291).
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-145 (Log #291).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 18
NEGATIVE: 4
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
DAVIDSON: There are many independent installers both union and open shop who presently meet or exceed the ASSE Series 6000 standards, while there are installers who are certified under the ASSE Series 6000 standards who have installed systems using copper water tubing, using non-oxygen clean pipe and fittings, have no policy and procedure manuals and brazed the systems without nitrogen gas purge. Certification does not deal with the problems of poor installers, internal contractor management, poor construction management/supervision and poor certification. The requirement for the installing contractor should be defined within NFPA 99, Chapter 4, not through a third party standards making body.
ERICKSON: Reject the Proposal. The section as currently written is more than adequate to handle the competency issues of installing medical gas piping systems in health care facilities. Just because an independent non-consensus organization develops a standard for training and qualifications does not mean it needs to be codified in a national standard. Where local or state governments see a need for this set of qualifications, then ANSI/ASSE 6000, Standard 6010. Just by having an installer take a 35 hour course and a test does not guarantee that the installation will be of any higher quality than if the installer just followed NFPA 99 or NFPA 99C.
SHOEMAKER: The current wording is more than sufficient to ensure the quality of the task of installing med gas piping systems. As I see it we are not in the business of specifying codes written by private organizations. If we approve this, we loose control over future changes in our code, we essentially abdicate our responsibility to a private, non-consensous organization. Our focus should be "performance based", "built to a standard", not the method for performing installations, and certainly not the training program itself.
SMIDT: Reject the proposal: The current standards address the appropriate level of installer competence. The additional time spent in class will only serve to raise the cost of the installation while providing no more promise of compliance. NFPA 99 as currently written provides the guidance necessary for a well installed system.
COMMENT ON AFFIRMATIVE:
MRAULAK: After the circulation of votes, I wish to formally comment on the negative ballot and supporting rationale submitted by Douglas S. Erickson on the revised draft of NFPA 99. Specifically, I wish to comment on Mr. Erickson's rationale to reject Log #190 and Log #195.
As a member of the ASSE working group responsible for the drafting and revision of the ANSI/ASSE Series 6000 standards. I would like to go on record stating that contrary to Mr. Erickson's allegations, the American Society of Sanitary Engineering (ASSE) is an internationally recognized, ANSI accredited standards developer. ASSE has been in existence since 1906, and began developing standards for the plumbing and pipefitting industries in the 1950's. ASSE standards are referenced in all of the model plumbing codes used in the United States, and have a working relationship to develop standards with CSA International in Ontario, Canada.
Currently, ASSE is approved by the American National Standards Institute to promulgate standards under two types of accreditation - Organizational Accreditation and Canvass Accreditation. ASSE's procedures, as approved by the American National Standards Institute, require that the technical committees (Professional Qualifications Standards and Product Standards Committee) be balanced, provide for due process and openness, have a mechanism for appeals in place, that a standard must be approved by two-third's of the committee, and that all comments be addressed by the committee and/or Board of Directors.
ASSE Standards, including the ANSI/ASSE Series 6000, are submitted to ANSI for the open review process and are reviewed to ensure that all ASSE and ANSI requirements are met prior to becoming an American National Standard.
I believe that the requirement for training and certification of medial gas installers and verifiers is necessary, and is not currently addressed within the NFPA 99. These two changes are necessary to ensure the proper installation of the critical life-supporting systems.

(Log #11)
Committee: HEA-PIP

99- 192 - (4-3.1.2.10(d)): Reject
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Delete and move this paragraph.
SUBSTANTIATION: This requirement refers to proper testing procedures for newly installed medical pipelines and should be removed from the Installation Requirements section and placed as the second paragraph under Section 4-3.4.1.2 (Installer Performance Testing).
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The committee feels the present location is satisfactory since it has to do with installation and not limited to installer testing.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #140)
Committee: HEA-PIP

99- 193 - (4-3.1.2.11): Accept in Principle
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Rewrite the paragraph to read:
"The following requirements apply to systems having standard operating pressures outside of those specified in Table 4-3.1.2.4, and are in addition to the minimum requirements listed in 4-3.1.2.3 through 4-3.1.2.9."
SUBSTANTIATION: The reference to pressures are now inaccurate and redundant. The new table resolves this.
COMMITTEE ACTION: Accept in Principle.
Remove the word "standard". This wording will be inserted into Proposal 99-145 (Log #291).
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-145 (Log #291).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #342)
Committee: HEA-PIP

99- 194 - (4-3.1.2.11(b)1): Accept
SUBMITTER: Dale J. Dumbleton, National Inspection Testing and Certification Corp.
RECOMMENDATION: Revise as follows:
"Only Type K medical gas tube (ASTM B819) shall be used for piping larger than 3 1/8 in. O.D. (3 in. nominal)."
SUBSTANTIATION: The wrought copper fittings used for medical gas piping installations have a working pressure rating of 30 percent less than type "L" hard copper tubing as per the requirements of ASME B16.22-1995. According to the table with this standard, the working pressure doesn't drop below 300 psig working pressure until you reach fitting over 3 in. in size. The requirements for the burst pressure are at least 4 times the working pressure which allows over 700 psig of safety factor in the testing of nonstandard pressure systems at 450 psig.
Note: Supporting material is available for review at NFPA Headquarters.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #91)
Committee: HEA-PIP

99- 195 - (4-3.1.2.11(c) 5): Reject
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Delete 4-3.1.2.11(c).
SUBSTANTIATION: This subject is addressed in 4-3.1.2.11(a).
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The recommnedation was to delete all of 4-3.1.2.11 (c) and was inappropriate.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #12)
Committee: HEA-PIP

99- 196 - (4-3.1.2.11(c)5d): Reject
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Delete this requirement from section 4-3.1.2.11 (Systems having nonstandard operating pressures) and place it under section 4-3.4.1.1 (General).
SUBSTANTIATION: The testing requirement for systems having nonstandard operating pressures should be placed under Section 4-3.4.1.1 because this section provides general guidelines for inspection and testing Level-1 Piped Gas Systems.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: It is more appropriate in it's current location because it deals with non standard operating pressures.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #56)
Committee: HEA-PIP

99- 197 - (4-3.1.2.12(a)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Brazers shall be qualified by visual examination of the test coupon followed by sectioning. ~~except that a tension test shall be permitted to be substituted for sectioning. Where tension tests are used for brazer qualification, they shall be performed in accordance with ASME IX.~~"
SUBSTANTIATION: The tension test to qualify the brazer was a mistake corrected by a TIA back in 1996. The tension test is used by ASME Section IX to qualify a braze procedure, not the brazer.
COMMITTEE ACTION: Accept in Principle.
Accept the recommendation and insert into Proposal 99-145 (Log #291).
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-145 (Log #291).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #232)
Committee: HEA-PIP

99- 198 - (4-3.1.2.12(a)): Accept in Principle
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise text as follows:
4-3.1.2.12(a) Brazers shall be qualified by visual examination of the test coupon followed by sectioning ~~except that a tension test shall be permitted to be substituted for sectioning. Where tension tests are used for brazer qualification, they shall be performed in accordance with ASME IX~~.
SUBSTANTIATION: A tension test does not prove the ability of a brazer to achieve adequate penetration of the braze filler metal into a joint with no more than 20 percent voids.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-145 (Log #291).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #CP715)
Committee: HEA-PIP

99- 199 - (4-3.1.2.12(f)): Accept
SUBMITTER: Technical Committee on Piping Systems
RECOMMENDATION: Revise to read:
"Performance Qualifications of Brazers shall remain in effect unless the brazer does not braze with this qualified procedure for a period exceeding 6 months...".
SUBSTANTIATION: AWS and ASME are the dominant standards used by NFPA 99 and this standard can not be made less restrictive than the dominant standard for brazing.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #57)
Committee: HEA-PIP

99- 200 - (4-3.1.2.13): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Labeling. The gas content of medical gas piping systems shall be readily identifiable by appropriate labeling with the name ~~and pressure~~ of the gas contained. Such labeling shall be by means of metal tags, stenciling, stamping, or adhesive markers, in a manner that is not readily removable. Labeling shall appear on the piping at intervals of not more than 20 ft (6 m) and at least once in each room and each story traversed by the piping system. ~~w~~Where supplementary color identification of piping is used, it shall be in accordance with the gases and colors indicated in CGA Pamphlet C-9, Standard Color-Marking of Compressed Gas Cylinders Intended for Medical Use. Only those systems operating at nonstandard pressures shall be labeled with the name of the gas and operating pressure."
SUBSTANTIATION: The pressure of the gases in standard operating pressure systems, as agreed in 1999, is not required to be on the label.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-145 (Log #291) which reads as follows:
Revise the proposal as follows:
Affected Paragraphs: 4-3.1.2 through 4-6.1.2.5 (Level 1,2,3,and 4 affecting piping, materials and installation). This is an attempt to meld the vacuum and positive gas piping systems. NFPA eliminated the vacuum subcommittee a number of years ago with the intention of bringing the two sections into one document. This is just a continued effort to accomplish this goal.
The Left Column is the complete proposed text. New material is **Bold.** Where the text is sourced in the current document, the source paragraph is listed in the right-hand column. Where the text is new, the relevant proposal is noted.

4-3.1.2 Distribution — ~~Level 1 (Manifold, Piping, Valving/~~ **Level 1, 2, 3, and 4 Gas and Vacuum Piping and Materials** ~~Controls, Outlets/Terminals, Alarms). See Figure 4-3.1.2.~~	
4-3.1.2.1 General Requirements.	
(a) *Oxygen Compatibility.* Components in nonflammable medical gas and vacuum systems shall be of materials that are suitable for oxygen service. *(See 4-3.1.1.3, Material — Oxygen Compatibility.)* Pipe (tube), fittings, valves, and other components shall have been thoroughly cleaned internally to remove oil, grease, and other readily oxidizable materials, as if for oxygen service.	4-3.1.2.1(a)
(b) *Cleanliness.* Materials that have been cleaned for use in medical gas piping systems shall be plugged, capped, or otherwise sealed until installed. Particular care shall be taken in the storage and handling of such material to maintain its clean condition. Immediately before final assembly, such material shall be visually examined internally for contamination. Material that has become contaminated and is no longer suitable for oxygen service shall not be installed.	4-3.1.2.1(b)
(c) *On-Site* ***Rec*** ~~*C*~~*leaning.* On-site **re**cleaning of the interior surfaces of tube ends, valves, fittings, and other components shall be limited to recleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Such surfaces shall be cleaned by washing in a clean, hot water/alkaline solution, such as sodium carbonate or trisodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot potable water.	AIP Log #43
(e) *Pressure Gauges for Gases.* The scale range of positive pressure analog gauges shall be such that the normal reading falls within the middle 50 percent of the scale. The scale range of digital gauges shall be not more than two times the working pressure. The rated accuracy of pressure gauges used for testing shall be one percent (full scale) or better at the point of reading. Pressure gauges shall be in compliance with ANSI/ASME B-40.1, *Gauges, Pressure Indicating Dial-Type, Elastic Element*s.	
1.* A pressure gauge shall be installed in the main line adjacent to the actuating switch required in 4-3.1.2.2(b)3e. It shall be appropriately labeled and shall be readily visible from a standing position.	
2.* An appropriately identified pressure gauge, connected to the line being monitored, shall be installed at each area alarm panel location. It shall be appropriately labeled and shall be readily visible from a standing position.	
(f) Vacuum System Gauges.	
(a) ***Main-Line Gauge*****. A vacuum gauge shall be provided in the main vacuum line adjacent to the actuator (vacuum switch) for the master alarms, with this gauge located immediately upstream (on the terminal or inlet side) terminal or inlet of the source valve (the main line valve, if so equipped). Those with normal range display shall indicate normal only between 12 and 19 in. Hg (vacuum).**	4-3.2.2.10
(b) ***Area Gauge.*** **Vacuum gauges shall be located at each area vacuum alarm signal location, with this gauge connected upstream (on the terminal or inlet side) of any valve controlling that area. Those with normal range display shall indicate normal only between 12 and 19 in. Hg (vacuum).**	
(c)*Vacuum Gauge Identification. All permanently installed vacuum gauges and manometers for the vacuum system shall be continuous reading, manufactured expressly for vacuum, and labeled: VACUUM.	
4-3.1.2.7 Piping Materials. The provisions of this section apply to field-installed piping for the distribution of medical piped gases and vacuum systems.	
(a) Tubes, valves, fittings, station outlets, and other piping components in medical gas systems shall have been cleaned for oxygen service prior to installation.	
(b) Piping for nonflammable medical gas systems shall be suitable for oxygen service in accordance with 4-3.1.2.1. Each length of tube shall be permanently labeled and delivered plugged or capped. Fittings, valves, and other devices shall be sealed and marked. The installer shall furnish documentation certifying that all installed piping materials comply with the requirements of this paragraph.	
(c) Piping shall be ASTM B 819 specification hard drawn seamless medical gas tubing; ASTM B 819 tubing is identified by the markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" ~~in green (Type K) or~~ blue (Type L). Main and branches shall be not less than 1/2 in. nominal size **for positive gases and 3/4 in. nominal for vacuum**. **Drops to individual outlet/inlets shall be not less than 1/2 in. nominal.** Factory-installed tube on station outlets extending no further than 8 in. from the outlet body shall be permitted to be 1/2 in. O.D. (3/8 in. nominal) size. **Connecting tubing for** gauges and alarm switches and runouts to alarm panels shall be permitted to be ~~1/4~~ **3/8** in. O.D. (~~1/8~~ **1/4** in. nominal) size.	4-3.1.2.7(c) and 4-3.2.2.2(c) AIP Log #229 AIP Log #62 4-3.1.2.7(d)
(d) Where seismic construction is required by the building code, piping shall be properly braced.	
(e)*Except as provided under 4-3.1.2.7(g) and (h), joints in copper tubes shall be brazed using capillary fittings complying with ANSI B16.22, *Wrought Copper and Copper Alloy Solder Joint Pressure Fittings,* or brazing fittings complying with *MSS SP-73, Brazing Joints for Wrought and Cast Copper Alloy Solder Joints Pressure Fittings.* Cast fittings shall not be used for brazed joints.	

(f) Valves, fittings, and other piping components shall be cleaned for oxygen service by the manufacturer in accordance with CGA Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service,* except that fittings shall be permitted to be cleaned by a supplier or agency other than the manufacturer.	
(g) Joints in medical gas tube shall be brazed except that memory-metal couplings having temperature and pressure ratings not less than that of a brazed joint shall be permitted. Flared and compression fittings shall be prohibited throughout the piping system, including connections to station outlet**/inlet** alarm devices, and other components. Unions shall not be permitted in the distribution pipeline system.	
Exception:	
1. Threaded connections for air compressor sets and devices such as manifolds, pressure regulators, relief valves, pressure switches, and pressure gauges.	
2. Dielectric fittings at equipment requiring isolation between the piping distribution system and the equipment.	AIP Log #77
(h) Listed or approved metallic gas tube fittings that, when made up, provide a permanent joint having the mechanical, thermal, and sealing integrity of a brazed joint shall be permitted to be used in lieu of brazed joints.	
(i) Turns, offsets, and other changes in direction in piping shall be made with fittings complying with 4-3.1.2.7(e).	
Vacuum System Piping	
1. Seamless copper water tube (ASTM B88), Type K,L,M copper ACR tube, (ASTM B280), or (ASTM B819) medical gas tube shall be permitted to be used.	4-3.2.2.2(a)
~~*2. Soft annealed copper tubing (ASTM B88) shall be permitted underground*~~	AIP Log #192
Exception: Nonstandard Operating Pressure Systems	
1. Where operating pressures are ~~200 to 300 psig~~ ~~(1380 to 2068)~~ **above 185 psig (1,276** kPa) only Type K medical gas tube (ASTM B819) shall be used **for piping larger than 3 1/8 in. O.D. (3 in. nominal)**	AIP Log #48 Proposal (sent 6/30 not in ROP's)
4-3.1.2.8 Pipe Joints.	
(a)* *Threaded Joints.*	
1. Threaded joints in medical gas distribution piping shall be limited to the connection of pressure**/vacuum** gauges, alarm pressure**/vacuum** switches, and similar devices.	
2. Threads on pipe and fittings shall be tapered pipe threads complying with ANSI B1.20.1, *Pipe Threads, General Purpose.*	
3. Threaded joints in piping systems shall be made up with polytetrafluoroethylene (such as Teflon™) tape or other thread sealant suitable for oxygen service. Sealants shall be applied to the male threads only.	
(b)**Brazed Joints.*	
1. Brazed tube joints shall be the socket type. Filler metals shall bond with and be metallurgically compatible with the base metals being joined. Flux shall not be used except where permitted under 4-3.1.2.8(b)1b. Brazing filler metals shall comply with ANSI/AWS A5.8, *Specification for Brazing Filler Metal*~~, except that filler metals having compositions not conforming to the exact ANSI/AWS A5.8 classifications shall be permitted when used according to the manufacturer's instructions~~.	Accept Log #289
a. Copper-to-copper joints shall be brazed using a copper- phosphorus or copper-phosphorous-silver brazing filler metal (BCuP series) without flux.	
b. Dissimilar metals, such as copper and bronze or brass, shall be brazed using an appropriate flux with a silver (BAg series) brazing filler metal.	
2. Joints to be brazed in place shall be accessible for proper preparation, assembly, heating, filler application, cooling, cleaning, and inspection.	
3. Tube ends shall be cut square using a sharp tubing cutter to avoid deforming the tube. The cutting wheel shall be free from grease, oil, or other lubricant not suitable for oxygen service. The cut ends of tube and pipe shall be deburred with a sharp, clean deburring tool, taking care to prevent chips from entering the tube or pipe.	
4. The **fitting** surfaces to be brazed shall be **pre-cleaned by the manufacturer and the tube ends to be brazed shall be cleaned with a non-abrasive pad**. The use of steel wool shall be prohibited due to the possible presence of oil. Mechanical cleaning shall not result in grooving of the surfaces to be joined. After mechanical cleaning, the surfaces shall be wiped using a clean, lint-free white cloth. During this cleaning, care shall be taken to avoid contamination of the "cleaned for oxygen" internal surfaces of the tube and components. Joints shall be re-cleaned if contaminated prior to brazing. Joints shall be brazed within 1 hour of being cleaned.	Accept Log #50

5. Where dissimilar metals, such as copper and bronze or brass, are being brazed, flux shall be applied sparingly to minimize contamination of the inside of the tube with flux. The flux shall be applied and worked over the surfaces to be brazed using a stiff ~~stainless steel~~ bristle brush to ensure adequate coverage and wetting of the surfaces with flux. Where possible, short sections of copper tube shall be brazed to the non-copper component and the interior of the sub-assembly shall be cleaned of flux prior to installation in the piping system. Flux-coated brazing rods shall be permitted to be used in lieu of the application of flux to the surfaces to be joined on tube 3 /4 in. nominal size and smaller.	AIP Log #64
6. Tube ends shall be inserted fully into the socket of the fitting. Where flux is permitted, the joint shall be heated slowly until the flux has liquefied. Once this has occurred, or where flux is not used, the joint shall be heated quickly to the brazing temperature, taking care not to overheat the joint. Techniques for heating the joint, applying the brazing filler metal, and making horizontal, vertical, and large-diameter joints shall be as stated in sections on "Applying Heat and Brazing" and "Horizontal and Vertical Joints" in the chapter on "Joining and Bending" in the CDA *Copper Tube Handbook*.	
7.* While being brazed, joints shall be continuously purged with oil-free dry nitrogen **NF** to prevent the formation of copper oxide on the inside surface of the joint. **The purge gas shall be monitored and audibly alert the brazer of low content of purge gas .** The flow of purge gas shall be maintained **with the use of a flow meter** until the joint is cool to the touch.	Accept Log #52
*Exception: A final connection to an existing pipeline shall be permitted to be made without the use of a nitrogen purge. After final connection, ~~the affected downstream portions of the pipeline shall be tested in accordance with 4-3.4.1.3(i)~~ **twenty-five percent of the existing zones downstream from the connection shall be tested for particulate matter in accordance with the piping purge test in 4-3.4.1.3(e)** ~~with~~ **using** the gas of system designation.*	AIP Log #230
8. During and after installation, openings in the piping system shall be kept capped or plugged to avoid unnecessary loss of purge gas while brazing and to prevent debris or other contaminants from entering the system, except that during brazing, a discharge opening shall be provided on the opposite side of the joint from where the purge gas is being introduced. During brazing, the purge gas flow rate shall be maintained at a level that will not produce a positive pressure in the piping system. After brazing, the discharge opening shall be plugged or capped to prevent contamination of the inside of the tube.	
9. After brazing, the outside of all joints shall be cleaned by washing with water and a ~~stainless steel~~ wire brush to remove any residue and permit clear visual inspection of the joint. Where flux has been permitted, hot water shall be used.	
10.Each brazed joint shall be visually examined after cleaning of the outside of the joint. The following conditions shall be considered unacceptable:	
a. Flux or flux residue **(BAg series rods used with dissimilar metals only)**	Accept Log #291
b. ~~Excessive oxidation of the joint~~. **Tube or fitting melting or erosion**	
c. Presence of unmelted filler metal	
d. Failure of the filler metal to be clearly visible all the way around the joint at the interface between the socket and the tube	
e. Cracks in the tube or component	
f. Cracks in the braze filler metal	
g. Failure of the joint to hold the test pressure under 4-3.4.1.2~~(c)~~ **(b) and (e)**	
11. Brazed joints that are found to be defective under 4-3.1.2.8(b)10, conditions a, c, d, f, or g, shall be permitted to be ~~repaired~~ **reheated**, except that no joint shall be repaired more than once **before being replaced**. Brazed joints that are found to be defective under 4-3.1.2.8(b)10, conditions b and e, shall be replaced.	Accept Log #231
Exceptions: Level 1 and 2 Vacuum and WAGD Systems	
1. Mechanically Formed Branch Connections. The use of drilled and extruded tee-branch connections to copper mains and branches shall be permitted. Such connections shall be made In accordance with the tool manufacturer's instructions and the joints shall be brazed.	4-3.2.2.2(f)
2. Unions, flare nuts, and similar straight-threaded connections shall be permitted only in exposed locations and shall not be concealed in walls or ceilings.	4-3.2.2.2(h)
4-3.1.2.9 Piping Installation.	
(a) Piping systems shall be designed and sized to deliver the required flow rates at the utilization pressures. **Horizontal runouts from all mains and branches shall be taken off above the center line of the pipe and rise vertically or at an angle of not more than 45° from the vertical.**	
(b) Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports — Selection and Application*. Hangers and supports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Supports — Materials, Design and Manufacture*. Hangers for copper tube shall have a copper finish. In potentially damp locations, copper tube hangers or supports shall be plastic-coated or otherwise insulated from the tube. Maximum support spacing shall be as follows:	

1/4 in. (0.635 cm) nominal	5 ft (1.52 m)	
3/8 in. (0.953 cm) nominal	6 ft (1.83 m)	
1/2 in. (1.27 cm) nominal	6 ft (1.83 m)	
3/4 in. (1.91 cm) nominal	7 ft (2.13 m)	
1 in. (2.54 cm) nominal	8 ft (2.44 m)	
1 1/4 in. (3.175 cm) nominal	9 ft (2.74 m)	
1 1/2 in. (3.81 cm) nominal	10 ft (3.05 m) and larger	
Vertical risers, all sizes	Every floor, but not to exceed 15 ft (4.57 m)	
(c) Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient depth to protect the piping from excessive stresses. The minimum backfilled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in.(45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated so that the pipe has a firm, substantially continuous bearing on the bottom of the trench.		
Underground piping shall be installed in a continuous enclosure to protect the pipe from damage during backfilling. The enclosure shall be split or otherwise provide access at the joints during visual inspection and leak testing. Backfill shall be clean and compacted so as to protect and uniformly sup-port the piping. A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. In addition, a continuous warning means shall be provided above the pipeline at approximately one-half the depth of bury. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping underground within buildings or embedded in concrete floors or walls shall be installed in a continuous conduit.		
(d) Medical gas risers shall be permitted to be installed in pipe shafts if protected from physical damage, effects of excessive heat, corrosion, or contact with oil.		
(e) Piping shall not be installed in **elevator shafts,** kitchens or electrical switch gear rooms.		Tabled Log #290
(f) Medical gas piping shall be permitted to be located in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities provided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 130°F (54°C) maximum. Medical gas piping shall not be located where subject to contact with oil, including flooding in the case of a major oil leak.		
(g) Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be suitably protected.		
(h) Hoses and flexible connectors, both metallic and non-metallic, shall be no longer than necessary and shall not penetrate or be concealed in walls, floors, ceilings, or partitions. Flexible connectors, metallic or nonmetallic, shall have a minimum burst pressure of 1000 psig (6900 kPa gauge).		
(i) Where a system originally used or constructed for use at one pressure and for a gas is converted for operation at another pressure or for another gas, all provisions of 4-3.1.2.1,4-3.1.2.4, 4-3.1.2.8, 4-3.1.2.10, 4-3.1.2.12, 4-3.4.1, and the Exception to 4-3.1.2.7(c) shall apply as if the system were new. **Vacuum systems shall never be converted for use as gas systems.**		Exhisting bold
4-3.1.2.10* Installation Requirements.		
(a) *Equipment and Component Installation.*		
1. The installation of individual components shall be made in accordance with the instructions of the manufacturer. Such instructions shall include directions and information deemed by the manufacturer to be adequate for attaining proper installation, testing, maintenance, and operation of the medical gas systems. These instructions shall be left with the owner.		
2. The installation shall be made by qualified, competent technicians experienced in making such installations and meeting the requirements of ANSI/ASSE Series 6000, Standard 6010. *(See 4-3.1.2.12 for brazer performance.)*		
3. Brazing shall be performed by individuals who are qualified under the provisions of 4-3.1.2.12.		
(b) Health care organization personnel shall be permitted to install piping systems if all the requirements of Section 4-3are met during installation.		
(c) The installer of medical gas piping and equipment shall maintain on the job site documentation the qualification of brazing procedures and individual brazers per 4-3.1.2.12prior to installation.		
(d) Two or more medical gas piping systems shall not be interconnected for testing or for any other reason. Leak testing shall be accomplished by separately charging and testing the individual piping system.		
4-3.1.2.11 Systems Having Nonstandard Operating Pressures. The following requirements apply to gas piping systems having an operating pressure other than the standard 50to 55 psig (345 to 380 kPa) [or 160 psig (1103 kPa) fornitrogen], and are in addition to the minimum requirements listed in 4-3.1.2.3 through 4-3.1.2.9.		

(a) Pipelines, shutoff valves, and station outlets in systems having nonstandard operating pressures shall be labeled for gas name and operating pressure.	
(b) Where operating pressures are ~~200 to 300~~ **above 185** psig ~~(1380 to 2068~~ **1276** kPa), the following applies:	AIP Log #48
~~1. Only Type K medical gas tube (ASTM B819) shall be used.~~	Proposal (sent 6/30 not in ROP's)
2. Brazing procedures and brazers shall be qualified as required under 4-3.1.2.12.	
(c) Station outlets in systems having nonstandard operating pressures shall meet the following additional requirements:	
1. Be gas-specific	
2. Be pressure-specific where a single gas is piped at more than one operating pressure [e.g., a station outlet for oxygen, 80 psig (550 kPa) shall not accept an adapter for oxygen, 50 psig (345 kPa)]	
3. If operated at a pressure above 80 psig (550 kPa) but below ~~200~~ **185** psig ~~(1380~~ **1276** kPa), be either DISS style or comply with 4-3.1.2.4	AIP Log #48
4. If operated at a pressure ~~between 200 and 300 psig (1380 to 2068~~ **above 185 psig (1276** kPa), the station outlet shall be so designed as to prevent the removal of the adapter until the pressure has been relieved, to prevent the adapter injuring the user or others when removed from the outlet.	AIP Log #48
5. Be labeled for the gas name and operating pressure [e.g., nitrogen, 250 psig (1725 kPa)]	
(d) *Testing*. When systems operated at different pressures are installed, each pipeline shall be tested separately.	
4-3.1.2.12 Qualification of Brazing Procedures and Brazer Performance. Brazing procedures and brazer performance shall be qualified in accordance with either Section IX, Welding and Brazing Qualifications, of the ASME *Boiler and Pressure Vessel Cod*e, or AWS B2.2, *Standard for Brazing Procedure and Performance Qualification*s, both as modified below.	
(a) Brazers shall be qualified by visual examination of the test coupon followed by sectioning ~~except that a tension test shall be permitted to be substituted for sectioning. Where tension tests are used for brazer qualification, they shall be performed in accordance with ASME IX.~~	Accept Log #56
(b) The Brazing Procedure Specification shall address cleaning, joint clearance, overlap, internal purge gas, purge gas flow rate, and filler metal.	
(c) The Brazing Procedure Qualification Record and the Record of Brazer Performance Qualification shall document filler metal used, cleaning, joint clearance, overlap, internal purge gas and flow rate used during brazing of the test coupon, and no internal oxidation exhibited on the completed test coupon.	
(d) Brazing procedures qualified by a technically competent group or agency are permitted under the following conditions:	
1. The Brazing Procedure Specification and the Procedure Qualification Record shall meet the requirements of this standard.	
2. The employer shall obtain a copy of both the Brazing Procedure Specification and the supporting qualification records from the group or agency and shall sign and date these records, thereby accepting responsibility for the qualifications that were performed by the group or agency.	
3. The employer shall qualify at least one brazer following each Brazing Procedure Specification used.	
(e) An employer shall be permitted to accept Brazer Qualification Records of a previous employer under the following conditions:	
1. The brazer shall have been qualified following the same or an equivalent procedure as that which he/she will use for the new employer.	
2. The new employer shall obtain a copy of the record of Brazer Performance Qualification tests from the previous employer and shall sign and date these records, thereby accepting responsibility for the qualifications performed by the previous employer.	
(f) Performance qualification of brazers shall remain in effect indefinitely unless the brazer does not braze with the qualified procedure for a period exceeding 12 months, or there is a specific reason to question the ability of the brazer.	
4-3.1.2.13 Labeling. The gas content of medical gas piping systems shall be readily identifiable by appropriate labeling with the name ~~and pressure~~ of the gas contained. Such labeling shall be by means of metal tags, stenciling, stamping, or adhesive markers, in a manner that is not readily removable. Labeling shall appear on the piping at intervals of not more than 20 ft (6 m)and at least once in each room and each story traversed by the piping system. where supplementary color identification of piping if used, it shall be in accordance with the gases and colors indicated in CGA Pamphlet C-9, *Standard Color-Marking of Compressed Gas Cylinders Intended for Medical Use.* Only those systems operating at nonstandard pressures shall be labeled with the name of the gas and the operating pressure.	Accept Log #57
~~4-5.1.2.10* Gas Piping.~~	
~~(a) *Gas Piping.* The provisions of this section apply to field-installed piping for the distribution of nonflammable medical piped gases~~	
~~1. Tubes, valves, fittings, station outlets, and other piping components in medical gas systems shall have been cleaned for oxygen service prior to installation.~~	

~~2. Piping for nonflammable medical gas systems shall be suitable for oxygen service in accordance with 4-5.1.2.10(a)3. Each length of tube shall be permanently labeled and delivered plugged or capped. Fittings, valves, and other devices shall be sealed and marked. The installer shall furnish documentation certifying that all installed piping materials comply with the requirements of this paragraph.~~	
~~3. Piping shall be ASTM B 819 specification hard drawn seamless medical gas tubing; ASTM B 819 tubing is identified by the markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in green (Type K) or blue (Type L). Main and branches shall be not less than 1 /2 in. nominal size. Factory-installed tube on station outlets extending no farther than 8 in. from the outlet body shall be permitted to be 3 /8 in. O.D. (1 /4 in. nominal) size. Connection to gauges and alarm switches and runouts to alarm panels shall be permitted to be 1 /4 in. O.D. (1 /8 in. nominal) size.~~	
~~*Exception: For systems operated at pressures between 200 and 300 psig (1380 and 2070 kPa, respectively), ASTM B 819, Type K copper shall be used.*~~	
~~Copper tube shall, wherever possible, be installed over-head or below floor level. Only where the installation requires installing in a slab, exceptions below are permitted to apply:~~	
~~a. Annealed (soft temper) ASTM B 88 (Type K or L) copper tube that has been prepared for oxygen service according to CGA Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service,* shall be permitted to be used up to 1 /2 in. O.D. (3 /8 in. nominal) size.~~	
~~b. The tube shall be installed in conduit sufficiently large to accept the following gases (if used) O2 , N2 O, N2 , MA, DA, Level 3 vacuum.~~	
~~c. The pipe shall be a continuous run from entry to exit of the conduit. PVC conduit shall be permitted for Level 3 vacuum only.~~	
~~d. All station outlets (inlets) shall be permitted to be completed after the slab is complete.~~	
~~e. All tests shall be completed per 4-5.4.1.2.~~	
~~4. Except as provided under 4-5.1.2.10(a)8 and 9, joints in copper tubes shall be brazed using capillary fittings com-plying with ANSI B16.22, *Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings,* or brazing fittings complying with MSS SP-73, *Brazing Joints for Wrought and Cast Copper Alloy Solder Joint Pressure Fittings.* Cast fittings shall not be used for brazed joints.~~	
~~*Exception: Flared connections shall be permitted where exposed at station outlets and manifold connections.*~~	
~~5. Valves, fittings, and other piping components shall be cleaned for oxygen service by the manufacturer in accordance with CGA Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service,* except that fittings shall be permitted to be cleaned by a supplier or agency other than the manufacturer.~~	
~~6. Piping systems shall be designed and sized to deliver the required flow rates at the utilization pressures.~~	
~~7. Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports Selection and Application.* Hangers and supports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Supports Materials, Design and Manufacture.* Hangers for copper tube shall have a copper finish. In potentially damp locations, copper tube hangers or sup-ports shall be plastic-coated or otherwise insulated from the tube. Maximum support spacing shall be as follows:~~	
~~8. Joints in medical gas tube shall be brazed except that memory-metal couplings having temperature and pressure ratings not less than that of a brazed joint shall be permitted. Compression-type connections shall be prohibited throughout the piping system, including connections to station outlets, alarm devices, and other components. Unions shall not be permitted in the distribution pipeline system.~~	
~~*Exception: Threaded connections for air compressor sets and devices such as manifolds, pressure regulators, relief valves, pressure switches, and pressure gauges.*~~	
~~9. Listed or approved metallic gas tube fittings that, when made up, provide a permanent joint having the mechanical, thermal, and sealing integrity of a brazed joint shall be permitted to be used in lieu of brazed joints.~~	
~~10. Turns, offsets, and other changes in direction in piping shall be made with fittings complying with 4-5.1.2.10(a)4.~~	
~~11. Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient depth to protect the piping from excessive stresses. The minimum back-filled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in. (45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated so that the pipe has a firm, substantially continuous bearing on the bottom of the trench. Underground piping shall be installed in a continuous enclosure to protect the pipe from damage while backfilling. The enclosure shall be split or otherwise provide access at the joints during visual inspection and leak testing. Backfill shall be clean and compacted so as to protect and uniformly support the piping. A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. In addition, a continuous warning means shall be provided above the pipeline at approximately one-half the depth of bury. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping underground within buildings or imbedded in concrete floors or walls shall be installed in a continuous conduit.~~	
~~12. Medical gas risers shall be permitted to be installed in pipe shafts if protected from physical damage, effects of excessive heat, corrosion, or contact with oil.~~	
~~13. Piping shall not be installed in kitchens or electrical switch-gear rooms.~~	

~~14. Medical gas piping shall be permitted to be located in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities provided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 130°F (54°C) maximum. Medical gas piping shall not be located where subject to contact with oil, including flooding in the case of a major oil leak.~~	
~~15. Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be suitably protected.~~	
~~16. Where a system originally used or constructed for use at one pressure and for a gas is converted for operation at another pressure or for another gas, all provisions of 4-5.1.2.12, 4-5.1.2.10(b), 4-5.4, and the Exception to 4-5.1.2.10(a)3 shall apply as if the system were new. Vacuum systems shall never be converted for use as gas systems.~~	
~~(b) *Brazed Joints.*~~	
~~1. Brazed tube joints shall be the socket type. Filler metals shall bond with and be metallurgically compatible with the base metals being joined. Flux shall not be used except where permitted under 4-5.1.2.10(b)1b. Brazing filler metals shall comply with ANSI/AWS A5.8, *Specification for Brazing Filler Metal,* except that filler metals having compositions not conforming to the exact ANSI/AWS A5.8 classifications shall be permitted when used according to the manufacturer's instructions.~~	
~~a. Copper-to-copper joints shall be brazed using a cop-per- phosphorous or copper-phosphorous-silver brazing filler metal (BCuP series) without flux.~~	
~~b. Dissimilar metals, such as copper and bronze or brass, shall be brazed using an appropriate flux with a silver (Bag series) brazing filler metal.~~	
~~2. Joints to be brazed in place shall be accessible for proper preparation, assembly, heating, filler application, cooling, cleaning, and inspection.~~	
~~3. Tube ends shall be cut square using a sharp tubing cutter to avoid deforming the tube. The cutting wheel shall be free from grease, oil, or other lubricant not suitable for oxygen service. The cut ends of tube and pipe shall be deburred with a sharp, clean deburring tool, taking care to prevent chips from entering the tube or pipe.~~	
~~4. The surfaces to be brazed shall be mechanically cleaned using a clean stainless steel wire brush or equivalent. The use of steel wool shall be prohibited due to the possible presence of oil. Mechanical cleaning shall not result in grooving of the surfaces to be joined. After mechanical cleaning, the surfaces shall be wiped using a clean, lint-free white cloth. During this cleaning, care shall be taken to avoid contamination of the cleaned item for oxygen internal surfaces of the tube and components. Joints shall be recleaned if contaminated prior to brazing. Joints shall be brazed within 1 hour of being cleaned.~~	
~~5. Where dissimilar metals, such as copper and bronze or brass, are being brazed, flux shall be applied sparingly to minimize contamination of the inside of the tube with flux. The flux shall be applied and worked over the surfaces to be brazed using a stiff stainless steel bristle brush to ensure adequate coverage and wetting of the surfaces with flux. Where possible, short sections of copper tube shall be brazed to the noncopper component and the interior of the subassembly shall be cleaned of flux prior to installation in the piping system. Flux-coated brazing rods shall be permitted to be used in lieu of the application of flux to the surfaces to be joined on tube 3 /4 in. nominal size and smaller.~~	
~~6. Tube ends shall be inserted fully into the socket of the fit-ting. Where flux is permitted, the joint shall be heated slowly until the flux has liquefied. Once this has occurred, or where flux is not used, the joint shall be heated quickly to the brazing temperature, taking care not to overheat the joint. Techniques for heating the joint, applying the brazing filler metal, and making horizontal, vertical, and large-diameter joints shall be as stated in sections on "Applying Heat and Brazing" and "Horizontal and Vertical Joints" in the chapter on "Joining and Bending" in the CDA *Copper Tube Handbook*.~~	
~~7.* While being brazed, joints shall be continuously purged with oil-free dry nitrogen to prevent the formation of copper oxide on the inside surface of the joint. The flow of purge gas shall be maintained until the joint is cool to the touch.~~	
~~*Exception: A final connection to an existing pipeline shall be permitted to be made without the use of a nitrogen purge. After final connection, the affected downstream portions of the pipeline shall be tested in accordance with 4-5.4.1.3 with the gas of system designation.*~~	
~~8. During and after installation, openings in the piping system shall be kept capped or plugged to avoid unnecessary loss of purge gas while brazing and to prevent debris or other contaminants from entering the system; except that during brazing, a discharge opening shall be provided on the opposite side of the joint from where the purge gas is being introduced. During brazing, the purge gas flow rate shall be maintained at a level that will not produce a positive pressure in the piping system. After brazing, the discharge opening shall be plugged or capped to prevent contamination of the inside of the tube.~~	
~~9. After brazing, the outside of all joints shall be cleaned by washing with water and a stainless steel wire brush to remove any residue and permit clear visual inspection of the joint. Where flux has been permitted, hot water shall be used.~~	
~~10. Each brazed joint shall be visually examined after cleaning of the outside of the joint. The following conditions shall be considered unacceptable:~~	
~~a. Flux or flux residue~~	
~~b. Excessive oxidation of the joint~~	
~~c. Presence of unmelted filler metal~~	
~~d. Failure of the filler metal to be clearly visible all the way around the joint at the interface between the socket and the tube~~	
~~e. Cracks in the tube or component~~	
~~f. Cracks in the braze filler metal~~	
~~g. Failure of the joint to hold the test pressure under~~	

~~11. Brazed joints that are found to be defective under 4-5.1.2.10(b)10 conditions a, c, d, f, or g, shall be permitted to be repaired, except that no joint shall be repaired more than once. Brazed joints that are found to be defective under 4-5.1.2.10(b)10 conditions b and e, shall be replaced~~	
~~(c)**Threaded Joints.*~~	
~~1. Threaded joints in medical gas distribution piping shall be limited to the connection of pressure gauges, alarm pressure switches, and similar devices.~~	
~~2. Threads on pipe and fittings shall be tapered pipe threads complying with ANSI B1.20.1, *Pipe Threads, General Purpose.*~~	
~~3. Threaded joints in piping systems shall be made up with polytetrafluoroethylene (such as Teflon*) tape or other thread sealant suitable for oxygen service. Sealants shall be applied to the male threads only.~~	
~~(d) *Manufactured Equipment and Component Installation.*~~	
~~1. The installation of individual components shall be made in accordance with the instructions of the manufacturer. Such instructions shall include directions and information deemed by the manufacturer to be adequate for attaining proper installation, testing, maintenance, and operation of the medical gas systems. These instructions shall be left with the owner~~	
~~2. The installation shall be made by qualified, competent technicians experienced in making such installations.~~	
~~(e) *Prohibited Interconnections.* Two or more medical gas piping systems shall not be interconnected for testing or for any other reason. Leak testing shall be accomplished by separately charging and testing the individual piping system.~~	
~~(f)* *Fittings.* Fittings shall be manufactured from metallic corrosion-resistant materials suitable for the system pressures [not to exceed 160 psig (1103 kPa)].~~	
~~(g) *Connectors and Joints.* Connectors and joints shall be brazed or threaded NPT.~~	
~~(h) *General Requirements.*~~	
~~1. *Oxygen Compatibility.* Components in nonflammable medical gas systems shall be of materials that are suitable for oxygen service. *(See 4-3.1.1.3, Material — Oxygen Compatibility.)* Pipe (tube), fittings, valves, and other components shall have been thoroughly cleaned internally to remove oil, grease, and other readily oxidizable materials, as if for oxygen service.~~	
~~2. *Cleanliness.* Materials that have been cleaned for use in medical gas piping systems shall be plugged, capped, or otherwise sealed until installed. Particular care shall be taken in the storage and handling of such material to maintain its clean condition. Immediately before final assembly, such material shall be visually examined internally for contamination. Material that has become contaminated and is no longer suitable for oxygen service shall not be installed.~~	
~~3. *On-Site Cleaning.* On-site cleaning of the interior surfaces of tubes, valves, fittings, and other components shall be limited to recleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Such surfaces shall be cleaned by washing in a clean, hot water/alkaline solution, such as sodium carbonate or trisodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot potable water.~~	
~~4-5.1.3 Distribution for Gas-Powered Devices — Level 3.~~	Included in 4-3.1.2.7
~~4-5.1.3.1 The provisions of this section apply to field-installed piping for the distribution of gases to power devices. (a) Piping shall be Type K or L copper (hard drawn or annealed) or brass (schedule 40 or 80). If Level 3 system dynamic gas piping is installed simultaneously with other patient gas piping systems, either the Level 3 system piping shall be labeled or otherwise identified prior to installation in order to preclude inadvertent inclusion in a nonflammable medical gas piping system, or the Level 3 system piping shall be cleaned and degreased in accordance with 4-5.4.1.~~	
~~(b)*Fittings shall be manufactured from corrosion-resistant materials suitable for the system pressures [not to exceed 160 psig (1103 kPa)].~~	
~~(c) Connectors and joints shall be brazed, or threaded NPT.~~	
~~(d) Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports — Selection and Application.* Hangers and supports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Support — Materials, Design and Manufacture.*~~	
~~(e) Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient depth to protect the piping from excessive stresses. The minimum backfilled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in. (45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated w~~ **s** ~~o that the pipe has a firm, substantially continuous bearing on the bottom of the trench. Underground piping shall be installed in a continuous enclosure to protect the pipe from damage while backfilling. The enclosure shall be split or otherwise provide access at the joints during visual inspection and leak testing. Backfill shall be clean and compacted so as to protect and uniformly sup-port the piping. A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. In addition, a continuous warning means shall be provided above the pipeline at approximately one-half the depth of bury. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping underground within buildings or imbedded in concrete floors or walls shall be installed in a continuous conduit.~~	

~~(f) Gas piping shall be permitted to be located in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities provided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 130° F (54° C) maximum. Gas piping shall not be located where subject to contact with oil, including flooding in the case of a major oil leak.~~	
~~(g) Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be suitably protected.~~	
~~4-6.1.2.3 Piping systems for nonflammable gases shall comply with Level 1 gas systems as specified in this chapter.~~	Included in 4-3.1.2

The revised proposal incorporated the accepted proposal and inserted.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #92)
Committee: HEA-PIP

99- 201 - (4-3.1.2.13): Reject
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Delete last sentence ("Only those systems operating ... and the operating pressure.")
SUBSTANTIATION: Sentence 1 already covers the subject of labeling piping. In addition, 4-3.1.2.14(a) covers the subject of pipe labeling.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Non-standard operating pressure pipeline should have the pressure on the pipeline.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #292)
Committee: HEA-PIP

99- 202 - (4-3.1.2.13): Accept in Principle in Part
TCC NOTE: The Technical Correlating Committee directs the Committee to review and be more specific in the Committee Action. State what is accepted and what is not accepted.
SUBMITTER: David Esherick, Patient Instrumentation Corp.
RECOMMENDATION: Revise text as follows:
"The gas content of medical gas piping systems shall be readily identifiable by appropriate labeling with the name ~~and pressure~~ of the gas contained. If the medical gas system is operating at nonstandard pressure the labeling shall then include the name of the gas as well as the operating pressure."
SUBSTANTIATION: The problem is that this sentence makes it seem as if all medical gas systems should be labeled with pressure of system. Per my recollection this was not the committee's intent. It was the intent of the committee that only the nonstandard operating pressure systems be so labeled.
COMMITTEE ACTION: Accept in Principle in Part.
Accept everything except the last sentence of the recommendation.
COMMITTEE STATEMENT: The existing wording is adequate. See Committee Action and Statement on Proposal 99-145 (Log #291) which reads as follows:
Revise the proposal as follows:
Affected Paragraphs: 4-3.1.2 through 4-6.1.2.5 (Level 1,2,3,and 4 affecting piping, materials and installation). This is an attempt to meld the vacuum and positive gas piping systems. NFPA eliminated the vacuum subcommittee a number of years ago with the intention of bringing the two sections into one document. This is just a continued effort to accomplish this goal.
The Left Column is the complete proposed text. New material is **Bold.** Where the text is sourced in the current document, the source paragraph is listed in the right-hand column. Where the text is new, the relevant proposal is noted.

4-3.1.2 Distribution — ~~Level 1 (Manifold, Piping, Valving/~~ **Level 1, 2, 3, and 4 Gas and Vacuum Piping and Materials** ~~Controls, Outlets/Terminals, Alarms). See Figure 4-3.1.2.~~	
4-3.1.2.1 General Requirements.	
(a) *Oxygen Compatibility.* Components in nonflammable medical gas and vacuum systems shall be of materials that are suitable for oxygen service. *(See 4-3.1.1.3, Material — Oxygen Compatibility.)* Pipe (tube), fittings, valves, and other components shall have been thoroughly cleaned internally to remove oil, grease, and other readily oxidizable materials, as if for oxygen service.	4-3.1.2.1(a)
(b) *Cleanliness.* Materials that have been cleaned for use in medical gas piping systems shall be plugged, capped, or otherwise sealed until installed. Particular care shall be taken in the storage and handling of such material to maintain its clean condition. Immediately before final assembly, such material shall be visually examined internally for contamination. Material that has become contaminated and is no longer suitable for oxygen service shall not be installed.	4-3.1.2.1(b)
(c) *On-Site* ***Rec*** ~~*C*~~*leaning.* On-site **re**cleaning of the interior surfaces of tube ends, valves, fittings, and other components shall be limited to recleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Such surfaces shall be cleaned by washing in a clean, hot water/alkaline solution, such as sodium carbonate or trisodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot potable water.	AIP Log #43
(e) *Pressure Gauges for Gases.* The scale range of positive pressure analog gauges shall be such that the normal reading falls within the middle 50 percent of the scale. The scale range of digital gauges shall be not more than two times the working pressure. The rated accuracy of pressure gauges used for testing shall be one percent (full scale) or better at the point of reading. Pressure gauges shall be in compliance with ANSI/ASME B-40.1, *Gauges, Pressure Indicating Dial-Type, Elastic Element*s.	
1.* A pressure gauge shall be installed in the main line adjacent to the actuating switch required in 4-3.1.2.2(b)3e. It shall be appropriately labeled and shall be readily visible from a standing position.	
2.* An appropriately identified pressure gauge, connected to the line being monitored, shall be installed at each area alarm panel location. It shall be appropriately labeled and shall be readily visible from a standing position.	
(f) Vacuum System Gauges.	
(a) ***Main-Line Gauge*****. A vacuum gauge shall be provided in the main vacuum line adjacent to the actuator (vacuum switch) for the master alarms, with this gauge located immediately upstream (on the terminal or inlet side) terminal or inlet of the source valve (the main line valve, if so equipped). Those with normal range display shall indicate normal only between 12 and 19 in. Hg (vacuum).**	4-3.2.2.10
(b) ***Area Gauge.*** **Vacuum gauges shall be located at each area vacuum alarm signal location, with this gauge connected upstream (on the terminal or inlet side) of any valve controlling that area. Those with normal range display shall indicate normal only between 12 and 19 in. Hg (vacuum).**	
(c)*Vacuum Gauge Identification. All permanently installed vacuum gauges and manometers for the vacuum system shall be continuous reading, manufactured expressly for vacuum, and labeled: VACUUM.	
4-3.1.2.7 Piping Materials. The provisions of this section apply to field-installed piping for the distribution of medical piped gases and vacuum systems.	
(a) Tubes, valves, fittings, station outlets, and other piping components in medical gas systems shall have been cleaned for oxygen service prior to installation.	
(b) Piping for nonflammable medical gas systems shall be suitable for oxygen service in accordance with 4-3.1.2.1. Each length of tube shall be permanently labeled and delivered plugged or capped. Fittings, valves, and other devices shall be sealed and marked. The installer shall furnish documentation certifying that all installed piping materials comply with the requirements of this paragraph.	
(c) Piping shall be ASTM B 819 specification hard drawn seamless medical gas tubing; ASTM B 819 tubing is identified by the markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" ~~in green (Type K) or~~ blue (Type L). Main and branches shall be not less than 1/2 in. nominal size **for positive gases and 3/4 in. nominal for vacuum**. **Drops to individual outlet/inlets shall be not less than 1/2 in. nominal.** Factory-installed tube on station outlets extending no further than 8 in. from the outlet body shall be permitted to be 1/2 in. O.D. (3/8 in. nominal) size. **Connecting tubing for** gauges and alarm switches and runouts to alarm panels shall be permitted to be ~~1/4~~ **3/8** in. O.D. (~~1/8~~ **1/4** in. nominal) size.	4-3.1.2.7(c) and 4-3.2.2.2(c) AIP Log #229 AIP Log #62 4-3.1.2.7(d)
(d) Where seismic construction is required by the building code, piping shall be properly braced.	
(e)*Except as provided under 4-3.1.2.7(g) and (h), joints in copper tubes shall be brazed using capillary fittings complying with ANSI B16.22, *Wrought Copper and Copper Alloy Solder Joint Pressure Fittings,* or brazing fittings complying with *MSS SP-73, Brazing Joints for Wrought and Cast Copper Alloy Solder Joints Pressure Fittings.* Cast fittings shall not be used for brazed joints.	

(f) Valves, fittings, and other piping components shall be cleaned for oxygen service by the manufacturer in accordance with CGA Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service,* except that fittings shall be permitted to be cleaned by a supplier or agency other than the manufacturer.	
(g) Joints in medical gas tube shall be brazed except that memory-metal couplings having temperature and pressure ratings not less than that of a brazed joint shall be permitted. Flared and compression fittings shall be prohibited throughout the piping system, including connections to station outlet**/inlet** alarm devices, and other components. Unions shall not be permitted in the distribution pipeline system.	
Exception:	
1. Threaded connections for air compressor sets and devices such as manifolds, pressure regulators, relief valves, pressure switches, and pressure gauges.	
2. Dielectric fittings at equipment requiring isolation between the piping distribution system and the equipment.	AIP Log #77
(h) Listed or approved metallic gas tube fittings that, when made up, provide a permanent joint having the mechanical, thermal, and sealing integrity of a brazed joint shall be permitted to be used in lieu of brazed joints.	
(i) Turns, offsets, and other changes in direction in piping shall be made with fittings complying with 4-3.1.2.7(e).	
Vacuum System Piping	
1. Seamless copper water tube (ASTM B88), Type K,L,M copper ACR tube, (ASTM B280), or (ASTM B819) medical gas tube shall be permitted to be used.	4-3.2.2.2(a)
~~*2. Soft annealed copper tubing (ASTM B88) shall be permitted underground*~~	AIP Log #192
Exception: Nonstandard Operating Pressure Systems	
1. Where operating pressures are ~~200 to 300 psig~~ ~~(1380 to 2068)~~ **above 185 psig (1,276** kPa) only Type K medical gas tube (ASTM B819) shall be used **for piping larger than 3 1/8 in. O.D. (3 in. nominal)**	AIP Log #48 Proposal (sent 6/30 not in ROP's)
4-3.1.2.8 Pipe Joints.	
(a)* *Threaded Joint*s.	
1. Threaded joints in medical gas distribution piping shall be limited to the connection of pressure**/vacuum** gauges, alarm pressure**/vacuum** switches, and similar devices.	
2. Threads on pipe and fittings shall be tapered pipe threads complying with ANSI B1.20.1, *Pipe Threads, General Purpos*e.	
3. Threaded joints in piping systems shall be made up with polytetrafluoroethylene (such as Teflon™) tape or other thread sealant suitable for oxygen service. Sealants shall be applied to the male threads only.	
(b)**Brazed Joints.*	
1. Brazed tube joints shall be the socket type. Filler metals shall bond with and be metallurgically compatible with the base metals being joined. Flux shall not be used except where permitted under 4-3.1.2.8(b)1b. Brazing filler metals shall comply with ANSI/AWS A5.8, *Specification for Brazing Filler Metal*~~, except that filler metals having compositions not conforming to the exact ANSI/AWS A5.8 classifications shall be permitted when used according to the manufacturer's instructions~~.	Accept Log #289
a. Copper-to-copper joints shall be brazed using a copper- phosphorus or copper-phosphorous-silver brazing filler metal (BCuP series) without flux.	
b. Dissimilar metals, such as copper and bronze or brass, shall be brazed using an appropriate flux with a silver (BAg series) brazing filler metal.	
2. Joints to be brazed in place shall be accessible for proper preparation, assembly, heating, filler application, cooling, cleaning, and inspection.	
3. Tube ends shall be cut square using a sharp tubing cutter to avoid deforming the tube. The cutting wheel shall be free from grease, oil, or other lubricant not suitable for oxygen service. The cut ends of tube and pipe shall be deburred with a sharp, clean deburring tool, taking care to prevent chips from entering the tube or pipe.	
4. The **fitting** surfaces to be brazed shall be **pre-cleaned by the manufacturer and the tube ends to be brazed shall be cleaned with a non-abrasive pad**. The use of steel wool shall be prohibited due to the possible presence of oil. Mechanical cleaning shall not result in grooving of the surfaces to be joined. After mechanical cleaning, the surfaces shall be wiped using a clean, lint-free white cloth. During this cleaning, care shall be taken to avoid contamination of the "cleaned for oxygen" internal surfaces of the tube and components. Joints shall be re-cleaned if contaminated prior to brazing. Joints shall be brazed within 1 hour of being cleaned.	Accept Log #50

5. Where dissimilar metals, such as copper and bronze or brass, are being brazed, flux shall be applied sparingly to minimize contamination of the inside of the tube with flux. The flux shall be applied and worked over the surfaces to be brazed using a stiff ~~stainless steel~~ bristle brush to ensure adequate coverage and wetting of the surfaces with flux. Where possible, short sections of copper tube shall be brazed to the non-copper component and the interior of the sub-assembly shall be cleaned of flux prior to installation in the piping system. Flux-coated brazing rods shall be permitted to be used in lieu of the application of flux to the surfaces to be joined on tube 3 /4 in. nominal size and smaller.	AIP Log #64
6. Tube ends shall be inserted fully into the socket of the fitting. Where flux is permitted, the joint shall be heated slowly until the flux has liquefied. Once this has occurred, or where flux is not used, the joint shall be heated quickly to the brazing temperature, taking care not to overheat the joint. Techniques for heating the joint, applying the brazing filler metal, and making horizontal, vertical, and large-diameter joints shall be as stated in sections on "Applying Heat and Brazing" and "Horizontal and Vertical Joints" in the chapter on "Joining and Bending" in the CDA *Copper Tube Handbook*.	
7.* While being brazed, joints shall be continuously purged with oil-free dry nitrogen **NF** to prevent the formation of copper oxide on the inside surface of the joint. **The purge gas shall be monitored and audibly alert the brazer of low content of purge gas .** The flow of purge gas shall be maintained **with the use of a flow meter** until the joint is cool to the touch.	Accept Log #52
*Exception: A final connection to an existing pipeline shall be permitted to be made without the use of a nitrogen purge. After final connection, ~~the affected downstream portions of the pipeline shall be tested in accordance with 4-3.4.1.3(i)~~ **twenty-five percent of the existing zones downstream from the connection shall be tested for particulate matter in accordance with the piping purge test in 4-3.4.1.3(e)** ~~with~~ **using** the gas of system designation.*	AIP Log #230
8. During and after installation, openings in the piping system shall be kept capped or plugged to avoid unnecessary loss of purge gas while brazing and to prevent debris or other contaminants from entering the system, except that during brazing, a discharge opening shall be provided on the opposite side of the joint from where the purge gas is being introduced. During brazing, the purge gas flow rate shall be maintained at a level that will not produce a positive pressure in the piping system. After brazing, the discharge opening shall be plugged or capped to prevent contamination of the inside of the tube.	
9. After brazing, the outside of all joints shall be cleaned by washing with water and a ~~stainless steel~~ wire brush to remove any residue and permit clear visual inspection of the joint. Where flux has been permitted, hot water shall be used.	
10.Each brazed joint shall be visually examined after cleaning of the outside of the joint. The following conditions shall be considered unacceptable:	
a. Flux or flux residue **(BAg series rods used with dissimilar metals only)**	Accept Log #291
b. ~~Excessive oxidation of the joint~~. **Tube or fitting melting or erosion**	
c. Presence of unmelted filler metal	
d. Failure of the filler metal to be clearly visible all the way around the joint at the interface between the socket and the tube	
e. Cracks in the tube or component	
f. Cracks in the braze filler metal	
g. Failure of the joint to hold the test pressure under 4-3.4.1.2~~(c)~~ **(b) and (e)**	
11. Brazed joints that are found to be defective under 4-3.1.2.8(b)10, conditions a, c, d, f, or g, shall be permitted to be ~~repaired~~ **reheated**, except that no joint shall be repaired more than once **before being replaced**. Brazed joints that are found to be defective under 4-3.1.2.8(b)10, conditions b and e, shall be replaced.	Accept Log #231
Exceptions: Level 1 and 2 Vacuum and WAGD Systems	
1. Mechanically Formed Branch Connections. The use of drilled and extruded tee-branch connections to copper mains and branches shall be permitted. Such connections shall be made In accordance with the tool manufacturer's instructions and the joints shall be brazed.	4-3.2.2.2(f)
2. Unions, flare nuts, and similar straight-threaded connections shall be permitted only in exposed locations and shall not be concealed in walls or ceilings.	4-3.2.2.2(h)
4-3.1.2.9 Piping Installation.	
(a) Piping systems shall be designed and sized to deliver the required flow rates at the utilization pressures. **Horizontal runouts from all mains and branches shall be taken off above the center line of the pipe and rise vertically or at an angle of not more than 45° from the vertical.**	
(b) Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports — Selection and Application*. Hangers and supports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Supports — Materials, Design and Manufacture*. Hangers for copper tube shall have a copper finish. In potentially damp locations, copper tube hangers or supports shall be plastic-coated or otherwise insulated from the tube. Maximum support spacing shall be as follows:	

1/4 in. (0.635 cm) nominal	5 ft (1.52 m)	
3/8 in. (0.953 cm) nominal	6 ft (1.83 m)	
1/2 in. (1.27 cm) nominal	6 ft (1.83 m)	
3/4 in. (1.91 cm) nominal	7 ft (2.13 m)	
1 in. (2.54 cm) nominal	8 ft (2.44 m)	
1 1/4 in. (3.175 cm) nominal	9 ft (2.74 m)	
1 1/2 in. (3.81 cm) nominal	10 ft (3.05 m) and larger	
Vertical risers, all sizes	Every floor, but not to exceed 15 ft (4.57 m)	
(c) Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient depth to protect the piping from excessive stresses. The minimum backfilled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in.(45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated so that the pipe has a firm, substantially continuous bearing on the bottom of the trench.		
Underground piping shall be installed in a continuous enclosure to protect the pipe from damage during backfilling. The enclosure shall be split or otherwise provide access at the joints during visual inspection and leak testing. Backfill shall be clean and compacted so as to protect and uniformly sup-port the piping. A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. In addition, a continuous warning means shall be provided above the pipeline at approximately one-half the depth of bury. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping underground within buildings or embedded in concrete floors or walls shall be installed in a continuous conduit.		
(d) Medical gas risers shall be permitted to be installed in pipe shafts if protected from physical damage, effects of excessive heat, corrosion, or contact with oil.		
(e) Piping shall not be installed in **elevator shafts,** kitchens or electrical switch gear rooms.		Tabled Log #290
(f) Medical gas piping shall be permitted to be located in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities provided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 130°F (54°C) maximum. Medical gas piping shall not be located where subject to contact with oil, including flooding in the case of a major oil leak.		
(g) Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be suitably protected.		
(h) Hoses and flexible connectors, both metallic and non-metallic, shall be no longer than necessary and shall not penetrate or be concealed in walls, floors, ceilings, or partitions. Flexible connectors, metallic or nonmetallic, shall have a minimum burst pressure of 1000 psig (6900 kPa gauge).		
(i) Where a system originally used or constructed for use at one pressure and for a gas is converted for operation at another pressure or for another gas, all provisions of 4-3.1.2.1,4-3.1.2.4, 4-3.1.2.8, 4-3.1.2.10, 4-3.1.2.12, 4-3.4.1, and the Exception to 4-3.1.2.7(c) shall apply as if the system were new. **Vacuum systems shall never be converted for use as gas systems.**		Exhisting bold
4-3.1.2.10* Installation Requirements.		
(a) *Equipment and Component Installation.*		
1. The installation of individual components shall be made in accordance with the instructions of the manufacturer. Such instructions shall include directions and information deemed by the manufacturer to be adequate for attaining proper installation, testing, maintenance, and operation of the medical gas systems. These instructions shall be left with the owner.		
2. The installation shall be made by qualified, competent technicians experienced in making such installations and meeting the requirements of ANSI/ASSE Series 6000, Standard 6010. *(See 4-3.1.2.12 for brazer performance.)*		
3. Brazing shall be performed by individuals who are qualified under the provisions of 4-3.1.2.12.		
(b) Health care organization personnel shall be permitted to install piping systems if all the requirements of Section 4-3are met during installation.		
(c) The installer of medical gas piping and equipment shall maintain on the job site documentation the qualification of brazing procedures and individual brazers per 4-3.1.2.12prior to installation.		
(d) Two or more medical gas piping systems shall not be interconnected for testing or for any other reason. Leak testing shall be accomplished by separately charging and testing the individual piping system.		
4-3.1.2.11 Systems Having Nonstandard Operating Pressures. The following requirements apply to gas piping systems having an operating pressure other than the standard 50to 55 psig (345 to 380 kPa) [or 160 psig (1103 kPa) fornitrogen], and are in addition to the minimum requirements listed in 4-3.1.2.3 through 4-3.1.2.9.		

(a) Pipelines, shutoff valves, and station outlets in systems having nonstandard operating pressures shall be labeled for gas name and operating pressure.	
(b) Where operating pressures are ~~200 to 300~~ **above 185** psig ~~(1380 to 2068~~ **1276** kPa), the following applies:	AIP Log #48
~~1. Only Type K medical gas tube (ASTM B819) shall be used.~~	Proposal (sent 6/30 not in ROP's)
2. Brazing procedures and brazers shall be qualified as required under 4-3.1.2.12.	
(c) Station outlets in systems having nonstandard operating pressures shall meet the following additional requirements:	
1. Be gas-specific	
2. Be pressure-specific where a single gas is piped at more than one operating pressure [e.g., a station outlet for oxygen, 80 psig (550 kPa) shall not accept an adapter for oxygen, 50 psig (345 kPa)]	
3. If operated at a pressure above 80 psig (550 kPa) but below ~~200~~ **185** psig ~~(1380~~ **1276** kPa), be either DISS style or comply with 4-3.1.2.4	AIP Log #48
4. If operated at a pressure ~~between 200 and 300 psig (1380 to 2068~~ **above 185 psig (1276** kPa), the station outlet shall be so designed as to prevent the removal of the adapter until the pressure has been relieved, to prevent the adapter injuring the user or others when removed from the outlet.	AIP Log #48
5. Be labeled for the gas name and operating pressure [e.g., nitrogen, 250 psig (1725 kPa)]	
(d) *Testing*. When systems operated at different pressures are installed, each pipeline shall be tested separately.	
4-3.1.2.12 Qualification of Brazing Procedures and Brazer Performance. Brazing procedures and brazer performance shall be qualified in accordance with either Section IX, Welding and Brazing Qualifications, of the ASME *Boiler and Pressure Vessel Cod*e, or AWS B2.2, *Standard for Brazing Procedure and Performance Qualification*s, both as modified below.	
(a) Brazers shall be qualified by visual examination of the test coupon followed by sectioning ~~except that a tension test shall be permitted to be substituted for sectioning. Where tension tests are used for brazer qualification, they shall be performed in accordance with ASME IX.~~	Accept Log #56
(b) The Brazing Procedure Specification shall address cleaning, joint clearance, overlap, internal purge gas, purge gas flow rate, and filler metal.	
(c) The Brazing Procedure Qualification Record and the Record of Brazer Performance Qualification shall document filler metal used, cleaning, joint clearance, overlap, internal purge gas and flow rate used during brazing of the test coupon, and no internal oxidation exhibited on the completed test coupon.	
(d) Brazing procedures qualified by a technically competent group or agency are permitted under the following conditions:	
1. The Brazing Procedure Specification and the Procedure Qualification Record shall meet the requirements of this standard.	
2. The employer shall obtain a copy of both the Brazing Procedure Specification and the supporting qualification records from the group or agency and shall sign and date these records, thereby accepting responsibility for the qualifications that were performed by the group or agency.	
3. The employer shall qualify at least one brazer following each Brazing Procedure Specification used.	
(e) An employer shall be permitted to accept Brazer Qualification Records of a previous employer under the following conditions:	
1. The brazer shall have been qualified following the same or an equivalent procedure as that which he/she will use for the new employer.	
2. The new employer shall obtain a copy of the record of Brazer Performance Qualification tests from the previous employer and shall sign and date these records, thereby accepting responsibility for the qualifications performed by the previous employer.	
(f) Performance qualification of brazers shall remain in effect indefinitely unless the brazer does not braze with the qualified procedure for a period exceeding 12 months, or there is a specific reason to question the ability of the brazer.	
4-3.1.2.13 Labeling. The gas content of medical gas piping systems shall be readily identifiable by appropriate labeling with the name ~~and pressure~~ of the gas contained. Such labeling shall be by means of metal tags, stenciling, stamping, or adhesive markers, in a manner that is not readily removable. Labeling shall appear on the piping at intervals of not more than 20 ft (6 m)and at least once in each room and each story traversed by the piping system. where supplementary color identification of piping if used, it shall be in accordance with the gases and colors indicated in CGA Pamphlet C-9, *Standard Color-Marking of Compressed Gas Cylinders Intended for Medical Use.* Only those systems operating at nonstandard pressures shall be labeled with the name of the gas and the operating pressure.	Accept Log #57
~~4-5.1.2.10* Gas Piping.~~	
~~(a) *Gas Piping.* The provisions of this section apply to field-installed piping for the distribution of nonflammable medical piped gases~~	
~~1. Tubes, valves, fittings, station outlets, and other piping components in medical gas systems shall have been cleaned for oxygen service prior to installation.~~	

~~2. Piping for nonflammable medical gas systems shall be suitable for oxygen service in accordance with 4-5.1.2.10(a)3. Each length of tube shall be permanently labeled and delivered plugged or capped. Fittings, valves, and other devices shall be sealed and marked. The installer shall furnish documentation certifying that all installed piping materials comply with the requirements of this paragraph.~~	
~~3. Piping shall be ASTM B-819 specification hard drawn seamless medical gas tubing; ASTM B-819 tubing is identified by the markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in green (Type K) or blue (Type L). Main and branches shall be not less than 1 /2 in. nominal size. Factory-installed tube on station outlets extending no farther than 8 in. from the outlet body shall be permitted to be 3 /8 in. O.D. (1 /4 in. nominal) size. Connection to gauges and alarm switches and runouts to alarm panels shall be permitted to be 1 /4 in. O.D. (1 /8 in. nominal) size.~~	
~~*Exception: For systems operated at pressures between 200 and 300 psig (1380 and 2070 kPa, respectively), ASTM B-819, Type K copper shall be used.*~~	
~~Copper tube shall, wherever possible, be installed over-head or below floor level. Only where the installation requires installing in a slab, exceptions below are permitted to apply:~~	
~~a. Annealed (soft temper) ASTM B-88 (Type K or L) copper tube that has been prepared for oxygen service according to CGA Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service,* shall be permitted to be used up to 1 /2 in. O.D. (3 /8 in. nominal) size.~~	
~~b. The tube shall be installed in conduit sufficiently large to accept the following gases (if used) O2 , N2 O, N2 , MA, DA, Level 3 vacuum.~~	
~~c. The pipe shall be a continuous run from entry to exit of the conduit. PVC conduit shall be permitted for Level 3 vacuum only.~~	
~~d. All station outlets (inlets) shall be permitted to be completed after the slab is complete.~~	
~~e. All tests shall be completed per 4-5.4.1.2.~~	
~~4. Except as provided under 4-5.1.2.10(a)8 and 9, joints in copper tubes shall be brazed using capillary fittings com-plying with ANSI B16.22, *Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings,* or brazing fittings complying with MSS SP-73, *Brazing Joints for Wrought and Cast Copper Alloy Solder Joint Pressure Fittings.* Cast fittings shall not be used for brazed joints.~~	
~~*Exception: Flared connections shall be permitted where exposed at station outlets and manifold connections.*~~	
~~5. Valves, fittings, and other piping components shall be cleaned for oxygen service by the manufacturer in accordance with CGA Pamphlet G-4.1, *Cleaning Equipment for Oxygen Service,* except that fittings shall be permitted to be cleaned by a supplier or agency other than the manufacturer.~~	
~~6. Piping systems shall be designed and sized to deliver the required flow rates at the utilization pressures.~~	
~~7. Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports Selection and Application.* Hangers and supports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Supports Materials, Design and Manufacture.* Hangers for copper tube shall have a copper finish. In potentially damp locations, copper tube hangers or sup-ports shall be plastic-coated or otherwise insulated from the tube. Maximum support spacing shall be as follows:~~	
~~8. Joints in medical gas tube shall be brazed except that memory-metal couplings having temperature and pressure ratings not less than that of a brazed joint shall be permitted. Compression-type connections shall be prohibited throughout the piping system, including connections to station outlets, alarm devices, and other components. Unions shall not be permitted in the distribution pipeline system.~~	
~~*Exception: Threaded connections for air compressor sets and devices such as manifolds, pressure regulators, relief valves, pressure switches, and pressure gauges.*~~	
~~9. Listed or approved metallic gas tube fittings that, when made up, provide a permanent joint having the mechanical, thermal, and sealing integrity of a brazed joint shall be permitted to be used in lieu of brazed joints.~~	
~~10. Turns, offsets, and other changes in direction in piping shall be made with fittings complying with 4-5.1.2.10(a)4.~~	
~~11. Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient depth to protect the piping from excessive stresses. The minimum back-filled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in. (45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated so that the pipe has a firm, substantially continuous bearing on the bottom of the trench. Underground piping shall be installed in a continuous enclosure to protect the pipe from damage while backfilling. The enclosure shall be split or otherwise provide access at the joints during visual inspection and leak testing. Backfill shall be clean and compacted so as to protect and uniformly support the piping. A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. In addition, a continuous warning means shall be provided above the pipeline at approximately one-half the depth of bury. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping underground within buildings or imbedded in concrete floors or walls shall be installed in a continuous conduit.~~	
~~12. Medical gas risers shall be permitted to be installed in pipe shafts if protected from physical damage, effects of excessive heat, corrosion, or contact with oil.~~	
~~13. Piping shall not be installed in kitchens or electrical switch-gear rooms.~~	

~~14. Medical gas piping shall be permitted to be located in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities pro-vided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 130°F (54°C) maximum. Medical gas piping shall not be located where subject to contact with oil, including flooding in the case of a major oil leak.~~	
~~15. Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be suitably protected.~~	
~~16. Where a system originally used or constructed for use at one pressure and for a gas is converted for operation at another pressure or for another gas, all provisions of 4-5.1.2.12, 4-5.1.2.10(b), 4-5.4, and the Exception to 4-5.1.2.10(a)3 shall apply as if the system were new. Vacuum systems shall never be converted for use as gas systems.~~	
~~(b) *Brazed Joints.*~~	
~~1. Brazed tube joints shall be the socket type. Filler metals shall bond with and be metallurgically compatible with the base metals being joined. Flux shall not be used except where permitted under 4-5.1.2.10(b)1b. Brazing filler metals shall comply with ANSI/AWS A5.8, *Specification for Brazing Filler Metal,* except that filler metals having compositions not conforming to the exact ANSI/AWS A5.8 classifications shall be permitted when used according to the manufacturer's instructions.~~	
~~a. Copper-to-copper joints shall be brazed using a cop-per- phosphorous or copper-phosphorous-silver brazing filler metal (BCuP series) without flux.~~	
~~b. Dissimilar metals, such as copper and bronze or brass, shall be brazed using an appropriate flux with a silver (Bag series) brazing filler metal.~~	
~~2. Joints to be brazed in place shall be accessible for proper preparation, assembly, heating, filler application, cooling, cleaning, and inspection.~~	
~~3. Tube ends shall be cut square using a sharp tubing cutter to avoid deforming the tube. The cutting wheel shall be free from grease, oil, or other lubricant not suitable for oxygen service. The cut ends of tube and pipe shall be deburred with a sharp, clean deburring tool, taking care to prevent chips from entering the tube or pipe.~~	
~~4. The surfaces to be brazed shall be mechanically cleaned using a clean stainless steel wire brush or equivalent. The use of steel wool shall be prohibited due to the possible presence of oil. Mechanical cleaning shall not result in grooving of the surfaces to be joined. After mechanical cleaning, the surfaces shall be wiped using a clean, lint-free white cloth. During this cleaning, care shall be taken to avoid contamination of the cleaned item for oxygen internal surfaces of the tube and components. Joints shall be recleaned if contaminated prior to brazing. Joints shall be brazed within 1 hour of being cleaned.~~	
~~5. Where dissimilar metals, such as copper and bronze or brass, are being brazed, flux shall be applied sparingly to minimize contamination of the inside of the tube with flux. The flux shall be applied and worked over the surfaces to be brazed using a stiff stainless steel bristle brush to ensure adequate coverage and wetting of the surfaces with flux. Where possible, short sections of copper tube shall be brazed to the noncopper component and the interior of the subassembly shall be cleaned of flux prior to installation in the piping system. Flux-coated brazing rods shall be permitted to be used in lieu of the application of flux to the surfaces to be joined on tube 3 /4 in. nominal size and smaller.~~	
~~6. Tube ends shall be inserted fully into the socket of the fit-ting. Where flux is permitted, the joint shall be heated slowly until the flux has liquefied. Once this has occurred, or where flux is not used, the joint shall be heated quickly to the brazing temperature, taking care not to overheat the joint. Techniques for heating the joint, applying the brazing filler metal, and making horizontal, vertical, and large-diameter joints shall be as stated in sections on "Applying Heat and Brazing" and "Horizontal and Vertical Joints" in the chapter on "Joining and Bending" in the CDA *Copper Tube Handbook*.~~	
~~7.* While being brazed, joints shall be continuously purged with oil-free dry nitrogen to prevent the formation of copper oxide on the inside surface of the joint. The flow of purge gas shall be maintained until the joint is cool to the touch.~~	
~~*Exception: A final connection to an existing pipeline shall be permitted to be made without the use of a nitrogen purge. After final connection, the affected downstream portions of the pipeline shall be tested in accordance with 4-5.4.1.3 with the gas of system designation.*~~	
~~8. During and after installation, openings in the piping system shall be kept capped or plugged to avoid unnecessary loss of purge gas while brazing and to prevent debris or other contaminants from entering the system; except that during brazing, a discharge opening shall be provided on the opposite side of the joint from where the purge gas is being introduced. During brazing, the purge gas flow rate shall be maintained at a level that will not produce a positive pressure in the piping system. After brazing, the discharge opening shall be plugged or capped to prevent contamination of the inside of the tube.~~	
~~9. After brazing, the outside of all joints shall be cleaned by washing with water and a stainless steel wire brush to remove any residue and permit clear visual inspection of the joint. Where flux has been permitted, hot water shall be used.~~	
~~10. Each brazed joint shall be visually examined after cleaning of the outside of the joint. The following conditions shall be considered unacceptable:~~	
~~a. Flux or flux residue~~	
~~b. Excessive oxidation of the joint~~	
~~c. Presence of unmelted filler metal~~	
~~d. Failure of the filler metal to be clearly visible all the way around the joint at the interface between the socket and the tube~~	
~~e. Cracks in the tube or component~~	
~~f. Cracks in the braze filler metal~~	
~~g. Failure of the joint to hold the test pressure under~~	

~~11. Brazed joints that are found to be defective under 4-5.1.2.10(b)10 conditions a, c, d, f, or g, shall be permitted to be repaired, except that no joint shall be repaired more than once. Brazed joints that are found to be defective under 4-5.1.2.10(b)10 conditions b and e, shall be replaced~~	
~~(c)**Threaded Joints.*~~	
~~1. Threaded joints in medical gas distribution piping shall be limited to the connection of pressure gauges, alarm pressure switches, and similar devices.~~	
~~2. Threads on pipe and fittings shall be tapered pipe threads complying with ANSI B1.20.1, *Pipe Threads, General Purpose.*~~	
~~3. Threaded joints in piping systems shall be made up with polytetrafluoroethylene (such as Teflon*) tape or other thread sealant suitable for oxygen service. Sealants shall be applied to the male threads only.~~	
~~(d) *Manufactured Equipment and Component Installation.*~~	
~~1. The installation of individual components shall be made in accordance with the instructions of the manufacturer. Such instructions shall include directions and information deemed by the manufacturer to be adequate for attaining proper installation, testing, maintenance, and operation of the medical gas systems. These instructions shall be left with the owner~~	
~~2. The installation shall be made by qualified, competent technicians experienced in making such installations.~~	
~~(e) *Prohibited Interconnections.* Two or more medical gas piping systems shall not be interconnected for testing or for any other reason. Leak testing shall be accomplished by separately charging and testing the individual piping system.~~	
~~(f)* *Fittings.* Fittings shall be manufactured from metallic corrosion-resistant materials suitable for the system pressures [not to exceed 160 psig (1103 kPa)].~~	
~~(g) *Connectors and Joints.* Connectors and joints shall be brazed or threaded NPT.~~	
~~(h) *General Requirements.*~~	
~~1. *Oxygen Compatibility.* Components in nonflammable medical gas systems shall be of materials that are suitable for oxygen service. *(See 4-3.1.1.3, Material — Oxygen Compatibility.)* Pipe (tube), fittings, valves, and other components shall have been thoroughly cleaned internally to remove oil, grease, and other readily oxidizable materials, as if for oxygen service.~~	
~~2. *Cleanliness.* Materials that have been cleaned for use in medical gas piping systems shall be plugged, capped, or otherwise sealed until installed. Particular care shall be taken in the storage and handling of such material to maintain its clean condition. Immediately before final assembly, such material shall be visually examined internally for contamination. Material that has become contaminated and is no longer suitable for oxygen service shall not be installed.~~	
~~3. *On-Site Cleaning.* On-site cleaning of the interior surfaces of tubes, valves, fittings, and other components shall be limited to recleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Such surfaces shall be cleaned by washing in a clean, hot water/alkaline solution, such as sodium carbonate or trisodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot potable water.~~	
~~4-5.1.3 Distribution for Gas-Powered Devices — Level 3.~~	Included in 4-3.1.2.7
~~4-5.1.3.1 The provisions of this section apply to field-installed piping for the distribution of gases to power devices. (a) Piping shall be Type K or L copper (hard drawn or annealed) or brass (schedule 40 or 80). If Level 3 system dynamic gas piping is installed simultaneously with other patient gas piping systems, either the Level 3 system piping shall be labeled or otherwise identified prior to installation in order to preclude inadvertent inclusion in a nonflammable medical gas piping system, or the Level 3 system piping shall be cleaned and degreased in accordance with 4-5.4.1.~~	
~~(b)*Fittings shall be manufactured from corrosion-resistant materials suitable for the system pressures [not to exceed 160 psig (1103 kPa)].~~	
~~(c) Connectors and joints shall be brazed, or threaded NPT.~~	
~~(d) Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, *Piping Hangers and Supports — Selection and Application.* Hangers and supports shall comply with MSS Standard Practice SP-58, *Pipe Hangers and Support — Materials, Design and Manufacture.*~~	
~~(e) Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient depth to protect the piping from excessive stresses. The minimum backfilled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in. (45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated w~~ **s** ~~o that the pipe has a firm, substantially continuous bearing on the bottom of the trench. Underground piping shall be installed in a continuous enclosure to protect the pipe from damage while backfilling. The enclosure shall be split or otherwise provide access at the joints during visual inspection and leak testing. Backfill shall be clean and compacted so as to protect and uniformly sup-port the piping. A continuous tape or marker placed immediately above the enclosure shall clearly identify the pipeline by specific name. In addition, a continuous warning means shall be provided above the pipeline at approximately one-half the depth of bury. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping underground within buildings or imbedded in concrete floors or walls shall be installed in a continuous conduit.~~	

~~(f) Gas piping shall be permitted to be located in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities provided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 130° F (54° C) maximum. Gas piping shall not be located where subject to contact with oil, including flooding in the case of a major oil leak.~~	
~~(g) Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be suitably protected.~~	
~~4-6.1.2.3 Piping systems for nonflammable gases shall comply with Level 1 gas systems as specified in this chapter.~~	Included in 4-3.1.2

The revised proposal incorporated the accepted proposal and inserted.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #255)
Committee: HEA-PIP
99- 203 - (4-3.1.2.13 and 4-3.1.2.14(a)): Accept in Principle
SUBMITTER: David B. Mohile, Medical Engineering Services, Inc.
RECOMMENDATION: Delete the reference to pressure on the labeling on the pipeline in the first sentence of 4-3.1.2.13 and the first sentence of 4-3.1.2.14(a).
SUBSTANTIATION: This is an error in the standard. Pressure on the labels is only required when the gas is operating at a nonstandard pressure. This is confirmed by the last sentence of Paragraph 4-3.1.2.13. We attempted to clear this up during the last revision but it apparently got lost in the shuffle.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-200 (Log #57).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #191)
Committee: HEA-PIP
99- 204 - (4-3.1.2.13 and 4-3.5.4.1): Reject
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Revise text as follows:
"The gas content of <u>all</u> medical gas piping systems shall be readily identifiable by appropriate labeling with the name and pressure of the gas contained. Such labeling ... ~~Only those systems operating at nonstandard pressures shall be labeled with the name of the gas and operating pressure.~~"
SUBSTANTIATION: For years the last sentence in these paragraphs has contradicted the first sentence. All gases should be marked with both the name of the gas and the pressure.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: It is the committee's intent that only non standard systems be labled for pressure.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #58)
Committee: HEA-PIP
99- 205 - (4-3.1.2.14(a)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Identification. (a) Piping. Pipe labeling shall include the name or chemical symbol for the system gas ~~and its operating pressure~~."
SUBSTANTIATION: The pressure of the gases in standard operating pressure systems, agreed in 1999, is not required to be on the label.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-203 (Log #255).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #59)
Committee: HEA-PIP
99- 206 - (4-3.1.2.14(b)4 (New)): Accept
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Add the following:
"<u>4. The pressure of the gas if nonstandard.</u>"
SUBSTANTIATION: By marking the pressure of the nonstandard gas system shutoff valves it will distinguish the valve just as it did for the pipe labeling.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #60)
Committee: HEA-PIP
99- 207 - (4-3.1.2.14(c)): Reject
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Station Outlets and Inlets. Station outlets and inlets shall be identified as to the specific medical or vacuum provided. <u>Nonstandard pressure shall be identified with the pressure/vacuum on the outlet/inlet.</u>"
SUBSTANTIATION: The identification of pressure on the station outlets/inlets that are nonstandard is important for patient safety.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Already covered in 4-3.2.11(c)5.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #133)
Committee: HEA-PIP
99- 208 - (4-3.2.1.6): Reject
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Revise the first sentence:
"Vacuum receiver(s) shall be provided when required by the technology of the pump but may be omitted if the pump is designed to operate without them."
SUBSTANTIATION: The requirement for vacuum receivers was written when the available technologies required or preferred "on-off operation." This is not true of all technologies now employed, and the requirement should be changed to admit this advance.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The use of a receiver provides protection for pumps.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ALLEN: The protection provided by the receiver and referred to by the committee is necessary in many but not all pumps, and it has not been the practice of this standard to be design restrictive, as this now is and would remain by this action.

(Log #2)
Committee: HEA-PIP
99- 209 - (Figure 4-3.2.1.10): Reject
SUBMITTER: Kurt P. Kubli, M/E Engineering
RECOMMENDATION: Per 4-3.2.2.8(b) Master alarm switch should be located between the source shutoff valve and the medical piping systems.

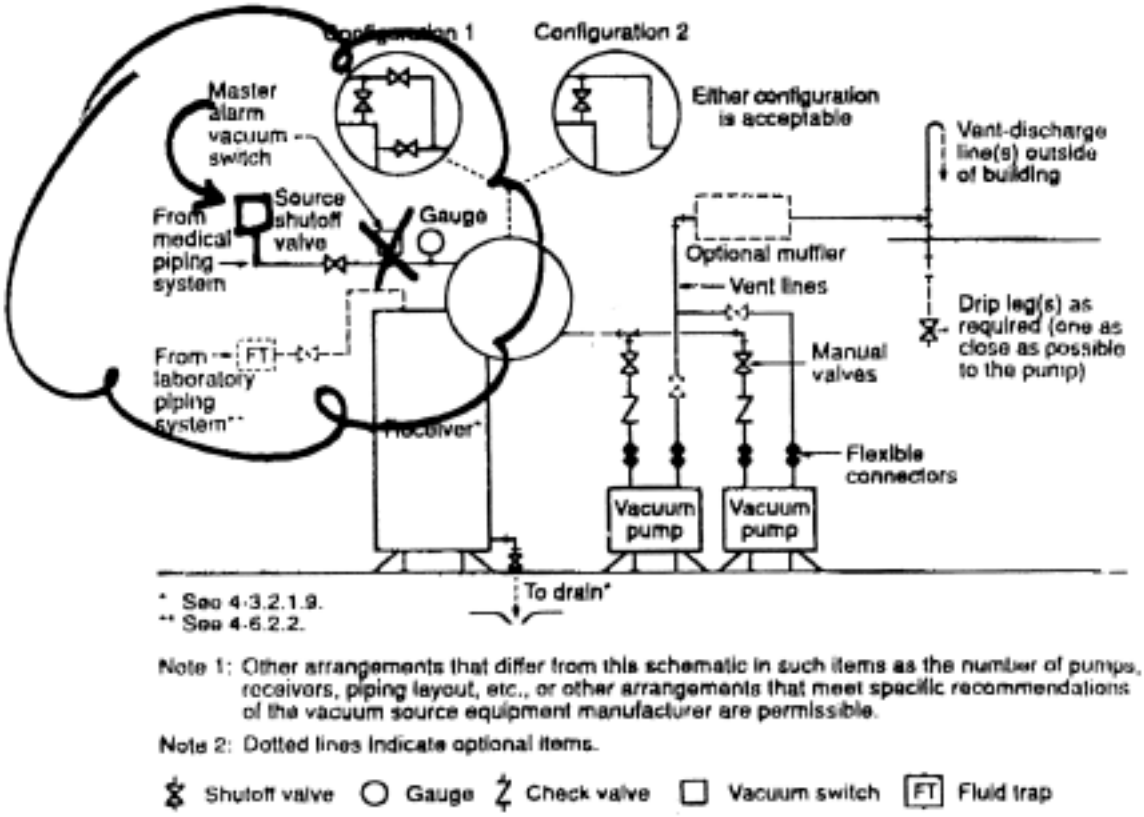


Figure 4-3.2.1.10 Typical Level 1 vacuum source.

SUBSTANTIATION: None given.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: This was corrected in the 1999 edition of the standard.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #55)
Committee: HEA-PIP

99- 210 - (Figure 4-3.2.1.10): Reject
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: This drawing shows a swing check used on the inlet of the vacuum pumps. Swing checks are designed to be used in horizontal piping and not in vertical piping because the seat which stops the back pressure uses gravity to close the seat of the valve.
SUBSTANTIATION: Spring check valves should be drawn since the spring check can and will operate in both the horizontal and vertical position.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The check valve indicated does not represent any particular type of check valve.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #32)
Committee: HEA-PIP

99- 211 - (4-3.2.2.2): Reject
SUBMITTER: S. Karl Sellers, Victaulic Company of America
RECOMMENDATION: Revise text as follows:
4-3.2.2.2 Vacuum System Piping Network.
(a)* Vacuum Network Piping. Piping shall be corrosion-resistant metal such as seamless copper water tube (ASTM B88, Types K, L, M), copper ACR tube (ASTM B280), copper medical gas tube (ASTM B819), stainless steel tube, or galvanized steel pipe [1 1/2 in. minimum size] (ASTM A53). Pipe threads shall comply with ANSI B1.20.1, Pipe Threads, General Purpose. Copper tube shall be hard drawn temper except that annealed tube shall be permitted underground. Joints in copper tube shall be soldered, ~~or~~ brazed or roll grooved and joined by flush seal rubber gasketed grooved mechanical couplings. Joints in stainless steel tube shall be brazed, ~~or~~ welded, roll grooved and joined by flush seal rubber gasketed grooved mechanical couplings or piping shall be schedule 5, Type 316 stainless steel approved for use with and joined with mechanical pressfitting pipe joining method. Joints in galvanized steel pipe shall be threaded, ~~or~~ flanged or roll grooved schedule 10 or schedule 40 galvanized steel pipe and joined by flush seal rubber gasketed grooved mechanical couplings. Soldering shall be performed in accordance with ASTM B828, Making Capillary Joints by Soldering of Copper and Copper Ally Tube and Fittings. Solder metal (ASTM B32) shall contain less than 0.2 percent lead. Brazing shall be in accordance with 4-3.1.2.3(c) except that flux shall be permitted to be used for copper-to-copper joints and nitrogen purging while brazing shall not be required.
SUBSTANTIATION: Roll grooved copper tube, stainless steel pipe, and galvanized steel pipe provides a permanent mechanical joint, equivalent or superior to soldered, brazed, welded, threaded or flanged joints, without requiring heat or open flame (eliminates fire hazards).
Pressfit stainless steel pipe provides a permanent mechanical joint, equivalent or superior to brazed or welded joints, without requiring heat or open flame (eliminates fire hazards).
Note: Supporting material is available for review at NFPA Headquarters.

COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Vacuum systems now need to be brazed which implies that a joint meeting the requirements of AWS 5.8 be met. Vacuum systems shall have the same piping integrity of positive piping systems.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 17
NEGATIVE: 5
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ALLEN: The positions on these three points are not substantiated by actual experience nor are they defensible on theoretical principles. It represents a cost hardship and a design restriction. In addition, exclusion of the Victaulic or similar fitting systems cannot be justified in light of the evidence presented, and is further indefensible in light of the committee's undertaking to further study the proposal.
ERICKSON: Accept the Proposal. The committee has been very short sited in the exclusion of this technology from vacuum installations in health care facilities. This system is not a positive pressure system and therefore does not require the same materials and brazing requirements. There is no safety rationale for not permitting roll grooved and joined by flush seal rubber gasketed grooved mechanical couplings. Vacuum systems because of the nature of their design do not pose a health or fire safety problem if they are not installed to the same high standards of positive pressure gases. I see no evidence in the Technical Committee's substantiation for turning this proven technology down as meeting the standard's requirements.
FRANKEL: I strongly disagree with the rejection of the Victaulic coupling method of joining pipe for vacuum systems. This Victaulic joint has been successfully used for many years and has proven very reliable. The information provided in the log application proves the gasket and joint suitable for use in vacuum systems.
SHOEMAKER: The product presented was for vacuum, not for any positive pressured gas. The application of this product does not cause any safety issues. There was no reason presented that was convincing and lacked any factual substantiation for rejection.
SMIDT: Accept the proposal: In our last cycle the committee sent this proposal back for the submitter to provide more substantiation. This time the submitter provided the information requested and showed that the system proposed will perform as a vacuum piping system. The committee has not provided adequate reason to reject this proposal.

(Log #61)
Committee: HEA-PIP

99- 211a - (4-3.2.2.2(a)): Accept in Principle
TCC NOTE: The Technical Correlating Committee is including this proposal in the ROP with the action of Accept in Principle. Proposal 99-211a (Log #61) was inadvertently omitted from the Technical Committee ROP ballot. See action on 99- 213 (Log #80). This action is consistent with the committee action on Proposal 99-212 (Log #79) and 99-213 (Log #80).
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
(a) Vacuum Network Piping. Piping shall be corrosion-resistant metal such as seamless copper water tube (ASTM B 88, Type "K," "L," "M"), copper ACR tube (ASTM A280), copper medical gas tube (ASTM B 819), stainless steel tube or galvanized steel pipe [1 1/2 in. minimum size] (ASTM A53). Joints in copper tube shall be ~~soldered or~~ brazed. Joints in stainless steel tube shall be brazed or welded. Joints in galvanized steel pipe shall be threaded or flanged. ~~Solder metal (ASTM B32) shall contain less than 0.2 percent lead.~~ Brazing shall be in accordance with ~~4-2.1.2.3(c)~~ 4-3.1.2.12 except that nitrogen purging while brazing shall not be required.
SUBSTANTIATION: A small fire at a remote location within a facility, whether the facility is small or a multistory facility, could be compromised and lose the entire medical/surgical vacuum system. With the 0.2 percent lead-free solders on the market today, one could lose the entire vacuum system by a temperature of less than 400°F.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-213 (Log #80)

(Log #79)
Committee: HEA-PIP

99- 212 - (4-3.2.2.2(a)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst./National ITC
RECOMMENDATION: Revise text as follows:
(a) Vacuum Network Piping. Piping shall be corrosion-resistant metal such as seamless copper water tube (ASTM B 88, Type "K," "L," "M"), copper ACR tube (ASTM A280), copper medical gas tube (ASTM B 819), stainless steel tube or galvanized steel pipe [1 1/2 in. minimum size] (ASTM A53). Joints in copper tube shall be soldered or brazed. Joints in stainless steel tube shall be brazed or welded. Joints in galvanized steel pipe shall be threaded or flanged. Solder metal (ASTM B32) shall contain less than 0.2 percent lead. Brazing shall be in accordance with 4-2.1.2.3(c) ~~except that nitrogen purging while brazing shall not be required.~~
SUBSTANTIATION: The need for nitrogen purging is to eliminate copper oxides from forming on the interior of the vacuum tubing during brazing. A large vacuum system brazed without a nitrogen purge could accumulate as much as a trash bag full of copper oxides. Requiring a nitrogen purge eliminates this problem and the cost of the nitrogen purge is less than a penny per foot of pipe run.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-213 (Log #80).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 19
NEGATIVE: 3
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ALLEN: See my Explanation of Negative on Proposal 99-211 (Log #32).
ERICKSON: Reject the Proposal. The need to use a nitrogen purge for vacuum system tube installation is overkill. This is not a system that transmits gas to a patient for inhalation but a system that scaling in the pipe would never be a danger to equipment or the patient population. NFPA 99 also states that you can never convert a vacuum system tube installation to a positive pressure gas system so where is the need for a nitrogen purge?
SMIDT: Reject the proposal: Why purge a vacuum system. The system will never be used for breathing gases!
COMMENT ON AFFIRMATIVE:
SHOEMAKER: Vacuum systems by their very definition and application never conduct anything "to" a patient or patient devices, they only conduct "away" from the patient or patient devices. Since we prohibit a vacuum system from every being reconfigured to a positive gas system of any kind, there is no chance that debris could ever be conducted to a patient or patient device in the future.

(Log #80)
Committee: HEA-PIP

99- 213 - (4-3.2.2.2(a)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst./National ITC
RECOMMENDATION: Revise text as follows:
(a) Vacuum Network Piping. Piping shall be ~~corrosion-resistant metal such as~~ seamless copper water tube (ASTM B 88, Type "K," "L," "M"), copper ACR tube (ASTM A280), copper medical gas tube (ASTM B 819), ~~stainless steel tube or galvanized steel pipe [1 1/2 in. minimum size] (ASTM A53)~~. Joints in copper tube shall be soldered or brazed. ~~Joints in stainless steel tube shall be brazed or welded. Joints in galvanized steel pipe shall be threaded or flanged.~~ Solder metal (ASTM B32) shall contain less than 0.2 percent lead. Brazing shall be in accordance with 4-2.1.2.3(c) except that nitrogen purging while brazing shall not be required.
SUBSTANTIATION: By eliminating the use of corrosion-resistant metal, galvanized and stainless steel tube puts vacuum systems in line with positive pressure medical gas distribution systems. The cost of installing galvanized or stainless steel tube is cost prohibited.
COMMITTEE ACTION: Accept in Principle.
Revise as follows:
(a) Vacuum Network Piping. Piping shall be ~~corrosion-resistant metal such as~~ seamless copper water tube (ASTM B 88, Type "K," "L," "M"), copper ACR tube (ASTM B280), copper medical gas tube (ASTM B 819), ~~stainless steel tube or galvanized steel pipe [1 1/2 in. minimum size] (ASTM A53)~~. Copper tube shall be hard drawn temper. Turns, offsets, and other changes in direction in

piping shall be made with fittings complying with 4-3.1.2.7(e). Joints in copper tube shall be soldered or brazed. ~~Joints in stainless steel tube shall be brazed or welded. Joints in galvanized steel pipe shall be threaded or flanged.~~ ~~Solder metal (ASTM B32) shall contain less than 0.2 percent lead.~~ Brazing shall be in accordance with ~~4-2.1.2.3(c)~~ 4-3.1.2.12 ~~except that nitrogen purging while brazing shall not be required.~~

COMMITTEE STATEMENT: The committee revised the wording for clarity.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 17
NEGATIVE: 5
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ALLEN: See my Explanation of Negative on Proposal 99-211 (Log #32).
ERICKSON: Reject the Proposal. There is no reason for eliminating perfectly good technology based on the fact that it "may" increase the cost of construction. If an organization wants to install stainless steel or other corrosion resistant metal tubing then this standard should not prohibit it.
FRANKEL: I strongly disagree with the elimination of any piping material for vacuum piping system that has a proven successful record based on years of service. By restricting the piping to only copper we are precluding the use of other materials and jointing methods. The cost of an installed system is not the committee's concern, only suitability for the intended service.
SHOEMAKER: No reason was presented that proved or even hinted that installations using these products would be substandard. The fact that "costs" may be higher is subjective and if in the future manufacturing costs are reduced for some reason, we will have excluded their use by our rejection.
SMIDT: Reject the proposal: There is no good reason to not allow owners or designers flexibility in materials that they choose for an installation. Cost of a system is not the purview of the committee; performance of the system is. The committee is not taking a reasonable action.

(Log #192)
Committee: HEA-PIP

99- 214 - (4-3.2.2.2(a)): Accept in Principle
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Add text as follows:
"Copper tube shall be hard drawn temper except that annealed tube shall be permitted underground. Turns, offsets, and other changes in direction in piping shall be made with fittings complying with 4-3.1.2.7(e)."
SUBSTANTIATION: The use of fittings has not been addressed in this section. All changes in direction should be made with appropriate fittings.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-213 (Log #80).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #9)
Committee: HEA-PIP

99- 215 - (4-3.2.2.2(c)): Reject
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Revise text:
"Mains and branches shall be not less than 7/8 in. O.D. (3/4 in. nominal) size. Drops to individual vacuum inlets shall be not less than 5/8 in. O.D. (1/2 in. nominal)size. (0.500 in minimum inside diameter), except that the tube attached immediately to the station inlet body and not extending more than 8 in. (20.3 cm) from the station inlet shall be permitted to be 3/8 in. O.D. (1/4 in. nominal) size (0.250 in. minimum inside diameter). Connections to gauges and alarm switches and runouts to alarm panels shall be permitted to be 1/4 in. O.D. (1/8 in. nominal) size."
SUBSTANTIATION: There were never any proposals stating that the minimum size of the 8 in. extending tube be increased to 1/2 in. O.D. (3/8 in. nominal). There has not been any problem with individual vacuum inlets flowing proper flow rates using the smaller 1/4 in. nominal 8 in. pipe extension. Therefore, there should not be any change from the 1996 edition of NFPA 99.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: 1. Larger flows are provided by the larger tube. Manufacturers have adapted to the existing requirement.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #62)
Committee: HEA-PIP

99- 216 - (4-3.2.2.2(c)): Accept in Principle in Part
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Minimum Sizes. Mains and branches shall be not less than 7/8 in. O.D. (3/4 in. nominal) size. Drops to individual vacuum inlets shall be not less than 5/8 in. O.D. (1/2 in. nominal) size (0.500 in. minimum inside diameter), except that the tube attached immediately to the station inlet body and not extending more than 8 in. (20.3 cm) from the station inlet shall be permitted to be ~~1/2 in. O.D. (3/8 in. nominal) size (0.400 in.~~ 3/8 in. O.D. (1/4 in. nominal) size (0.305 in. minimum inside diameter). Connections to gauges and alarm switches and runouts to alarm panels shall be permitted to be ~~1/4 in. O.D. (1/8 in. nominal)~~ 3/8 in. O.D. (1/4 in. nominal) size."
SUBSTANTIATION: The station inlets are manufactured with 3/8 O.D. tubing, not 1/2 O.D. tubing. Alarm switches and runouts are normally piped with 3/8 in. O.D. copper tubing, the 1/4 in. O.D. tubing is a special order, 3/8 in. O.D. tubing is common.
COMMITTEE ACTION: Accept in Principle in Part.
Revise text as follows:
"Minimum Sizes. Mains and branches shall be not less than 7/8 in. O.D. (3/4 in. nominal) size. Drops to individual vacuum inlets shall be not less than 5/8 in. O.D. (1/2 in. nominal) size (0.500 in. minimum inside diameter), except that the tube attached immediately to the station inlet body and not extending more than 8 in. (20.3 cm) from the station inlet shall be permitted to be 1/2 in. O.D. (3/8 in. nominal) size (0.400 in.) ~~3/8 in. O.D. (1/4 in. nominal) size (0.305 in.)~~ minimum inside diameter). Connecting tubing to gauges and alarm switches and runouts to alarm panels shall be permitted to be ~~1/4 in. O.D. (1/8 in. nominal)~~ 3/8 in. O.D. (1/4 in. nominal) size."
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-215 (Log #9) for the rejection of the first proposed change and the second modification was for correlation with pressure systems.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
RIDENOUR: The committee failed to correct a mistake in the 1999 edition because Beacon Medical (Mark Allen) changed their vacuum inlet connections to 5/8 in. O.D. because of Richard Wagner's mistake of O.D. and I.D. I don't think we, as a committee should not correct a mistake unless proof indicates that the 3/8 in. O.D., 1/4 in. nominal inlet extensions, that has been used for years, are inadequate.

(Log #193)
Committee: HEA-PIP

99- 217 - (4-3.2.2.2(c)): Reject
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Revise text as follows:
"...except that the tube attached immediately to the station inlet body and not extending more than 8 in. (20.3 cm) from the station inlet shall be permitted to be ~~1/2 in. O.D.~~ 3/8 in. O.D. (~~3/8 in.~~ 1/4 in. nominal) size ~~(o.400 in. minimum inside diameter)~~."
SUBSTANTIATION: I believe the 1/2 in. O.D. and 3/8 in. nominal was a mistake in the 1999 edition. Minimum inside diameter is not used anywhere else in this document. It should not be used here.
COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-215 (Log #9) which reads as follows:
1. Larger flows are provided by the larger tube. Manufacturers have adapted to the existing requirement.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #63)
Committee: HEA-PIP

99- 218 - (4-3.2.2.6(g)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Add the following text:
"Zone Valve. Station inlets shall not be supplied directly from a riser unless a manual shutoff valve located in the same story is installed between the riser and the inlet with a wall intervening between the valve and the inlet. This valve shall be readily operable from a standing position in the corridor on the same floor it serves. Each lateral branch line serving patient rooms shall be provided with a shutoff valve that controls the vacuum to the patient rooms. Zone valves shall be so arranged that shutting off the supply of vacuum to one zone will not affect the vacuum to the rest of the system. A vacuum gauge shall be provided on the patient room side of each zone valve. A shutoff valve shall be located immediately outside of each vital life-support, critical care, or anesthetizing location in each vacuum line, and located as to be readily accessible in an emergency or for maintenance of the terminals or piping within the individual zone served."
SUBSTANTIATION: This will require a zone valve before serving a patient inlet on the vacuum system as it is required for patient outlets on positive gas systems.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-162 (Log #258).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #233)
Committee: HEA-PIP

99- 219 - (4-3.2.2.8, 4-3.2.2.9, and 4-3.2.2.10): Accept in Principle
TCC NOTE: The Technical Correlating Committee directs the Committee to review the Committee Statement and provide a more explicit explanation to their action.
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise text as follows:
~~4-3.2.2.8 Master Alarm System for Vacuum Systems.~~
~~(a) General. To ensure continuous responsible observation, the master alarm signal panels shall be located in two separate warning locations, wired in parallel to a single sensor to indicate when the vacuum in the main line drops below the level required in 4-3.4.2.2(c)4b. Audible and noncancellable visual signals shall be installed in the office or principal working area of the individual responsible for the maintenance of the vacuum system and, to ensure continuous surveillance, at the telephone switchboard, the security office, or other continuously staffed locations.~~
~~(b) Actuator Switch. The actuator (vacuum switch) for the master alarm shall be connected to the main line immediately upstream (on the terminal or inlet side) of the source valve (the main line valve, if so equipped).~~
~~(c) Alarm Panels. The master alarm signal panel(s) required in 4-3.2.2.8(a) (each with visual and audible signal) shall be actuated by the vacuum switch described in 4-3.2.2.8(b).~~
~~(d) Panel Labels. The master alarm signal panel(s) shall be appropriately labeled.~~
~~(e)* Combined Alarm Signals. The vacuum alarm signal shall serve only the medical-surgical vacuum system.~~
~~(f)* Alarm System Power. The master alarm signal system shall be energized by the essential electrical system described in 4-3.2.1.5.~~
~~(g) Connection to Centralized Computers. The connection of the master alarm system to a centralized computer (e.g., a building management system) shall be permitted. The computer shall not constitute one of the two master alarm panels required.~~
~~4-3.2.2.9 Area Alarm Systems for Vacuum Systems.~~
~~(a)* General. Area alarms shall be provided for anesthetizing locations and critical care areas. Warning signals shall be provided for all medical surgical vacuum piping systems supplying these areas to indicate if the vacuum decreases from the normal operating range.~~
~~(b) Visual and Audible Alarms. The vacuum area alarm system shall incorporate both cancellable audible and noncancellable visual signals that are activated by actuators (vacuum switches) connected to the vacuum line serving each specific area.~~
~~(c) Alarm Panels. The visual and audible signal panels shall be installed at nurse's stations or other suitable locations in the areas described in 4-3.2.2.9(a) and be appropriately labeled.~~
~~(d) Actuating Switches. The actuating switch for anesthetizing locations shall be in the specific line supplying the operating or delivery room suites, with the individual room shutoff valve being the only one between the actuating switch and the room inlets.~~
~~The area alarm actuating switch for each vital life support and critical care unit shall be in the specific line serving that area. No shutoff valve shall be installed between the activating switch and the room inlets.~~
~~(e) Actuating Switch Settings. Actuating (vacuum switches) for the area alarm signals shall be set to activate their respective warning signals (visual and audible) at and below 12 in. Hg of vacuum.~~
~~(f) Electrical Power. The area alarm system shall be energized by the essential electrical system described in 4-3.2.1.5.~~

~~4-3.2.2.10 Vacuum System Gauges.~~
~~(a) Main Line Gauge. A vacuum gauge shall be provided in the main vacuum line adjacent to the actuator (vacuum switch) for the master alarms, with this gauge located immediately upstream (on the terminal or inlet side) terminal or inlet of the source valve (the main line valve, if so equipped). Those with "normal range" display shall indicate normal only between 12 and 19 in. Hg (vacuum).~~
~~(b) Area Gauge. Vacuum gauges shall be located at each area vacuum alarm signal location, with this gauge connected upstream (on the terminal or inlet side) of any valve controlling that area. Those with "normal range" display shall indicate normal only between 12 and 19 in. Hg (vacuum).~~
~~(c) Vacuum Gauge Identification. All permanently installed vacuum gauges and manometers for the vacuum system shall be continuous reading, manufactured expressly for vacuum, and labeled: VACUUM.~~
4-3.2.2.8 Vacuum Warning Systems.
(a) General.
1. All local, master, and area alarm panels used for medical-surgical vacuum systems shall provide the following:
a. Separate visual indicators for each condition monitored.
b. Cancelable audible indication of an alarm condition. The audible indicator shall produce a minimum of 80 dBA measured at 3 ft (1 m). A second indicated condition occurring while the alarm is silenced shall reinitiate the audible signal.
c. A means to visually indicate a lamp or LED failure.
2. Local, master, and area alarms shall indicate visually and audibly if
a. The monitored condition occurs.
b. The wiring to the sensor, switch, or alarm initiating device is disconnected.
3. Each local, master, and area alarm panel shall be labeled, including its area of surveillance [e.g., medical-surgical vacuum and the room(s) served]. Each indicator shall be separately labeled indicating the condition monitored.
4. Where multiple panels are intended to indicate the same condition(s):
a. Except for master alarm panels, at least one panel shall be connected directly to the sensor(s) or switch(es). Signals from this panel may be relayed to other panels.
b. Master alarm panels shall each connect directly and independently to the alarm initiating devices that they monitor. Master alarms shall not be relayed from one master alarm panel to another. Alarm initiating devices for master alarms shall have electrically isolated outputs. Where multi-pole alarm relays are used, the control power source shall be independent of any of the master alarm panels.
c. Panels other than master alarm panels shall be permitted to be connected through indirect means such as data transmission lines provided that such indirect means are fully supervised and failure of such indirect means is indicated at all panels so

connected. Such panels shall be designed and manufactured specifically to monitor medical gas and vacuum systems.

5. Local, master, and area alarms shall be powered from the life safety branch of the emergency system as described in Chapter 3, "Electrical Systems."

6. The responsible authority of the facility shall ensure that the labeling of alarms, where room numbers or designations are used, is accurate and up-to-date.

7. All wiring from switches, sensors, and alarm initiating devices shall be supervised or protected as required by Section 517-30(c)(3) of NFPA 70, National Electrical Code®, for emergency system circuits.

8. A centralized computer system (e.g., a building management system) shall not substitute for any required medical vacuum alarm panel, but shall be permitted to be used to supplement the medical vacuum alarm system.

(b) Master Alarms.

1. A master alarm system shall be provided to monitor the vacuum in the main line at the source equipment and the operation of reserve or off-duty vacuum pumps.

2. Master alarms for medical vacuum systems may be displayed on the same master alarm panels as medical gas alarms.

3. The master alarm system shall consist of at least two alarm panels located in at least two separate locations. One panel shall be located in the principle working area of the individual responsible for the maintenance of the medical vacuum piping systems. One or more other panels shall be installed in locations that assure continuous surveillance during the working hours of the facility (e.g., the telephone switchboard, security office, or other continuously staffed location).

4. Each master alarm panel shall include visual indicators for each of the following conditions:

a. It shall indicate when the vacuum in the main line drops to or below 12 in. Hg of vacuum. The vacuum switch or sensor for the master alarm shall be connected to the main line immediately upstream (on the terminal or inlet side) of the main line shutoff valve (if installed) or the source shutoff valve if a main line valve is not installed.

b. It shall indicate when a reserve or off-duty vacuum pump is in operation.

(c) Area Alarms.

1. Area alarms shall be provided where the medical-surgical vacuum system serves anesthetizing locations and other vital life support and critical care areas such as post-anesthesia recovery, intensive care units, and coronary care units.

2. Area alarm panels shall be located at the nurse's station or other location that will provide for responsible surveillance.

3. Area alarms shall indicate if the vacuum in the local line drops to or below 12 in. Hg of vacuum.

4. Actuating switches or sensors for critical care areas shall be placed in the individual line supplying each such specific area. No valve, other than valves located in areas accessible only to authorized personnel, shall intervene between the sensor or switch and the outlets intended to be monitored by the alarm.

5. Actuating switches or sensors for anesthetizing areas shall be placed in the individual line supplying each such specific area with the individual room shutoff valve being the only one between the actuating switch and the outlets.

(d) Local Alarms.

1. A local alarm indicator shall be provided for the operation of a reserve or off-duty vacuum pump. The indicator shall comply with 4-3.2.2.8(a)1, 2, and 3 and shall be located in an alarm panel or with the vacuum pump controls.

(e) Vacuum System Gauges. All permanently installed vacuum gauges and manometers for the vacuum system shall be continuous reading, manufactured expressly for vacuum, and labeled: VACUUM. Those that display "normal range" shall indicate normal only between 12 in. and 19 in. Hg (vacuum). Gauges shall be in compliance with ANSI/ASME B-40.1, Gauges, Pressure Indicating Dial-Type, Elastic Elements. The rated accuracy of vacuum gauges used for testing shall be one percent (full scale) or better at the point of reading.

1. A vacuum gauge shall be installed in the main line adjacent to the actuating switch or sensor required in 4-3.2.2.8(b)4. It shall be appropriately labeled and shall be readily visible from a standing position.

2. A vacuum gauge, connected to the line being monitored, shall be installed at each area alarm panel location. It shall be appropriately labeled and shall be readily visible from a standing position.

SUBSTANTIATION: To format the requirements for vacuum warning systems the same as for gas warning systems and include their more complete and detailed descriptions.

COMMITTEE ACTION: Accept in Principle.

See Committee Action on Proposal 99-152 (Log #226) which reads as follows:

Replace existing 4-3.1.2.2, 4-3.2.2.8, 4-3.2.2.9, 4-3.2.2.10 with the following:

5.1.4.4 Warning Systems (Level 1)

5.1.4.4.1 General

5.1.4.4.1.1 All local, area, and master alarm systems used for medical gas and vacuum systems shall provide the following: *[was 4-3.1.2.2(a)1 + Log #233]*

(1) separate visual indicators for each condition monitored, except as permitted in 5.1.4.4.2.8(i) and (j). *[was 4-3.1.2.2(a)1a + Log #233]*

(2) visual and audible indication that the monitored condition has occurred. *[was 4-3.1.2.2(a)2a + Log #233]*

(3) cancelable audible indication of an alarm condition, producing a minimum of 80 dBA measured at 3 ft (1 m). *[was 4-3.1.2.2(a)1b + Log #233]*

(4) re-initiation of the audible signal if a second alarm condition occurs while the audible alarm is silenced. *[was 4-3.1.2.2(a)1b + Log #233]*

(5) a means to visually indicate a lamp or LED failure. *[was 4-3.1.2.2(a)1c + Log #233]*

(6) visual and audible indication that the wiring to an alarm initiating device is disconnected. *[was 4-3.1.2.2(a)2b + Log #233]*

(7) labeling of each indicator, indicating the condition monitored, (e.g. O_2, medical air, vacuum, etc.) *[was 4-3.1.2.2(a)3 + Log #233]*

(8) labeling of each alarm panel for its area of surveillance. *[Log #226 + Log #233]*

(9) automatic restart after a power loss for 10 seconds (e.g. during generator startup) without giving false signals or requiring manual reset. *(Log #131)*

5.1.4.4.1.2 Where multiple local and area alarm panels are intended to indicate the same condition(s), *[was 4-3.1.2.2(a)4]*

(a) at least one panel shall be connected directly to the alarm initiating device. *(was 4-3.1.2.2(a)4a]*

(b) an alarm signal from a panel connected to an alarm initiating device shall be permitted to be relayed to other panels. *[Log #226 + Log #233]*

5.1.4.4.1.3 Local and area alarm panels shall be permitted to be connected through indirect means such as data transmission lines, provided that: *[was 4-3.1.2.2(a)4c + Log #233]*

(a) the indirect means are fully supervised and failure of such indirect means is indicated at all panels so connected. *[was 4-3.1.2.2(a)4c]*

(b) the panels are designed and manufactured specifically to monitor medical gas and vacuum systems. *[Log #226]*

(c) the panels are dedicated to monitoring only medical gas and vacuum systems. *[Log #226]*

5.1.4.4.1.4 Electrical power sources for local, area, and master alarms shall be in accordance with Chapter 3, "Electrical Systems". *[was 4-3.1.2.2(a)8 + Log #233]*

5.1.4.4.1.5 The responsible authority of the facility shall ensure that the labeling of alarms, where room numbers or designations are used, is accurate and up-to-date. *[was 4-3.1.2.2(a)7 + Log #233]*

5.1.4.4.1.6 All wiring from alarm initiating devices shall be supervised or protected as required by Section 517-30 (c)(3) of NFPA 70, National Electrical Code, for emergency system circuits. *[was 4-3.1.2.2(a)8 + Log #233]*

5.1.4.4.1.7 A centralized computer system (e.g., a building management system) shall not substitute for any required medical gas or vacuum alarm panel, but shall be permitted to be used to supplement the medical gas and vacuum alarm system. *[was 4-3.1.2.2(a)9 + Log #233]*

5.1.4.4.2 Master Alarms

5.1.4.4.2.1 A master alarm system shall be provided to monitor the operation and condition of the source of supply, the reserve source

(if any), and the pressure ~~of~~ in the main lines of each ~~all~~ medical gas and medical-surgical vacuum piping system.
[was 4-3.1.2.2(b)1, 4-3.2.2.8, & Log #233]

5.1.4.4.2.2 Master alarm systems shall comply with the general requirements of 5.1.4.4.1.1.
[was 4-3.1.2.2(a) + Log #233]

5.1.4.4.2.3 Master alarm systems shall consist of at least two master alarm panels located in at least two separate locations as follows:
[was 4-3.1.2.2(b)2 + Log #227 + Log #233]

(a) One master alarm panel shall be located in the principal working area of the individual responsible for the maintenance of the medical gas and vacuum pipeline systems. *[was 4-3.1.2.2(b)2 + 4-3.2.2.8]*

(b) One or more other master alarm panels shall be installed in locations that assure continuous surveillance during the working hours of the facility (e.g., the telephone switchboard, security office, or other continuously staffed location). *[was 4-3.1.2.2(b)2, 4-3.2.2.8, and Log #227]*

5.1.4.4.2.4 The master alarm panels required in 5.1.4.4.2.3 shall connect directly to the alarm initiating devices that they monitor.
[was 4-3.1.2.2(a)4 + Log #233]

5.1.4.4.2.7 Where multi-pole alarm relays are used to isolate the alarm initiating signals to master alarm panels, the control power source for the relays shall be independent of any of the master alarm panels. *[Log #226 + Log #233]*

5.1.4.4.2.8 Master alarm panels monitoring medical gas piping systems shall each include the following:

(a) a separate visual and audible alarm indicator for the source equipment in each medical gas system. *[was 4-3.1.2.2(b)1]*

(b) an alarm indication when, or just before, changeover occurs in a medical gas system that is supplied by a manifold or an alternating-type bulk system that has as part of its normal operation a changeover from one portion of the operating supply to another portion. *[was 4-3.1.2.2(b)3a]*

(c) an alarm indication when, or just before, the changeover to the reserve supply occurs in a medical gas system that consists of one or more units that continuously supply the piping system while another unit remains as the reserve supply and operates only in case of an emergency. *[was 4-3.1.2.2(b)3b]*

(d) an alarm indication when the reserve supply is reduced to one average day's supply where check valves are not provided for each cylinder lead of the reserve supply for a manifold or bulk supply system. These alarms are not required if check valves are provided in each cylinder lead. *[was 4-3.1.2.2(b)3c]*

(e) an alarm indication when the contents of the reserve is reduced to one average day's supply where a cryogenic liquid storage unit is used as a reserve for a bulk supply system. *[was 4-3.1.2.2(b)3d]*

(f) an alarm indication when the gas pressure available in the reserve unit is below that required for the medical gas system to function properly. *[was 4-3.1.2.2(b)3d]*

(g) an alarm indication when the pressure in the main line of each separate medical gas system increases 20 percent or decreases 20 percent from the normal operating pressure. *[was 4-3.1.2.2(b)3e]*

(h) high and low pressure alarm initiating devices installed in the main lines immediately downstream (on the terminal or outlet side) of the main line shutoff valves (if installed) or the source shutoff valves if main line shutoff valves are not installed. *[was 4-3.1.2.2(b)3e]*

(i) an alarm indication(s) for the local alarms required for medical air systems in 4-3.1.2.2(d)1, either by separate indications for individual conditions or as one or more group alarms. *[was 4-3.1.2.2(b)3f]*

(j) group alarms (if used) labeled "Medical Air System Fault – (indicate site)" or similar wording that indicates that one in a group of monitored conditions has occurred at a particular site. *[was 4-3.1.2.2(b)3f]*

(k) a medical air dew point alarm per 4-3.1.1.9(i)1. *[was 4-3.1.2.2(b)3g + Log #253]]*

5.1.4.4.2.9 Master alarm panels monitoring medical-surgical vacuum system source equipment shall each include the following:

(a) an alarm indication when the vacuum in the main line drops to or below 12 in. Hg of vacuum. *[was 4-3.2.2.8]*

(b) the alarm initiating device connected to the main line immediately upsteam (on the terminal or inlet side) of the main line shutoff valve (if installed) or the source shutoff valve if a main line shutoff valve is not installed. *[was 4-3.2.2.8]*

(c) an alarm indication when the reserve or off-duty vacuum pump is in operation. *[was 4-3.2.2.8]*

5.1.4.4.2.10 Master alarms for medical-surgical vacuum systems shall be permitted to be displayed on the same master alarm panels as medical gas alarms. *[Log #233]*

5.1.4.4.3 Area Alarms

5.1.4.4.3.1 Area alarms shall be provided where a piped medical gas and vacuum systems serve anesthetizing locations and other vital life support and critical care areas such as post-anesthesia recovery, intensive care units, and coronary care units.
[was 4-3.1.2.2(c)1 + 4-3.2.2.9]

5.1.4.4.3.2 Area alarm panels shall be located at the nurse's station or other location that will provide for responsible surveillance.
[was 4-3.1.2.2(c)2 + 4-3.2.2.9(c)]

5.1.4.4.3.3 Area alarm panels shall comply with the general requirements of 5.1.4.4.1.
[was 4-3.1.2.2(a) + Log #233]

5.1.4.4.3.4 Area alarms for medical gas systems shall indicate if the pressure in the local line increases 20 percent or decreases 20 percent from the normal line pressure.
[was 4-3.1.2.2(c)3]

5.1.4.4.3.5 Area alarms for medical vacuum systems shall indicate if the vacuum in the local line drops to or below 12 in. Hg of vacuum. *[was 4-3.2.2.8]*

5.1.4.4.3.6 Alarm initiating devices for critical care areas shall ~~be placed in~~ monitor the individual line supplying each such specific area. *[was 4-3.1.2.2(c)4 & 4-3.2.2.9(d)]*

5.1.4.4.3.7 No valve, other than valves located in areas accessible only to authorized personnel, shall intervene between alarm initiating devices and the outlets intended to be monitored by the device. *[was 4-3.1.2.2(c)4 & 4-3.2.2.9(d)]*

5.1.4.4.3.8 Alarm initiating devices for anesthetizing areas shall be placed in the individual line supplying each such specific area, with the individual room shutoff valve being the only valve between the alarm actuating device and the outlets. *[was 4-3.1.2.2(c)5 & 4-3.2.2.9(d)]*

5.1.4.4.4 Local Alarms

5.1.4.4.4.1 Local alarms shall comply with the general requirements of 5.1.4.4.1.
[was 4-3.1.2.2(a)1]

5.1.4.4.4.2 Local alarms, where required, shall be grouped together in a single location (e.g., in an alarm panel or with the system controls) at the source equipment site(s) for each system.,.
[was 4-3.1.2.2(d)1]

5.1.4.4.4.3 Local alarms for medical air compressor systems shall provide individual indication of the following conditions in accordance with 4-3.1.1.9(i): *[see 4-3.1.1.9(I)]*

(a) High water level in receiver (if so equipped). *[Log 13, 259]*
(b) High water level in air/water separator (if so equipped).
(c) High discharge air temperature (if so equipped).
(d) High carbon monoxide level.
(e) High dew point temperature.
(f) Backup compressor operating.

5.1.4.4.4.4 Local alarms for medical-surgical vacuum systems shall include individual indication of the following conditions in accordance with 4-3.2.1.2:

(a) Reserve or off-duty pump is in operation. *[see 4-3.2.1.2]*

5.1.4.4.5 Waste Anesthetic Gas Disposal (WAGD) Alarms
Alarms or other automatic mechanisms shall be provided to inform the user when the WAGD system is ~~operational~~ not functioning properly. *[was 4-3.3.2.4, see Log #95]*

5.2.4.4 Warning Systems (Level 2)

5.2.4.4.1 General

5.2.4.4.1.1 All local, area, and master alarm systems used for Level 2 medical gas and vacuum systems shall provide the following:
[was 4-3.1.2.2(a)1 + Log #233]

(1) separate visual indicators for each condition monitored. *[was 4-3.1.2.2(a)1a + Log +233]*

(2) visual and audible indication that the monitored condition has occurred. *[was 4-3.1.2.2(a)2a + Log +233]*

(3) cancelable audible indication of an alarm condition, producing a minimum of 80 dBA measured at 3 ft (1 m). *[was 4-3.1.2.2(a)1b + Log +233]*

(4) re-initiation of the audible signal if a second alarm condition occurs while the audible alarm is silenced. *[was 4-3.1.2.2(a)1b + Log +233]*

(5) a means to visually indicate a lamp or LED failure. *[was 4-3.1.2.2(a)1c + Log +233]*

(6) visual and audible indication that the wiring to an alarm initiating device is disconnected. *[was 4-3.1.2.2(a)2b + Log +233]*

(7) labeling of each indicator, indicating the condition monitored, (e.g. O_2, medical air, vacuum, etc.) *[was 4-3.1.2.2(a)3 + Log #233]*

(8) labeling of each alarm panel for its area of surveillance. *[Log #226 + Log #233]*

(9) automatic restart after a power loss for 10 seconds (e.g. during generator startup) without giving false signals or requiring manual reset. *(Log #131)*

5.2.4.4.1.2 Where multiple local and area alarm panels are intended to indicate the same condition(s), *[was 4-3.1.2.2(a)4]*

(a) at least one panel shall be connected directly to the alarm initiating device. *(was 4-3.1.2.2(a)4a]*

(b) an alarm signal from a panel connected to an alarm initiating device shall be permitted to be relayed to other panels. *[Log #226 + Log #233]*

5.2.4.4.1.3 Local and area alarm panels shall be permitted to be connected through indirect means such as data transmission lines, provided that: *[was 4-3.1.2.2(a)4c + Log #233]*

(a) the indirect means are fully supervised and failure of such indirect means is indicated at all panels so connected. *[was 4-3.1.2.2(a)4c]*

(b) the panels are designed and manufactured specifically to monitor medical gas and vacuum systems. *[Log #226]*

(c) the panels are dedicated to monitoring only the medical gas and vacuum systems. *[Log #226]*

5.2.4.4.1.4 Electrical power sources for local, area, and master alarms shall be in accordance with Chapter 3, "Electrical Systems". *[was 4-3.1.2.2(a)8 + Log #233]*

5.2.4.4.1.5 The responsible authority of the facility shall ensure that the labeling of alarms, where room numbers or designations are used, is accurate and up-to-date. *[was 4-3.1.2.2(a)7 + Log #233]*

5.2.4.4.1.6 All wiring from alarm initiating devices shall be supervised or protected as required by Section 517-30 (c)(3) of NFPA 70, National Electrical Code, for emergency system circuits. *[was 4-3.1.2.2(a)8 + Log #233]*

5.2.4.4.1.7 A centralized computer system (e.g., a building management system) shall not substitute for any required medical gas or vacuum alarm panel, but shall be permitted to be used to supplement the medical vacuum alarm system. *[was 4-3.1.2.2(a)9 + Log #233]*

5.2.4.4.2 Master Alarms

5.2.4.4.2.1 A master alarm panel shall be provided to monitor the operation and condition of the pressure ~~of~~ in the main lines of each ~~all~~ medical gas and medical-surgical vacuum piping system. *[was 4-3.1.2.2(b)1, 4-3.2.2.8, & Log #233]*

5.2.4.4.2.2 Master alarm panels shall comply with the general requirements of 5.2.4.4.1.1. *[was 4-3.1.2.2(a) + Log #233]*

5.2.4.4.2.3 At least one master alarm panel shall be installed in a location(s) that is under continuous surveillance during the working hours of the facility (e.g., the telephone switchboard, security office, or other continuously staffed location). *[was 4-3.1.2.2(b)2 + Log #227 + Log #233]*

5.2.4.4.2.4 The master alarm panel required in 5.2.4.4.2.3 shall connect directly to the alarm initiating devices that it monitors. *[was 4-3.1.2.2(a)4 + Log #233]*

5.2.4.4.2.7 Where multi-pole alarm relays are used to isolate the alarm initiating signals to master alarm panels, the control power source for the relays shall be independent of any of the master alarm panels. *[Log #226 + Log #233]*

5.2.4.4.2.8 Master alarm panels monitoring medical gas piping systems shall each include the following:

(a) a separate visual and audible alarm indicator for the source equipment in each medical gas system. *[was 4-3.1.2.2(b)1]*

(b) an alarm indication when, or just before, changeover occurs in a medical gas system that is supplied by a manifold or an alternating-type bulk system that has as part of its normal operation a changeover from one portion of the operating supply to another portion. *[was 4-3.1.2.2(b)3a]*

(c) an alarm indication when, or just before, the changeover to the reserve supply occurs in a medical gas system that consists of one or more units that continuously supply the piping system while another unit remains as the reserve supply and operates only in case of an emergency. *[was 4-3.1.2.2(b)3b]*

(d) an alarm indication when the reserve supply is reduced to one average day's supply where check valves are not provided for each cylinder lead of the reserve supply for a manifold or bulk supply system. These alarms are not required if check valves are provided in each cylinder lead. *[was 4-3.1.2.2(b)3c]*

(e) an alarm indication when the contents of the reserve is reduced to one average day's supply where a cryogenic liquid storage unit is used as a reserve for a bulk supply system. *[was 4-3.1.2.2(b)3d]*

(f) an alarm indication when the pressure in the main line of each separate medical gas system increases 20 percent or decreases 20 percent from the normal operating pressure. *[was 4-3.1.2.2(b)3e]*

(g) high and low pressure alarm initiating devices mounted at the source equipment. *[was 4-4.1 , Exception No.5]*(h) a pressure gauge or readout at the master alarm panel. *[was 4-4.1 , Exception No.5]*

5.2.4.4.2.9 Master alarm panels monitoring medical-surgical vacuum system source equipment shall each include the following:

(a) an alarm indication when the vacuum in the main line drops to or below 12 in. Hg of vacuum. *[was 4-3.2.2.8 + Log #233]*

(b) the alarm initiating device connected to the main line immediately upsteam (on the terminal or inlet side) of the main line shutoff valve (if installed) or the source shutoff valve if a main line shutoff valve is not installed. *[was 4-3.2.2.8 + Log #233]*

5.2.4.4.2.10 Master alarms for medical-surgical vacuum systems shall be permitted to be displayed on the same master alarm panels as medical gas alarms. [*Log #233]*

5.2.4.4.3 Area Alarms

5.2.4.4.3.1 Area alarms shall be provided where a piped medical gas and vacuum systems serve anesthetizing locations and other vital life support and critical care areas such as post-anesthesia recovery, intensive care units, and coronary care units. *[was 4-3.1.2.2(c)1 & 4-3.2.2.9]*

5.2.4.4.3.2 Area alarm panels shall be located at the nurse's station or other location that will provide for responsible surveillance. *[was 4-3.1.2.2(c)2 & 4-3.2.2.9(c)]*

5.2.4.4.3.3 Area alarm panels shall comply with the general requirements of 5.2.4.4.1. *[was 4-3.1.2.2(a) + Log #233]*

5.2.4.4.3.4 Area alarms for medical gas systems shall indicate if the pressure in the local line increases 20 percent or decreases 20 percent from the normal line pressure. *[was 4-3.1.2.2(c)3]*

5.2.4.4.3.5 Area alarms for medical vacuum systems shall indicate if the vacuum in the local line drops to or below 12 in. Hg of vacuum. *[was 4-3.2.2.8]*

5.2.4.4.3.6 Alarm initiating devices for critical care areas shall ~~be placed in~~ monitor the individual line supplying each such specific area. *[was 4-3.1.2.2(c)4 & 4-3.2.2.9(d)]*

5.2.4.4.3.7 No valve, other than valves located in areas accessible only to authorized personnel, shall intervene between alarm initiating devices and the outlets intended to be monitored by the device. *[was 4-3.1.2.2(c)4 & 4-3.2.2.9(d)]*

5.2.4.4.3.8 Alarm initiating devices for anesthetizing areas shall be placed in the individual line supplying each such specific area, with the individual room shutoff valve being the only valve between the alarm actuating device and the outlets. *[was 4-3.1.2.2(c)5 & 4-3.2.2.9(d)]*

5.2.4.4.4 Local Alarms

5.2.4.4.4.1 Local alarms shall comply with the general requirements of 5.2.4.4.1. *[was 4-3.1.2.2(a)1]*

5.2.4.4.4.2 Local alarms, where required, shall be grouped together in a single location (e.g., in an alarm panel or with the system controls) at the source equipment site(s) for each system. *[was 4-3.1.2.2(d)1]*

5.2.4.4.4.3 Local alarms for medical air compressor systems shall provide individual indication of the following conditions in accordance with 4-3.1.1.9(i): *[see 4-3.1.1.9(I)] [Log #13, #259]*

(a) High water level in receiver (if so equipped).
(b) High water level in air/water separator (if so equipped).
(c) High discharge air temperature (if so equipped).
(d) High carbon monoxide level.
(e) High dew point temperature.

5.2.4.4.5 Waste Anesthetic Gas Disposal (WAGD) Alarms. Alarms or other automatic mechanisms shall be provided to inform the user when the WAGD system is not functioning normally. *[was 4-3.3.2.4, see Log #95]*

5.3.4.4 Warning Systems (Level 3)

5.3.4.4.1 A warning system shall be installed in each single treatment facility served by a Level 3 ~~medical~~ patient gas supply system or Level 3 compressed air supply system. *[was 4-5.1.2.8(b), Log #238]*

5.3.4.4.2 The warning system shall include audible and non-cancelable visual alarm indications that can be seen and heard at a continually attended location during the time of operation of the facility. *[was 4-5.1.2.8(b)]*

5.3.4.4.3 Alarms shall indicate when the pressure in the main line of each monitored pressurized gas system increases 20 percent or decreases 20 percent from the normal operating pressure. *[was 4-5.1.2.8(d)]*
5.3.4.4.4 High and low pressure alarm initiating devices shall be connected to the main line in each monitored pressurized gas system immediately downstream (on the piping distribution side) of the main line shutoff valve (if installed) or the source shutoff valve is a main line shutoff valve is not installed. *[was 4-5.1.2.8(d)]*
5.3.4.4.5 Where facilities include monitored source equipment that provides automatic changeover to secondary or reserve sources, an alarm shall be provided for each system indicating when automatic changeover has occurred or is about to occur. *[was 4-5.1.2.8(b), Log #238]*
5.3.4.4.6 The alarm initiating devices for changeover alarms shall be independent of the alarm initiating devices for high or low line pressure. *[was 4-5.1.2.8(c)]*
5.3.4.4.7 Where two treatment facilities are served by a common monitored supply system, automatic changeover alarms shall indicate in both facilities. *[was 4-5.1.2.8(c)]*
5.3.4.4.8 Visual changeover alarms shall remain un-cancelable until the secondary or reserve supply source is replenished. *[was 4-5.1.2.8(c)]*
5.3.4.4.9 Warning systems shall not be required for Level 3 gas powered systems, Level 3 vacuum systems, and Level 3 WAGD (scavenging) systems. *[was 4-5.1.3.4]*

COMMITTEE STATEMENT: Portions of the proposal would have created requirements that did not increase reliabilities of the systems installed.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #64)
Committee: HEA-PIP

99- 220 - (4-3.2.2.11(d-g)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
(d) Flux. Where flux is used for ~~soldered or~~ brazed joints, it shall be used sparingly to avoid excess flux inside of the finished joint.
(e) Cleaning. After ~~soldering or~~ brazing, the outside of all joints shall be cleaned by washing with water and a ~~stainless steel~~ wire brush to remove any residue and permit clear visual inspection of the joint. If flux has been used, joints shall be washed with hot water.
(f) Visual Inspection. Each ~~soldered or~~ brazed joint shall be visually examined after cleaning of the outside of the joint. The following conditions shall be considered unacceptable:
1. Flux or flux residue
2. Excessive oxidation of the joint
3. Presence of unmelted ~~solder or~~ braze filler metal
4. Cracks in the tube or component
5. Failure of the ~~solder or~~ braze filler metal to be clearly visible all the way around the joint at the interface between the socket and the tube
6. Cracks in the ~~solder or~~ braze filler metal
7. Failure of the joint to hold the test under 4-3.4.2.2(b)2 and 4

(g) Repairs. ~~Soldered or~~ Brazed joints that are found to be defective under 4-3.2.2.11(f)1, 3, 4 5, 6, or 7 shall be permitted to be repaired, except that no joint shall be repaired more than ~~twice~~ once. Joints that are found to be defective under 4-3.2.2.11(f)2 or ~~5~~ 4 shall be replaced.
SUBSTANTIATION: This change is to eliminate the use of solder during the installation of vacuum piping. A stainless steel brush is not required for the cleaning of the outside of the copper tubing. Braze joints shall be permitted to be repaired only once.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-145 (Log #291).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ALLEN: See my Explanation of Negative on Proposal 99-211 (Log #32).

(Log #194)
Committee: HEA-PIP

99- 221 - (4-3.2.2.11(g)): Accept in Principle
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Revise text as follows:
"Soldered or brazed joints that are found to be defective under 4-3.2.2.11(f)1, 3, ~~4,~~ 5, 6, or 7 shall be permitted to be repaired, except that no joint shall be repaired more than twice. Joints that are found to be defective under 4-3.2.2.11(f)2 or ~~5~~ 4 shall be replaced."
SUBSTANTIATION: The numbers 4 and 5 are in the wrong spots and need to be changed.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-145 (Log #291).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #234)
Committee: HEA-PIP

99- 222 - (4-3.2.2.11(g)): Accept in Principle
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise text as follows:
(g) Repairs. Soldered or brazed joints that are found to be defective under 4-3.2.2.11(f)1, 3, 4, 6, or 7 shall be permitted to be repaired, except that no joint shall be ~~repaired~~ reheated more than ~~twice~~ once before being replaced. Joints that are found to be defective under 4-3.2.2.11(f)2 and 5 shall be replaced.
SUBSTANTIATION: To make the requirements for repairing joints in vacuum systems similar to those for pressure gases. Reheating a joint more than once is not a recommended piping practice.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-145 (Log #291).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #66)
Committee: HEA-PIP

99- 223 - (4-3.3.2.1(b)): Accept in Principle in Part
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Distribution Network. WAGD distribution networks shall ~~be constructed of corrosion-resistant materials appropriate for use with oxygen, nitrous oxide, and halogenated anesthetics in the concentrations encountered in the anesthetic breathing circuit.~~ conform to the requirements of 4-3.4.2, Piped Vacuum Systems. Where only one set of vacuum pumps is available for a combined medical-surgical vacuum system and WAGD system, the WAGD system shall be connected at the source of equipment through a separate network of piping."
SUBSTANTIATION: The 1999 Standard required installation of WAGD inlets in all locations where nitrous oxide or halogenated anesthetic agents are likely to be administered. With a mandatory requirement for piping to all anesthetic locations, the standard should at least require the piping to meet the minimum requirements of vacuum piping for a Level 1 facility.
COMMITTEE ACTION: Accept in Principle in Part.
Revise text as follows:
"Distribution Network. WAGD distribution networks shall be constructed of corrosion-resistant materials appropriate for use with oxygen, nitrous oxide, and halogenated anesthetics in the concentrations encountered in the anesthetic breathing circuit. When a WAGD distribution network is connected to a medical surgical vacuum system it shall conform to the requirements of 4-3.4.2, Piped Vacuum Systems."
COMMITTEE STATEMENT: There was no technical substantiation for mandating seperate systems.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #67)
Committee: HEA-PIP

99- 224 - (4-3.3.2.1(c)): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Distribution Network Support. WAGD distribution networks shall be supported directly from the building structure by pipe hooks, straps, bands, or hangers suitable for the size and weight of the network material. ~~Supports shall be placed to ensure that support is provided at the joints, and placed at intervals which ensure adequate support for the size and weight of the network material.~~ Supports shall meet the same spacing and support requirements as 4-3.2.2.2(d)."
SUBSTANTIATION: The WAGD distribution network carries the same gases as the vacuum piping and positive gas piping and should be spaced and supported the same.
COMMITTEE ACTION: Accept in Principle.
Add "Piped" as the first word in the recommendation as follows:
" Distribution Newwork Support. Piped WAGD..."
COMMITTEE STATEMENT: This applies to piped systems only.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #95)
Committee: HEA-PIP

99- 225 - (4-3.3.2.4): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Revise 4-3.3.2.4 to read as follows:
"Alarms or other automatic mechanisms shall be provided to inform the user when the WAGD system is not functioning normally."
OR
Revise 4-3.3.2.4 to read as follows:
"Automatic mechanisms shall be provided to inform the user when the WAGD system is operational."
SUBSTANTIATION: Current wording suggests that alarms are to activate when the WAGD system is operational.
COMMITTEE ACTION: Accept.
Accept the first recommedation only.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #82)
Committee: HEA-PIP

99- 226 - (4-3.4.1.1): Reject
SUBMITTER: Christopher P. Swayze, Sherman Engineering Co.
RECOMMENDATION: Testing authority cannot be supplier or vendor of equipment being certified.
SUBSTANTIATION: For a truly objective test, testing agency should not have provided equipment on system being installed and tested. Testing one's own equipment supply is a conflict of interest.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: It is the committees opinion that the standards existing language clearly indicates that the supplier/vendor and verifier do not have to be independent of each other.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 17
NEGATIVE: 5
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ALLEN: The rejection of this proposal is inexplicable on logical grounds and places the NFPA in a very false position. The installer is disqualified from testing the equipment he/she installs, but the vendor is not disqualified from testing the equipment he/she has manufactured and sold. If the ultimate protection of the patient is the issue, then either we must accept that qualified means qualified and assert that the installer, certifier and manufacturer are equally honest, or we must assume that a conflict of interest is a disqualification, and we must preclude crossover between the functions. There is not justification for assuming the equipment vendor is naturally a finer, more honest fellow than the installer. One of the two positions is incorrect, and this must be reconciled.
DAVIDSON: For objective test, the testing agency should not have provided equipment, devices or labor for the system being installed or tested. The testing agency shall not have a financial interest in the result of the testing. If a financial interest is present then the testing agency has a serious conflict of interest.
ESHERICK: Although the committee statement is correct, the author of this log was trying to change that statement.
He stated that to be completely objective, the testing agency shall not be connected to the supplier in any manner. Just look at fire doors. An outside, independent testing agency such as UL or Factory Mutual, etc., must test the fire doors and so certify as to their fire rating.
MOHILE: We wish to speak in opposition to the Committee rejection on this proposal. For years we have taken the position that the company supplying and/or installing the equipment shall not verify that equipment. The Committee's action on this proposal continues a long standing situation in which there is no clear cut separation between the supplier and/or installer, and the verifier. Although there are many honest suppliers and installers, there also exist some suppliers and installers who continue to take advantage of the position and may reject a competitor's product during the verification process.
Accepting this proposal would eliminate any chance of a conflict of interest.
RIDENOUR: This change will not allow verifiers to sell equipment.

(Log #254)
Committee: HEA-PIP

99- 227 - (4-3.4.1.1):
TCC NOTE: The Technical Correlating Committee directs that the Committee Action be revised to read as Accept In Priniciple.
SUBMITTER: David B. Mohile, Medical Engineering Services, Inc.
RECOMMENDATION: In the fifth paragraph, change the first sentence to read:
"The inspection and testing reports shall be ~~verified and a certificate~~ submitted directly to the party that contracted for the testing."
SUBSTANTIATION: In the rewrite for the 1999 edition these words were erroneously left in after changes were made to the sentence. As printed the sentence makes no sense.
COMMITTEE ACTION: Accept.
Accept the proposed change and add the word "facility" between "responsible" and "authority" in the second sentence of the same paragraph.
Remove the word "health care" from the seventh paragraph.
COMMITTEE STATEMENT: Making the terminology for the authority consistent within the section.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #137)
Committee: HEA-PIP

99- 228 - (4-3.4.1.1, 4-5.2.3(j) (New)): Accept
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Add a new fifth paragraph to read:
"The removal of components within a source system for repair and reinstallation, or the replacement of components like for like constitutes a breach only when such work involves cutting piping and/or brazing new piping. Where no piping is affected, the provisions of 4-5.2.3(j) shall apply."
Add a new 4-5.2.3(j) to read:
"The removal of components within a source system for repair and reinstallation or the replacement of components like for like shall be treated as new work for the purposes of testing whenever such work involves cutting piping and/or brazing new piping. Where no piping is changed, testing shall be performed to verify the function of the replaced device(s) and to assure that no other equipment in the system has been adversely impacted. The following paragraphs shall apply:
(a) Prior to the new or repaired equipment being placed in service, and in addition to any tests of general function required by the manufacturer or repairer:
1. Pressure gas source systems shall be tested to 4-3.4.1.4(a) as applicable to the equipment type. Medical and Instrument Air systems shall in addition be tested to 4-3.1.1.9(c)1.
2. Vacuum systems shall be tested to 4-3.2.1.2.

3. WAGD systems shall be tested to 4-3.3.1.2(a).
4. Alarm systems shall be tested to 4-3.4.1.3(d)3 and 4.
5. All components shall be tested as appropriate to that specific component [e.g., a replaced dew point monitor would be tested to 4-3.1.1.9(i)3 and 4-3.4.1.4(b)2a].

SUBSTANTIATION: Repair or replacement of a failed piece of equipment should not require the level of testing expected of a new system. This wording in the 4-3.4.1.1 General paragraph has been and can easily be read to mandate far more testing than was ever intended of a system repair. The proposal attempts to correct this weakness.
COMMITTEE ACTION: Accept.
The reference to 4-5.2.3(j) should be 4-3.5.2.3(j).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #68)
Committee: HEA-PIP

99- 229 - (4-3.4.1.2): Accept in Principle
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Documented proof of the following tests shall be conducted by the installer or representative prior to those tests listed in 4-3.4.1.3, System Verification. Test gas shall be oil-free, dry nitrogen NF."
SUBSTANTIATION: Documented proof is essential to verify that these tests were performed properly. The test gas is required to be oil-free, dry nitrogen NF (National Formulary).
COMMITTEE ACTION: Accept in Principle.
Revise text as follows:
"The following tests shall be conducted and documented by the installer or representative prior to those tests listed in 4-3.4.1.3, System Verification. Test gas shall be oil-free, dry nitrogen NF."
COMMITTEE STATEMENT: Editorial. Note this revises the first paragraph only.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #65)
Committee: HEA-PIP

99- 230 - (4-3.4.1.2(b)):
TCC NOTE: The Technical Correlating Committee directs that the Committee Action be revised to read as Accept in Principle in Part.
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Initial Pressure Test. Before attachment of system components (e.g., pressure-actuating switches for alarms, manifolds, pressure gauges, or pressure relief valves), but after installation of the station outlets, with test caps (if supplied) in place (e.g., rough-in assembly), before walls are closed, each section of the piping system shall be subjected to a test pressure of 1.5 times the working pressure [minimum 150 psig (1 1.03 MPa gauge)] with oil-free, dry nitrogen N.F. (see Section 2-2, Definitions). This test pressure shall be maintained until each joint has been examined for leakage by means of soapy water or other equally effective means of leak detection safe for use with oxygen. ~~The source shutoff valves shall be closed.~~ The test gas shall be regulated to maintain 150 psig (1.03 MPa) until each joint is tested. Leaks, if any, shall be located, repaired, and retested in accordance with this paragraph."
SUBSTANTIATION: The wording "before walls are closed" was inadvertently removed in the 1999 edition. The change from 1 to 1.03 MPa is because 1 MPa is equal to 145 psig instead of 150 psig. The N.F. behind the oil-free dry nitrogen was a change in the 1999 Standard. To maintain a test pressure of 150 psig, someone would have to regulate the source gas to maintain a constant pressure. If you closed the source shutoff valve and there was a leak, the entire system would lose pressure making it impossible to test each joint to 150 psig.
COMMITTEE ACTION: Accept in Principle.
Revise text as follows:
"Initial Pressure Test. Before attachment of system components (e.g., pressure-actuating switches for alarms, manifolds, pressure gauges, or pressure relief valves), but after installation of the station outlets, with test caps (if supplied) in place (e.g., rough-in assembly), before walls are closed, each section of the piping system shall be subjected to a test pressure of 1.5 times the working pressure [minimum 150 psig (1 1.03 MPa gauge)] with oil-free, dry nitrogen N.F. (see Section 2-2, Definitions). This test pressure shall be maintained until each joint has been examined for leakage by means of soapy water or other equally effective means of leak detection safe for use with oxygen. ~~The source shutoff valves for the equipment shall be closed.~~ The test gas shall be regulated to maintain 150 psig (1.03 MPa) until each joint is tested. Leaks, if any, shall be located, repaired, and retested in accordance with this paragraph."
COMMITTEE STATEMENT: The committee does not agree the source shut off valve should be closed.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #27)
Committee: HEA-PIP

99- 231 - (4-3.4.1.3): Reject
TCC NOTE: The Technical Correlating Committee directs the Committee to reflect the submitter's substantiation in the Committee Statement, being more explicit by citing reasons.
SUBMITTER: David B. Mohile, Medical Engineering Services, Inc.
RECOMMENDATION: Delete all references to Hydrocarbons as methane and halogenated hydrocarbons in Paragraph (f) Piping Purity Test, Table (f) Maximum Allowable Variation Table, Paragraph (j) Medical Air Purity Test (Compressor System).
SUBSTANTIATION: The levels of hydrocarbons were first introduced into the standard back in 1993 as a method of determining the level of cleanliness of tubing. The halogenated hydrocarbon testing was to assure that the tubing installed was cleaned for oxygen service and that cleaning solvents were not left in the tubing. The hydrocarbon as methane testing was an attempt to verify that compressor oils were not migrating into the tubing from new compressors.
Since the introduction and almost universal acceptance of ASTM B819 tubing the problem of solvents in the tubing has become almost nonexistent. Tubing manufacturers are particularly aware of the problems that solvents caused in the past and are not using processes that can leave solvents in the tubing any longer. In addition, the hydrocarbon testing has become very expensive and is very difficult to perform on the jobsite.
Regarding the hydorcarbons as methane testing, it has been determined that this is also not a prevalent problem since a great many of the new compressors do not even have oil in them and the ones that do have are monitored by hospital-mandated checks for oil vapors in the standard on a daily and quarterly basis [see 4-3.1.1.9(i)].
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The proposal lowers the safety level.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ESHERICK: See my Explanation of Negative on Proposal 99-252 (Log #261).
MOHILE: We wish to speak in opposition to the Committee's action to reject this proposal. We do not feel that eliminating this testing lowers the safety level of testing for hospitals. The test for hydrocarbons as methane equivalents does not work at all. This test was inserted into NFPA 99 in an attempt to measure compressor oil that has made it's way into the pipeline from malfunctioning oil-lubricated compressors. In point of fact, compressor oil does not vaporize as hydrocarbons as methane and is not detectable as such. Therefore this test is invalid.
And a survey of laboratories and verifiers that have performed the halogenated hydrocarbon test thousands of times indicated that this test is unnecessary since the results have all been negative. This is an expensive test to perform and the cost savings to the end users could be appreciative.

(Log #28)
Committee: HEA-PIP

99- 232 - (4-3.4.1.3): Reject
SUBMITTER: Richard L. Miller, Medical Gas Technology Inc.
RECOMMENDATION: Delete all references to Hydrocarbons as methane and halogenated hydrocarbons in Paragraph (f) Piping Purity Test, Table (f) Maximum Allowable Variation Table, Paragraph (j) Medical Air Purity Test (Compressor System).
SUBSTANTIATION: The halogenated hydrocarbon testing was to assure that the tubing installed was cleaned for oxygen service and that cleaning solvents were not left in the tubing. The hydrocarbon as methane testing was an attempt to verify that compressor oils were not migrating into the tubing from new compressors.
Since the introduction of ASTM B819 tubing, the problem of solvents in the tubing has become almost nonexistent. Tubing manufacturers are not using processes that can leave solvents in the tubing. In addition, the hydrocarbon testing has become very expensive and is very difficult to perform in the field.
Regarding the hydrocarbons as methane testing, the majority of new compressors do not even have oil in them. Oil based compressors must be monitored for oil vapors on a daily and quarterly basis [see 4-3.1.1.9(i)].
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-231 (Log #27).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
MOHILE: We wish to speak in opposition to the Committee's action to reject this proposal which is the same as Log #27. We do not feel that eliminating this testing lowers the safety level of testing for hospitals. The test for hydrocarbons as methane equivalents does not work at all. This test was inserted into NFPA 99 in an attempt to measure compressor oil that has made it's way into the pipeline from malfunctioning oil-lubricated compressors. In point of fact, compressor oil does not vaporize as hydrocarbons as methane and is not detectable as such. Therefore this test is invalid.
And a survey of laboratories and verifiers that have performed the halogenated hydrocarbon test thousands of times indicated that this test is unnecessary since the results have all been negative. This is an expensive test to perform and the cost savings to the end users could be appreciative.
ESHERICK: See my Explanation of Negative on Proposal 99-252 (Log #261).

(Log #96)
Committee: HEA-PIP

99- 233 - (4-3.4.1.3): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Revise Paragraph 3 ("When systems have ...") to read:
"If a system has <u>not</u> been installed by in-house personnel, testing shall be permitted by personnel of that organization who meet the requirements of 4-3.4.1."
SUBSTANTIATION: Paragraph 4-3.1.2.10(b) permits "in-house" health care facility personnel to install piping systems if all requirements of 4-3 are met during installation. However, Section 4-3.4.1.3 requires system verification to be performed by a party "other than the installing contractor." If health care facility personnel were to install a piping system, someone <u>other than</u> personnel of the health care facility needs to be retained to verify the installation (i.e., someone not employed by the governing body of the health care facility).
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #195)
Committee: HEA-PIP

99- 234 - (4-3.4.1.3): Accept
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Revise text as follows:
"The testing shall be conducted by a party technically competent and experienced in the field of medical gas pipeline testing <u>and meeting the requirements of ANSI/ASSE Series 6000, Standard 6030</u>."
SUBSTANTIATION: Until the ANSI/ASSE Series 6000 became available there were no professional qualification standards for the verifier. I believe we should take advantage of and use this standard.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 18
NEGATIVE: 4
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
DAVIDSON: Is it the intent of NFPA through the enabling of ASSE's Series 6000, Standard 6030 to subterfuge the individual State Registration Board of Professional Engineers powers as to the professional Engineer's ability to certify a medical gas system in order to safeguard life, health and property and to promote public welfare?
For your information the following is the declaration of purpose and definition of unlawful practice of engineering typically found in most states and commonwealths enabling legislative engineer's acts.
"In order to safeguard life, health, and property and to promote the public welfare, the practice of engineering in this State is hereby declared to be subject to regulation in the public interest. It shall be unlawful for any person to practice or to offer to practice engineering in this State; to use in connection with his name, by verbal claim, sign, advertisement, letterhead, card or to in any other way, represent himself to be an engineer, a professional engineer or through the use of some other title imply that he is a professional engineer registered under this chapter, or to advertise any title or description tending to convey the impression that he is an engineer unless such person has been duly registered or exempted under this chapter. The right to engage in the practice of engineering shall be deemed a personal right based on the qualifications of the individual as evidenced by his certificate of registration, which shall not be transferable."
"Practice of engineering" or "to practice engineering" or "practice engineering" includes any professional service performed for the general public such as consultation, investigation, evaluation, planning, design, or responsible supervision of construction or operation in connection with any public or private utilities, structures, buildings, machines, equipment, processes, works, or projects wherein the public welfare or the safeguarding of life, health or property is concerned or involved when such professional service requires the application of engineering principles and data, but it does not include the work ordinarily performed by persons who operate or maintain machinery or equipment, neither does it include engineering services performed by an employee of a firm or corporation that does not offer professional engineering services to the general public."
With the acceptance of Log #195, NFPA will subterfuge the individual State Registration Board of Professional Engineers powers as to the Professional Engineer's ability to certify a medical gas system in order to safeguard life, health and property and to promote public welfare.
The requirements for the medical gas system and equipment "certifier" should be defined within NFPA 99, Chapter 4, not through a third party standards making body.
ERICKSON: Reject the Proposal. This section of the standard was fine without having the new requirement for meeting ANSI/ASSE Series 6000, Standard 6030. Just because one organization has developed a standard, in a non-consensus process, and it is now available doesn't mean it should become a standard within NFPA 99. If there is a problem with testing agency it is the responsibility of the health care organization and the local or state authority to make sure that a restrictive action is taken against the agency. The mere fact that they need to go thorough a 35 hour course and pass a test does not mean that they will be anymore honest, competent, or through in their dealing with the health care organization.
SHOEMAKER: While extra training such as a 30+ hour course, such as adapting the ANSI/ASSE Series 6000, Standard 6030 would require, may increase the knowledge and understanding base of the installer it does not mean that there will be any increase in the quality of installations. The local state and municipalities should and must maintain ultimate responsibility for meeting standards for installations. I am very concerned that we adapt any non-consensous standard.
SMIDT: Reject the proposal: While I agree that systems in the past have been improperly "verified", I don't believe that inclusion of a reference to ANSI/ASSE 6000-6030 will improve that record. This is a issue that individual state authorities and the facilities themselves should police. Lets not codify this requirement!

COMMENT ON AFFIRMATIVE:
MRAULAK: See my Comment on Affirmative on Proposal 99-191 (Log #190).

(Log #196)
Committee: HEA-PIP

99- 235 - (4-3.4.1.3): Accept in Part
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Revise text as follows:
"The following tests shall be performed after those listed in 4-3.4.1.2, Installer Performance Testing. The test gas shall be oil-free, dry nitrogen NF.
This testing shall be conducted by a party competent and experienced in the field of medical gas pipeline testing. Such testing shall be performed by a party other than the installing contractor.
~~When systems have been installed by in-house personnel, testing shall be permitted by personnel of that organization who meet the requirements of 4-3.4.1.~~"
SUBSTANTIATION: According to the definition of nitrogen, NF needs to be added. To me the third paragraph is a conflict of interest. If we don't allow the contractor to test his own work, why would we let the in-house personnel test in-house personnel work? Who's to say that all the proper tests will be done and/or done honestly? The verifier should be responsible for all testing since he has all the proper equipment and expertise.
COMMITTEE ACTION: Accept in Part.
Accept the part that added "NF" only.
COMMITTEE STATEMENT: Part 2 was addressed in Proposal 99-233 (Log #96).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #264)
Committee: HEA-PIP

99- 236 - (4-3.4.1.3): Accept
SUBMITTER: Peter Esherick, Patient Instrumentation Corp.
RECOMMENDATION: Add the following text to the first paragraph, second sentence:
"The test gas shall be oil-free dry nitrogen or the gas of system designation.
This also should apply to Paragraphs 4-3.4.1.3(a)1, (c)1, (d)2, and paragraph two of (e)."
SUBSTANTIATION: To insist that system verification tests use oil-free dry nitrogen adds additional costs to the hospital for the testing regimen with no good reason there for: All tests in Paragraph 4-3.4.1.3 can be conducted using the gas of system designation. The final result of such testing will be the same regardless of which gas is used. As Technical Correlating Committee member David A. McWhinnie, Jr. says in "Keeping Health Care Current," NFPA Journal, March/April, 2000: "There's absolutely no indication of why these tests are required, there is no case any of us on the committee are aware of contamination of properly installed piping systems...to spend millions of dollars for no useful purpose."
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #265)
Committee: HEA-PIP

99- 237 - (4-3.4.1.3):
TCC NOTE: The Technical Correlating Committee directs the Committee to reflect the submitter's substantiation in the Committee Statement, being more explicit by citing reasons, i.e., how did it lower the level of safety.
SUBMITTER: Peter Esherick, Patient Instrumentation Corp.
RECOMMENDATION: Delete the piping purity test in its entirety.
SUBSTANTIATION: This test serves no useful purpose. The patient does not use nitrogen. If the medical gas pipelines are properly installed using the required materials, good construction techniques, and installer performance testing, then system testing with system gas should be the only requirement of the "System Verification" testing agency.
This will save the hospital up to one half the cost of the "System Verification" test.
COMMITTEE ACTION: Reject.
This pertains to part (f).
COMMITTEE STATEMENT: This proposal lowers the level of safety.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ESHERICK: See my Explanation of Negative on Proposal 99-252 (Log #261).

(Log #267)
Committee: HEA-PIP

99- 238 - (4-3.4.1.3):
TCC NOTE: The Technical Correlating Committee directs the Committee to review and revise Committee Statement to respond to the submitter's substantiation and provide reasons to answer why.
SUBMITTER: Peter Esherick, Patient Instrumentation Corp.
RECOMMENDATION: Add to the end of second sentence of second paragraph:
"...equipment supplier or another party with a vested interest in the project."
SUBSTANTIATION: The problem is that the equipment supplier and others with a vested interest in the project may not be without prejudice regarding their interest in the project.
To make the testing truly independent, there must be no conflict of interest real or perceived such as an independent testing agency must be used to test fire doors, etc.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-226 (Log #82) which reads as follows:
It is the committees opinion that the standards existing language clearly indicates that the supplier/vendor and verifier do not have to be independent of each other.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 20
NEGATIVE: 2
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
ESHERICK: Although the committee statement is correct, the author of this log was trying to change that statement.
He stated that to be completely objective, the testing agency shall not be connected to the supplier in any manner. Just look at fire doors. An outside, independent testing agency such as UL or Factory Mutual, etc., must test the fire doors and so certify as to their fire rating.
MOHILE: We wish to speak in opposition to the Committee's rejection on this proposal. For years we have taken the position that the company supplying and or installing the equipment shall not verify that equipment. The Committee's action on this proposal continues a long standing situation in which there is no clear cut separation between the supplier and/or installer, and the verifier. Although there are many honest suppliers and installers, there also exist some suppliers and installers who continue to take advantage of the position and may reject a competitor's product during the verification process.
Accepting this proposal would eliminate any chance of conflict of interest.

(Log #CP706)
Committee: HEA-PIP

99- 239 - (4-3.4.1.3): Accept
SUBMITTER: Technical Committee on Piping Systems
RECOMMENDATION: In section 4-3.4.1.3(c), delete the text.
SUBSTANTIATION: The same procedures in 4-3.4.1.3(c) is repeated in the Operational Pressure Test 4-3.4.1.3(h) with the exception that the final sourced gas is used instead of oil-free nitrogen. There does not seem to be any advantage of conducting the Outlet Flow test and then conducting the same procedures again along with some additional performance testing after the final tie-in has been performed. A more accurate performance test

is conducted using the Operational Pressure Test and it is the final data that is collected during this test that will allow any future outlet performance testing to be used as a variance.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #340)
Committee: HEA-PIP

99- 240 - (4-3.4.1.3 Exception):
TCC NOTE: The Technical Correlating Committee directs the Committee to reflect the submitter's substantiation in the Committee Statement, being more explicit by citing reasons.
SUBMITTER: Fritz Koppenberger, Environmental Testing Services Inc.
RECOMMENDATION: Delete exception.
~~Exception: Where permitted by the authority having jurisdiction, for small projects affecting a limited number of areas where the use of nitrogen is impractical, the source gas shall be permitted to be used for the tests listed in 4-3.4.1.3(a)1, (c)1, (d)2, and paragraph 2 of (e).~~
SUBSTANTIATION: This exception is contradictory to the spirit of the code and is abused. The use of nitrogen is never impractical. The plumber had to have it on the job to perform his work and testing, and the verifier has to use it to perform 4-3.4.1.3(f). Oxygen should never be used as a test gas before the piping has been tested for hydrocarbons. It is contradictory to NFPA principles (fire protection) and this test methodology. The hazards associated with mixing oxygen and hydrocarbons, especially at elevated partial pressures, are documented by NFPA and other standards organizations. Filter testing with medical air as the test gas can cause false high readings from water on some filter media. Testing with source gas offers no protection for the installer. If the filter tests fail, it is expensive and difficult to prove if the piping was contaminated by the source gas or by the installer.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: There are times that the committee feels that the use of source gas, when approved by the authority having jurisdiction, is appropriate.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #338)
Committee: HEA-PIP

99- 241 - (4-3.4.1.3(a)): Reject
TCC NOTE: The Technical Correlating Committee directs the Committee to reflect the submitter's substantiation in the Committee Statement, providing explict reasons explaining why.
SUBMITTER: Fritz Koppenberger, Environmental Testing Services Inc.
RECOMMENDATION: Insert new text before "Cross-Connection Test" as (a) and bump existing sections down one letter, making "Cross-Connection Test" (b), etc.
(a) Standing Pressure Test. Piping systems shall be subjected to a 20 minute standing pressure test at 20 percent above the normal operating line pressure. The test gas shall be oil-free, dry nitrogen (see Section 2-2, Definitions). The source shutoff valve shall be closed.
1. After the piping system is filled with test gas, the supply valve, the zone valve, and all outlets shall be closed and the source of test gas disconnected. The piping system shall remain leak-free for 20 minutes.
2. Leaks, if any, shall be located, repaired, and retested in accordance with 4-3.4.1.2(c).
SUBSTANTIATION: There is no leak test performed by the verifier. This forces the verifier to make assumptions, i.e.:
1. The installer performed a standing pressure test per 4-3.4.1.2(e).
2. Workers other than the piping installer did not damage the piping after the installer performed a standing pressure test.
3. Piping integrity has not been compromised by third party source equipment installers following 4-3.4.1.2(c).
Many subcontractors can compromise the piping after the installer performs a standing pressure test. This test will provide a screen for damages caused by other workers or the failure of the installer to perform 4-3.4.1.2(e). The test should be inserted at this point so other verification tests do not have to be repeated if leaks are found. Currently, all installer performance tests are duplicated or exceeded by the verifier, except for a leak test. A short duration leak test by the verifier will screen out any significant damage yet will cause little or no change in the costs associated with verification.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The existing tests as required by this document are adequate.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #286)
Committee: HEA-PIP

99- 242 - (4-3.4.1.3(a)2d): Accept
SUBMITTER: David Esherick, Patient Instrumentation Corp.
RECOMMENDATION: Add the following text:
"Waste Anesthetic Gas Disposal (WAGD) Systems shall be in operation so that these WAGD systems are tested at the same time the medical gas systems are tested."
SUBSTANTIATION: We state how, when, etc. the vacuum system is tested but make no mention of WAGD system. This is an attempt to rectify this problem.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #266)
Committee: HEA-PIP

99- 243 - (4-3.4.1.3(a)3 (New)): Accept
SUBMITTER: Peter Esherick, Patient Instrumentation Corp.
RECOMMENDATION: Add new paragraph:
4-3.4.1.3(a)3: A third method of testing to ensure that no cross-connections to other piping systems exists follows: "An oxygen analyzer, or similar device, known to be accurate at 0 percent, 21 percent, and 100 percent oxygen is a suitable test instrument."
SUBSTANTIATION: This is a direct quote from NFPA 99 (1999), Chapter 8, Paragraph 8-5.1.2.1(c)4, last paragraph. It refers to testing for cross connections in anesthesia machines. It has been in NFPA 99 and its predecessors since before NFPA 56F (1973). If it is good enough for testing for cross connections in anesthesia machines, why can it not also be an alternate method for testing for cross connections in medical gas pipelines?
1. Before the 1993 edition of NFPA 99 was issued, many testing agencies used the oxygen analyzer to check for cross connections of those medical gas lines that contained oxygen and used the pressure difference method to differentiate between nitrous oxide and nitrogen when 0 percent oxygen was found. To my knowledge, no problems ever developed using this system.
2. It should be noted that requiring the cross connection test with nitrogen and subsequently checking all the medical gas systems for oxygen content with an oxygen analyzer almost doubles the cost of the testing program with no appreciable benefit to the hospital (who ultimately pays that extra cost).
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #26)
Committee: HEA-PIP

99- 244 - (4-3.4.1.3(e)): Accept in Principle
TCC NOTE: The Technical Correlating Committee directs the Committee to reflect the submitter's substantiation in the Committee Statement, providing explict reasons explaining why.
SUBMITTER: David B. Mohile, Medical Engineering Services, Inc.
RECOMMENDATION: Revise second paragraph, fourth sentence, to read as follows:
"The filter shall accrue no more than 0.01 gram (10 milligrams) of particulate matter. This test shall be performed only after the pipeline has been thoroughly purged using the white cloth specified in the previous paragraph."

SUBSTANTIATION: The existing standard of one ten-thousandth of a gram of particulate matter is extremely difficult to measure in the field and is not necessary for a construction project. Even if the installer has not adequately performed his blow down and pipe purging as mandated in 4-3.4.1.2(a) and (d), the verifier must also purge the system down as required in 4-3.4.1.3(e) prior to weighing a sample. A chemical balance sensitive enough to measure in the one ten-thousandth of a gram range is difficult to maintain and use in the field and is usually not being utilized by the majority of companies performing verifications.

The proposed amount of 0.01 grams of material is an extremely small amount of matter per 35 cubic ft (1,000 liters) of gas. This would equate to less than .000001 grams of matter per liter.

COMMITTEE ACTION: Accept in Principle.

Revise to read as follows:

"The filter shall accrue no more than 0.001 gram (1 milligram) of particulate matter from any outlet tested. This test shall be performed only after the pipeline has been thoroughly purged using the white cloth specified in the previous paragraph."

The existing two sentances will remain.

COMMITTEE STATEMENT: The committee feels that the .001 gram of particulate matter is adequate to protect patient safety.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 20

NEGATIVE: 2

NOT RETURNED: 1 Bancroft

EXPLANATION OF NEGATIVE:

ESHERICK: See my Explanation of Negative on Proposal 99-24 (Log #341).

MOHILE: We continue to feel that this revised number of .001 gram should be reduced to .01 gram. There was some considerable discussion regarding the about of particulate matter acceptable and we still feel that a level of .01 gram is more than adequate to protect patient safety.

We remind Committee members that a level of .01 gram would equate to less than .000001 grams of matter per liter. It is a very small amount of matter and more easily measured in the field by the verifiers who are performing this test, which would provide more immediate feedback for facilities who are in a rush to open and accept patients.

(Log #29)
Committee: HEA-PIP

99- 245 - (4-3.4.1.3(e)): Accept in Principle

SUBMITTER: Richard L. Miller, Medical Gas Technology Inc.

RECOMMENDATION: Revise second paragraph, fourth sentence, to read as follows:

"The filter shall accrue no more than 0.01 gram (10 milligrams) of particulate matter."

SUBSTANTIATION: The existing standard of one ten-thousandth of a gram is virtually impossible to measure. The verifier must purge the system down as required in 4-3.4.1.3(e) prior to weighing a sample. A chemical balance sensitive enough to measure in the one ten-thousandth of a gram range is difficult to maintain and use in the field and is usually not being utilized by the majority of companies performing verifications. It has been our experience that one ten-thousandth of a gram of particulate can be produced directly from the nitrogen test cylinder.

The proposed amount of 0.01 grams of material is an extremely small amount of matter per 35 cubic ft (1,000 liters) of gas. This would equate to less than .000001 grams of matter per liter.

COMMITTEE ACTION: Accept in Principle.

COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-244 (Log #26).

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

NOT RETURNED: 1 Bancroft

EXPLANATION OF NEGATIVE:

ESHERICK: See my Explanation of Negative on Proposal 99-24 (Log #341).

(Log #260)
Committee: HEA-PIP

99- 246 - (4-3.4.1.3(e)): Reject

TCC NOTE: The Technical Correlating Committee directs the Committee to reflect the submitter's substantiation in the Committee Statement, providing explict reasons explaining why.

SUBMITTER: D. A. McWhinnie, Jr., Mechanical Dynamics Associates

RECOMMENDATION: (e) Piping Purge Test.

Delete entire new second paragraph:

"~~For each positive pressure~~... (through to end) ...~~oil free, dry nitrogen.~~"

SUBSTANTIATION: Material above has been, and is, contrary to Regulations Governing Committee Projects, 4-3.3(d).

The committee has failed to provide any written report, meeting minute, or known verbal report of either the required "Statement of the problem and substantiation for Proposal..."

Since the early 1950s, NFPA 56F, 56K, and Code 99 to date many hundreds of hospitals, and well over a thousand medical gases and vacuum piping systems* we have never found, or heard of, justification for the above.

*Encyclopedia of Medical Devices and Instrumentation, Wiley, N.Y., 1988)

The issue of med-gases piping systems' internal cleanliness is stressed in Chapter 4, with mandate terms throughout:

Cleaning (13)/Blow down (1)/blown clear (1)/Purge (9)/high-flow purge (2)/heavy intermittent purging (2)/reduce to atmosphere (5) – and repressure. (33 mandate terms within 16 pages.)

Code 99 Sections 4-3.4.1.2(d) and 4-3.4.1.3(e) require "heavy," "high-flow," and "high purge" cleaning processes. These pressures, volumes and velocities will never be reached in normal use/and no materials (if any remain) would be moved.

These two sections (one by the installer, and the other by certifier) are clearly adequate.

To mandate this unsupported requirement is improper, and in conflict with NFPA Regulations. It inflicts an unnecessary expense on construction A/Es, installers, certifiers, and infects every new hospital, and all existing hospitals in the U.S. with expansions, modifications, and with replacement or repair of piping systems components.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: The piping purge test is still valid and necessary as modified by Committee Action on Proposal 99-244 (Log #26) which reads as follows:

Revise to read as follows:

"The filter shall accrue no more than 0.001 gram (1 milligram) of particulate matter from any outlet tested. This test shall be performed only after the pipeline has been thoroughly purged using the white cloth specified in the previous paragraph."

The existing two sentances will remain.

The committee feels that the .001 gram of particulate matter is adequate to protect patient safety.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

NOT RETURNED: 1 Bancroft

EXPLANATION OF NEGATIVE:

ESHERICK: See my Explanation of Negative on Proposal 99-24 (Log #341).

(Log #337)
Committee: HEA-PIP

99- 247 - (4-3.4.1.3(e)): Reject

SUBMITTER: Fritz Koppenberger, Environmental Testing Services Inc.

RECOMMENDATION: Revise second sentence of second paragraph of (e) as follows:

"A minimum of 35 ft^3 (1000 L) of gas shall be filtered through a clean, white (0.8 micron or less) ~~(0.45 micron)~~ filter at a minimum flowrate of 3.5 SCFM (100 L/min)."

SUBSTANTIATION: The required pore size of the filter for particulate testing hinders data collection. A filter with a pore size of .45 microns is used for filtration of bacteria in a liquid application. The physics of liquid filtration are different than gas filtration. The filtration process in a gas stream can be 10 times as efficient as in a liquid. NIOSH, the research branch of OSHA, performed extensive research many years ago to determine appropriate filter pore sizes. None of the OSHA particulate tests in a gas specify a .45 micron filter. Most OSHA filter pore sizes are 0.8.

The use of .45 micron filters need not be restricted. The problem is that the only filter media readily available in this pore size is cellulose ester. This substance readily absorbs water, which makes the filter weighing process difficult and can cause falsely high readings due to excessive water absorption. Some cellulose ester filters contain glycerine, which absorbs water and may not release the water at all, even after desiccating or heating the filters. Field samples can be ruined in high humidity.

An exceptional filter media for this application is PVC (poly vinyl chloride), which absorbs very little water. The PVC filters are not available in .45 microns without expensive custom ordering. They are readily available in 0.8 microns. This pore size will perform as well as a .45 cellulose filter in a gas stream, and will allow less restrictive handling and processing, and deliver more reliable data for this application.

The data submitted shows test results of water absorption in cellulose vs. PVC filter media and filter pore size data required by OSHA for particulates in air. The industry standard for collecting small particulates in a gas stream is 0.8 microns, and NFPA should adopt this standard.

NOTE: Supporting material is available for review at NFPA Headquarters.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: The committee feels the 0.45 micron filter traps an adequate amount of material more efficiently. There are commercially available filters of 0.45 micron that do not trap water. A cellulous fiber filter is hydroscopic, however the committee does not wish to specify the type of filter in the standard.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #339)
Committee: HEA-PIP

99- 248 - (4-3.4.1.3(e)): Reject

SUBMITTER: Fritz Koppenberger, Environmental Testing Services Inc.

RECOMMENDATION: Revise second paragraph as follows:

"For each positive-pressure gas system, the cleanliness of the piping system shall be verified. A minimum of 35 ft^3 (1000 L) of gas shall be filtered through a clean, white 0.45 micron filter at a minimum flowrate of 3.5 SCFM (100 L/min). Twenty-five percent of the zones shall be tested at the outlet most remote from the source. The filter shall accrue no more than 0.1 mg of matter. If any outlet fails this test, the test shall be repeated at the same location in the presence of responsible witnesses. If the outlet fails a second time, the most remote outlet in every zone shall be tested. The test shall be performed with the use of oil-free, dry nitrogen."

SUBSTANTIATION: This is an uncompromising and unfair section of the code. An honest verifier is going to be reluctant to quadruple the filter testing bill and delay a hospital opening by what could have either been a stray particle or a mishandled filter. The installer deserves the right to a second test before being penalized to this extent, and the verifier deserves the right to retest and prove in front of witnesses that he is not taking advantage of the situation. The current code is a "license to steal" for a dishonest verifier.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: The verification is already a written certified document.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #282)
Committee: HEA-PIP

99- 249 - (4-3.4.1.3(e)): Reject

SUBMITTER: David Esherick, Patient Instrumentation Corp.

RECOMMENDATION: Add the following text:

"An acceptable alternative to the weighed filter is this: Purge each outlet through a clean 0.45 micron filter at a minimum flow rate of 3.5 SCFM (100 L/min). Rapidly interrupt the flow of gas several times. Run gas through 0.45 micron filter until no particulate is noted on filter."

SUBSTANTIATION: The weighted particulate test is another unnecessary step in the certification of medical gas systems. Let's keep testing more cost efficient for the hospitals involved.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: The current requirement for a quantified test is necessary.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

NOT RETURNED: 1 Bancroft

EXPLANATION OF NEGATIVE:

ESHERICK: See my Explanation of Negative on Proposal 99-24 (Log #341).

(Log #283)
Committee: HEA-PIP

99- 250 - (4-3.4.1.3(e)): Reject

TCC NOTE: The Technical Correlating Committee directs the Committee to reflect the submitter's substantiation in the Committee Statement, providing explict reasons explaining why.

SUBMITTER: David Esherick, Patient Instrumentation Corp.

RECOMMENDATION: Revise text as follows:

"One hundred ~~Twenty five~~ percent of the zones shall be tested...".

SUBSTANTIATION: The medical gas system is too important to randomly check for particulate. All zones should be tested to assure the system is clean from particulate.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: The existing testing of 25 percent is still necessary.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

COMMENT ON AFFIRMATIVE:

ESHERICK: We always test each and every outlet for particulate matter. The 0.45_ filter is white before the test. The filter must show no discoloration or particulates. If discolored or particulates are seen, the outlet is vigorously purged and the test repeated. That is all that is necessary.

(Log #284)
Committee: HEA-PIP

99- 251 - (4-3.4.1.3(e)): Accept

SUBMITTER: David Esherick, Patient Instrumentation Corp.

RECOMMENDATION: Add text as follows:

"...a heavy, intermittent purging of the positive pressure gas pipelines shall be done."

SUBSTANTIATION: The way this is currently written someone could think that this also has to be done for the vacuum lines. This will further clarify specifically what committee's intent is.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #261)
Committee: HEA-PIP

99- 252 - (4-3.4.1.3(f)): Reject

TCC NOTE: The Technical Correlating Committee directs the Committee to review and reflect the submitter's substantiation in the Committee Statement, providing explicit reasons explaining why.

SUBMITTER: D. A. McWhinnie, Jr., Mechanical Dynamics Associates

RECOMMENDATION: One issue – related references in several places:

Delete from 4-3.4.1.3(f), Piping Purity Test: "~~total hydrocarbons (as methane), and halogenated hydrocarbons,~~"

Delete from Table 4-3.4.1.3(f):

"~~Total hydrocarbons as methane 1 ppm~~"

"~~Halogenated hydrocarbons 2 ppm~~"

SUBSTANTIATION: The committee has not given "the specific reason" (required by 4. above), nor the required "Statement of the problem and its substantiation..." NFPA Regulation 4-3.3(d).

It has also failed to provide any written report, meeting minute, or known report in support of determining, and mandating, the degrees of medical gases' purities (which is not within the NFPA scope).

These are packaged commodity gases, purchased principally by hospitals, which must meet the med-gases' chemical requirements determined by the medical profession. These are the responsibilities solely of the supplier and its clients, and has nothing to do with NFPA.

The only responsibility of NFPA re these gases is to assure adequate, and safe, delivery to the points of use.

Should NFPA determine, and mandate, the purity degree of water for patient treatments and/or consumption?

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-231 (Log #27), which reads as follows:

The proposal lowers the safety level.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

NOT RETURNED: 1 Bancroft

EXPLANATION OF NEGATIVE:

ESHERICK: With over 17 years of testing experience we have never found excessive amounts of total hydrocarbons nor any halogenated hydrocarbons in medical gas pipelines. Why test the nitrogen (at extra cost) when the patient does not use it? This proposal does NOT lower the limit of safety.

(Log #293)
Committee: HEA-PIP

99- 253 - (4-3.4.1.3(f)): Accept in Principle

SUBMITTER: David Esherick, Patient Instrumentation Corp.

RECOMMENDATION: Revise text as follows:

"The test shall be performed with the use of ~~oil free dry nitrogen or~~ gas of system."

SUBSTANTIATION: There is no reason for the hospital to pay for a test of the quality of the contractor's nitrogen.

COMMITTEE ACTION: Accept in Principle.

Revise as follows:

"The test shall be performed with the use of oil free dry nitrogen, NF, or gas of system."

COMMITTEE STATEMENT: The removal of oil free dry nitrogen is not necessary. Either is permitted.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #235)
Committee: HEA-PIP

99- 254 - (4-3.4.1.3(g)): Accept in Principle

SUBMITTER: J. Richard Wagner, The Poole & Kent Company

RECOMMENDATION: Revise 4-3.4.1.3(g) as follows:

(g) Final Tie-in Test.

1. Prior to the connection of any work or any extension or addition to an existing piping system, the tests in 4-3.4.1.3(a) through 4-3.4.1.3(f) shall be successfully performed on the new work. ~~After connection to the existing system and before use of the addition for patient care, the tests in 4-3.4.1.3(h) through 4-3.4.1.3(j) shall be completed. Permanent records of these tests shall be maintained in accordance with 4-3.5.3.~~

2. The final connection between the ~~addition~~ new work and existing system shall be leak-tested with the gas of system designation at the normal operating pressure. ~~This pressure shall be maintained until each joint~~ Each joint in the final connection ~~has been examined~~ shall be tested for leakage by means of soapy water or other equally effective means of leak detection safe for use with oxygen.

3. Immediately after the final connection is made and leak-tested, twenty-five percent of the existing zones downstream from the connection shall be tested for particulate matter in accordance with the piping purge test in 4-3.4.1.3(e), using the gas of system designation.

4. Before the new work is used for patient care, it shall be tested in accordance with 4-3.4.1.3(h) through 4-3.4.1.3(k).

5. Permanent records of all tests shall be maintained in accordance with 4-3.5.3.

SUBSTANTIATION: To clarify what tests need to be performed when making tie-ins to existing systems.

COMMITTEE ACTION: Accept in Principle.

Items 1, 2, and 5 are accepted.

Revise item 3 and 4 as follows:

3. For pressure gases, immediately after the final connection is made and leak tested, the specific altered zone and component in the immediate zone or area that is located down stream from the point or area of intrusion shall be tested per 4-3.4.1.3(a),(e), (h), (i)

In part 4, add: "and for vacuum and WAGD 4-3.4.1.3(a)." to the end of the recommendation.

COMMITTEE STATEMENT: Items 3 and 4 were changed to refer only to tests that apply.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

COMMENT ON AFFIRMATIVE:

WAGNER: The Committee Action on Item 3 is not consistent with the Committee Action on Proposal 4-3.1.2.8(b)7 [Log #230]. In Log #235, it's not clear whether the tests in (a), (e), (h), and (i) apply to the new work, to the existing work, or both.

(Log #10)
Committee: HEA-PIP

99- 255 - (4-3.4.1.3(h)3): Accept

SUBMITTER: Craig B. Williams, Hill-Rom

RECOMMENDATION: Revise text to read:

3. A nitrogen system shall be capable of delivering at least 160 psig (1103 kPa gauge) to all outlets at flow in 4-3.4.1.3(h)7.

SUBSTANTIATION: Paragraph 4-3.4.1.3(h)6 was added to the 1999 edition and the reference to this section in Paragraph 4-3.4.1.3(h)3 was not revised from the 1996 edition to reflect this change.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #97)
Committee: HEA-PIP

99- 256 - (4-3.4.1.3(i)): Accept in Principle

SUBMITTER: Burton R. Klein, Burton Klein Associates

RECOMMENDATION: In sentence 2, change "4-4.1.1.9(h)" to read: "4-3.1.1.9(i)."

SUBSTANTIATION: Correct reference.

COMMITTEE ACTION: Accept in Principle.

The reference is in 4-3.4.1.3(j) and should be corrected to read 4-3.1.1.9(i)3.

COMMITTEE STATEMENT: This corrects the reference.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #70)
Committee: HEA-PIP

99- 257 - (4-3.4.1.3(k)): Reject

SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.

RECOMMENDATION: Revise text as follows:

Labeling. The presence and correctness of labeling required by this standard for all piping and components (e.g., station outlets, shutoff valves, and signal panels) shall be verified.

SUBSTANTIATION: Add the word "piping" to the requirements of the presence and correctness of labeling. This is a requirement by the Standard and it should be listed as one of the verifier's responsibilities.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: This is the responsibility of the installing contractors.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
RIDENOUR: Rejection of the verifier to check for labeling. This should be a checks and balance, just because it's the installer's obligation to install the labels, someone, the verifier, should check.

(Log #24)
Committee: HEA-PIP

99- 258 - (Table 4-3.4.1.4): Accept
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Delete the reference to 4-3.1.1.7(b)3 under the column for Cryogenic Bulk W/Cryo Reserve.
SUBSTANTIATION: There is no Section 4-3.1.1.7(b)3.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #98)
Committee: HEA-PIP

99- 259 - (Table 4-3.4.1.4): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: 1. Change title of 1st column "Air Via" to "Air Via 4-3.1.1.9(a)."
2. Change title of 2nd column "Air Via" to "Air Via 4-3.1.1.9(b)."
3. For "Reserve pressure low" delete 3rd and 4th items "4-3.1.1.9(a)" and "4-3.1.1.9(b)."
4. For "Dew point high" change reference from "4-3.1.1.9(h)" to "4-3.1.1.9(i)" (3 places).
5. For "Local alarm" change reference from "4-3.1.1.9(h)" to "4-3.1.1.9(i)" (3 places).
SUBSTANTIATION: 1. Title of column is not complete.
2. Title of column is not complete.
3. Reference paragraphs are not applicable.
4. Update reference due to change in paragraph numbering in text.
5. Update reference due to change in paragraph numbering in text.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #236)
Committee: HEA-PIP

99- 260 - (Table 4-3.4.1.4): Accept in Principle
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise Table 4-3.4.1.4 as shown on the following page:
SUBSTANTIATION: To correct errors in the referenced paragraphs, extend references to specific subparagraphs, add references, and coordinate the table with the specific language in the standard.
COMMITTEE ACTION: Accept in Principle.
The committee accepts this table but many of the references were changed by previous proposals and will need to be updated.
COMMITTEE STATEMENT: Update the references as modified by the proposals and manual of style.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #294)
Committee: HEA-PIP

99- 261 - (4-3.4.2.2(c)): Accept in Principle
SUBMITTER: David Esherick, Patient Instrumentation Corp.
RECOMMENDATION: Revise text as follows:
"The test ~~gas~~ shall be ~~oil free dry nitrogen,~~ done with the vacuum on line."
SUBSTANTIATION: This paragraph relates to vacuum and the performance of the vacuum system. This is best done with vacuum.
COMMITTEE ACTION: Accept in Principle.
Revise to read:
"The test shall be done with the line under vacuum."
COMMITTEE STATEMENT: Editorial.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #99)
Committee: HEA-PIP

99- 262 - (4-3.5.2.1(b)21): Accept in Principle
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Make Sentence 2 ("It is against ... Bureau of Explosives.") a Note or move to Appendix A.
SUBSTANTIATION: Conform to NFPA Standards Manual on non-mandatory text in chapter portion of standards.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Proposal 99-7 (Log #CP700).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #100)
Committee: HEA-PIP

99- 263 - (4-3.5.2.1(b)25, 4-3.5.2.1(b)28, 8-6.4.3.6 (new), 8-6.4.3.7 (new), 8-6.4.3.8 (new)): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: 1. Delete 4-3.5.2.1(b)25.
2. Delete 4-3.5.2.1(b)28.
3. Add new 8-6.4.3.6 to read as follows: "8-6.4.3.6 When small-size (A, B, D, or E) cylinders are in use, they shall be attached to a cylinder stand or to a therapy apparatus of sufficient size to render the entire assembly stable."
4. Add new 8-6.4.3.7 to read as follows: "8-6.4.3.7 An individual cylinder placed in patient room for immediate use by a patient shall not be required to be stored in an enclosure."
5. Add new 8-6.4.3.8 to read as follows: "8-6.4.3.8 Cylinders shall not be chained to portable or movable apparatus such as beds and oxygen tents."
SUBSTANTIATION: 1. The subject of this paragraph is not related to piped gas systems, and thus does not belong in Chapter 4.
2. Same reason as item 1.
3. More appropriate location for sentence 1 of 4-3.5.2.1(b)25.
4. More appropriate location for idea contained in sentence 2 of 4-3.5.2.1(b)25. Address issue of a cylinder being held for immediate use in a patient room by a patient. Only one cylinder per patient should be permitted to be stationed like this.
5. More appropriate location for text of 4-3.5.2.1(b)28.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #100a)
Committee: HEA-GAS

99- 264 - (4-3.5.2.1(b)25, 4-3.5.2.1(b)28, 8-6.4.3.6 (new), 8-6.4.3.7 (new), 8-6.4.3.8 (new)): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: 1. Delete 4-3.5.2.1(b)25.
2. Delete 4-3.5.2.1(b)28.
3. Add new 8-6.4.3.6 to read as follows: "8-6.4.3.6 When small-size (A, B, D, or E) cylinders are in use, they shall be attached to a cylinder stand or to a therapy apparatus of sufficient size to render the entire assembly stable."
4. Add new 8-6.4.3.7 to read as follows: "8-6.4.3.7 An individual cylinder placed in patient room for immediate use by a patient shall not be required to be stored in an enclosure."

Table ~~4-3.4.1.4~~ 4-3.1.2.2 Monitoring Requirements for Required Alarm Signals (Level 1 Systems)

Alarm Condition ~~*Master Signals from Sources*~~	Manifold w/o Reserve	Manifold w/Reserve	Cryogenic Bulk w/Cryogenic Reserve	Cryogenic Bulk w/Cylinder Reserve	~~Air Via~~ Oil-free Compressor 4-3.1.1.9(e)1a	~~Air Via~~ Oil-lube Compressor 4-3.1.1.9(e)1b	~~Air Via~~ Liquid Ring Compressor 4-3.1.1.9(e)1a	Vacuum Pump
Master Alarm Signals								
Changeover to secondary supply	4-3.1.1.5(a) 4-3.1.2.2(b)3a	4-3.1.1.6(a)2 4-3.1.2.2(b)3a	4-3.1.1.7(a)1 4-3.1.2.2(b)3a	4-3.1.1.7(a)2 4-3.1.2.2(b)3a 4-3.1.2.2(b)3b				
~~Liquid level low~~			~~4-3.1.1.7(a)~~	~~4-3.1.1.7(a)~~				
Reserve in use		4-3.1.1.6(a)3 4-3.1.2.2(b)3b	4-3.1.1.7(a) 4-3.1.2.2(b)3b	4-3.1.1.7(a) 4-3.1.2.2(b)3b				
~~Reserve level low~~			~~4-3.1.1.7(b)2 or 3~~					
One day reserve supply		4-3.1.1.6(b) 4-3.1.2.2(b)3c	4-3.1.1.7(b)2 4-3.1.2.2(b)3d	4-3.1.1.7(b)1				
Reserve pressure low			~~4-3.1.1.6(b)3~~ 4-3.1.1.7(b)2 4-3.1.2.2(b)3d	~~4-3.1.1.6(b)2~~	~~4-3.1.1.9(a)~~	~~4-3.1.1.9(b)~~		
Dew point high					~~4-3.1.1.9(h)~~ 4-3.1.1.9(i)3 4-3.1.2.2(b)3g	~~4-3.1.1.9(h)~~ 4-3.1.1.9(i)3 4-3.1.2.2(b)3g	~~4-3.1.1.9(h)~~ 4-3.1.1.9(i)3 4-3.1.2.2(b)3g	
Local alarm					~~4-3.1.1.9(h)~~ 4-3.1.1.9(i)3 4-3.1.2.2(b)3f	~~4-3.1.1.9(h)~~ 4-3.1.1.9(i)3 4-3.1.2.2(b)3f	~~4-3.1.1.9(h)~~ 4-3.1.1.9(i)3 4-3.1.2.2(b)3f	4-3.2.1.2
~~*Master Signals from Pipeline*~~								
~~High line pressure~~	~~4-3.1.2.2(b)3e~~							
~~Low line pressure~~	~~4-3.1.2.2(b)3e~~							
~~Low vacuum~~								~~4-3.2.2.8(a)~~
Main line high pressure	4-3.1.2.2(b)3e	4-3.1.2.2(b)3e	4-3.1.2.2(b)3e	4-3.1.2.2(b)3e	4-3.1.2.2(b)3e	4-3.1.2.2(b)3e	4-3.1.2.2(b)3e	
Main line low pressure	4-3.1.2.2(b)3e	4-3.1.2.2(b)3e	4-3.1.2.2(b)3e	4-3.1.2.2(b)3e	4-3.1.2.2(b)3e	4-3.1.2.2(b)3e	4-3.1.2.2(b)3e	
Main line low vacuum								4-3.2.2.8(a)
Area Alarm Signals								
High line pressure (for each gas piped to area)	4-3.1.2.2(c)3							
Low line pressure (for each gas piped to area)	4-3.1.2.2(c)3							
Low vacuum (if piped)	4-3.2.2.9(e)							
WAGD (if piped)	4-3.3.2.4							
Local Alarm Signals								
High water in receiver	~~4-3.1.1.9(e)~~ 4-3.1.1.9(e)4, 4-3.1.1.9(e)6, and 4-3.1.1.9(i)3							
Carbon monoxide high	~~4-3.1.1.9(h)~~ 4-3.1.1.9(i)1, 4-3.1.1.9(i)2, and 4-3.1.1.9(i)3							
Backup compressor in operation	~~4-3.1.1.9(d)~~ 4-3.1.1.9(d)1 and 4-3.1.1.9(i)3							
Backup vacuum pump in operation	4-3.2.1.2							
High water in separator (if so equipped)	~~4-3.1.1.9(e)~~ 4-3.1.1.9(e)4 and 4-3.1.1.9(i)3							
High discharge air temperature (if so equipped)	~~4-3.1.1.9(e)~~ 4-3.1.1.9(e)5, 4-3.1.1.9(e)6, and 4-3.1.1.9(i)3							

5. Add new 8-6.4.3.8 to read as follows: "8-6.4.3.8 Cylinders shall not be chained to portable or movable apparatus such as beds and oxygen tents."

SUBSTANTIATION: 1. The subject of this paragraph is not related to piped gas systems, and thus does not belong in Chapter 4.
2. Same reason as item 1.
3. More appropriate location for sentence 1 of 4-3.5.2.1(b)25.
4. More appropriate location for idea contained in sentence 2 of 4-3.5.2.1(b)25. Address issue of a cylinder being held for immediate use in a patient room by a patient. Only one cylinder per patient should be permitted to be stationed like this.
5. More appropriate location for text of 4-3.5.2.1(b)28.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 8
NOT RETURNED: 3 Bancroft, Mills, Swope

(Log #139)
Committee: HEA-PIP

99- 265 - (4-3.5.2.1(e)): Reject
TCC NOTE: The Technical Correlating Committee refers this proposal to the Technical Committee on Laboratories for review and comment.
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Move these requirements to 4-6.5.
SUBSTANTIATION: These requirements now apply to Level 4 systems.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The committee will defer this material to chapter 10 for laboratory gases. See Committee Proposal 99-308 (Log #CP707).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #101)
Committee: HEA-PIP

99- 266 - (4-3.5.4.1): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Delete Paragraph 4-3.5.4.1. Renumber 4-3.5.4.2 and 4-3.5.4.3 to 4-3.5.4.1 and 4-3.5.4.2, respectively.
SUBSTANTIATION: Committee Action on Proposal 99-189 for 1998 Fall Meeting revised and transferred this text to what is now Paragraph 4-3.1.2.13. This movement is in concert with requirements for new installations, which are covered in Section 4-3.1. Section 4-3.5 covers existing installations.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #197)
Committee: HEA-PIP

99- 267 - (4-3.5.4.1): Accept in Principle
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Revise text as follows:
"The gas content of <u>all</u> medical gas piping systems shall be readily identifiable by appropriate labeling with the name and pressure of the gas contained. Such labeling ... ~~Only those systems operating at nonstandard pressures shall be labeled with the name of the gas and operating pressure.~~"
SUBSTANTIATION: For years the last sentence in these paragraphs has contradicted the first sentence. All gases should be marked with both the name of the gas and the pressure.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-266 (Log #101).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #102)
Committee: HEA-PIP

99- 268 - (4-5.1.1.2(c) (New)): Accept in Principle
SUBMITTER: Burton R. Klein, Burton Klein Associates

RECOMMENDATION: Insert new 4-5.1.1.2(c) to read:
"(c) Nonflammable Gases (greater than 3,000 ft^3.; In-Storage, Connected, or Both). Storage locations for nonflammable gases greater than 3,000 ft^3 (85 m^3) shall comply with 4-3.1.1.2 and 4-3.5.2.2."
SUBSTANTIATION: There are no requirements listed when quantities exceed 3,000 ft^3. Recommendation is based on requirements for the storage of cylinders not related to piped gas systems, as listed in 8-3.1.11.1 in Chapter 8.
COMMITTEE ACTION: Accept in Principle.
Revise to read as follows:
"(c) Nonflammable Gases (greater than 3,000 ft^3.; In-Storage, Connected, or Both). Storage locations for nonflammable gases greater than 3,000 ft^3 (85 m^3) shall comply with Level 1 systems in accordance with 4-3.1.1.2 and 4-3.5.2.2."
COMMITTEE STATEMENT: Level 1 was added for clarrity.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #246)
Committee: HEA-PIP

99- 269 - (4-5.1.1.3): Accept
SUBMITTER: Fred Quarnstrom, American Dental Association
RECOMMENDATION: Revise text as follows:
4.5.1.1.3 Level 3 ~~Patient Gas Supply~~ <u>Compressed Air</u> Systems. (See Figure 4-5.1.1.3.) Compressed air shall be provided by a Level 3 compressed air system as defined in Chapter 2.
SUBSTANTIATION: Level 3 compressed air is defined in Chapter 2 whereas patient air gas supply system is not defined in Chapter 2. Furthermore, this section addresses Level 3 compressed air. The use of the term "Patient Air Gas Supply" results in confusion. It is inappropriate to classify this section as "patient air system" as it actually addresses Level 3 compressed air systems.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #271)
Committee: HEA-PIP

99- 270 - (4-5.1.1.3): Accept in Principle
SUBMITTER: E. Daniel Shoemaker, MDS Matrix
RECOMMENDATION: 4-5.1.1.3 Level 3 Piped Supply Systems.
(a) Same (b) Same (c) Same (d) Same (e) Same (f) Same (g) Same (h) Same (i) Same
<u>Add:</u>
"The provisions of this section apply to field-installed piping for the distribution of Level 3 compressed air to power devices.
(a) Piping shall be Type K or L copper (hard drawn or annealed) or brass (schedule 40 or 80). If Level 3 compressed air piping is installed simultaneously with patient gas piping systems, either the Level 3 system piping shall be labeled or otherwise identified prior to installation in order to preclude inadvertent inclusion in a nonflammable medical gas piping system, or the Level 3 system piping shall be cleaned and degreased in accordance with 4-5.4.1.
(b) Fittings shall be manufactured from corrosion resistant materials suitable for the system pressures [not to exceed 160 psig (1103 kPa)].
(c) Connectors and joints shall be soldered with 95-5 tin antimony, silver brazed, or threaded NPT.
(d) Piping shall be supported from the building structure in accordance with MSS Standard Practice SP-69, Piping Hangers and Supports – Selection and Application. Hangers and supports shall comply with MSS Standard Practice SP-58, Pipe Hangers and Support – Materials, Design, and Manufacture.
(e) Piping shall be protected against freezing, corrosion, and physical damage. Buried piping outside of buildings shall be installed below the local level of frost penetration. Buried piping that will be subject to surface loads shall be buried at a sufficient

depth to protect the piping from excessive stresses. The minimum backfilled cover above the top of buried piping outside of buildings shall be 36 in. (91.4 cm), except that the minimum cover shall be permitted to be reduced to 18 in. (45.7 cm) where physical damage to the piping is not likely to occur. Trenches shall be excavated so that the pipe has a firm, substantially continuous bearing on the bottom of the trench. Backfill shall be clean and compacted so as to protect and uniformly support the piping. Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water. Piping embedded in concrete floors or walls shall be installed in a continuous conduit.

(f) Level 3 compressed air piping shall be permitted to be located in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities provided that the space is ventilated (naturally or mechanically) and the ambient temperature around compressed air piping is limited to 130°F (54°C) maximum.

(g) Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be suitably protected.

(h) Hoses and flexible connectors, both metallic and nonmetallic, shall be no longer than necessary and shall not penetrate or be concealed in walls, floors, ceilings, or partitions, except where removable panels or doors permit access for connections and service. Flexible connectors, metallic or nonmetallic, shall have a minimum burst pressure of 300 psig.

(i) Emergency compressed air shutoff valves shall not be required. Shutoff valves for isolation of a duplex system's operating components shall be provided as recommended by the manufacturer.

(j) Where nitrogen gas is used as a backup for a Level 3 compressed air system, a check valve and shutoff valve shall be located in each supply line prior to the tee connection in the main line. [See Figure 4-5.1.1.3(b).]"

SUBSTANTIATION: Current wording does not include standards for what is allowed for Level 3 compressed air piping. Therefore many refer to subsequent paragraphs under medical gas piping for standards. Many plan checkers and inspectors are confused. These additions will reduce the confusion.

COMMITTEE ACTION: Accept in Principle.

Revise to read as follows:

Reference Log#271 on page# 196 Change location from 4-5.1.1.3 to 4-5.1.3 to replace existing.

4-5.1.3 Distribution for Gas Powered Systems-Level 3. (Rename to) "Distribution for Compressed Air Source Systems and Gas Powered Systems"

"The provisions of this section apply to field-installed piping for the distribution of Level 3 Compressed Air to power devices."

(a) No Change.

(b) No Change.

(c) "Connectors and joints shall be brazed as required in accordance with 4-5.1.2.10 (b) with solder metal (ASTM B32)containing less than 0.2 percent lead, or brass threaded NPT."

(d) No Change.

(e) No Change.

(f) "Gas Level 3 Compressed Air Piping shall be permitted to be located in the same service..."

"Gas piping shall not be located where subject to contact with oil, including flooding in case of a major oil leak."

(h) "Hoses and flexible connectors, both metallic and nonmetallic, shall be no longer than necessary and shall not penetrate or be concealed, in walls, floors, ceilings, or partitions, except where removable panels or doors permit access for connections and service. Flexible connectors, metallic or nonmetallic, shall have a minimum burst pressure of 1000 300 psig."

(i) Emergency Compressed Air shutoff valves shall not be required. Shutoff valves for isolation of a duplex system's operating components shall be provided as recommended by the manufacturer.

(j) Where nitrogen gas is used as a backup for a Level 3 Compressed Air system, a check valve and shutoff valve shall be located in each supply line prior to the tee connection in the main line. [See Figure 4-5.1.1.3(b).]

COMMITTEE STATEMENT: The changes clarified the submitters wording.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

COMMENT ON AFFIRMATIVE:

FRANKEL: Clarify wording in "h" to read 1,000 psig only in lieu of the 1000 300 burst pressure that appears in the committee action portion of the log.

SHOEMAKER: Ensure that Level 3 Compressed Air NOT be connected to Medical Air Station Outlets.

WAGNER: 1. According to the Committee Action, it appears that Log #271 does not change 4-5.1.1.3. In 4-5.1.3(c), it requires brazing but calls for a solder filler metal (ASTM B32). In 4-5.1.3(h), the meaning of "1000 300 psig" is not clear. In 4-5.1.1.3(i), what are "emergency compressed air shutoff valves"? Non-emergency shutoff valves are proposed to be deleted by Proposal 99-291 (4-5.1.2.11(a) [Log #242]).

2. What is the title of this section? Log #246 (A) says "Compressed Air Systems". Log #237 (AIP) says "Compressed Air Supply Systems".

(Log #330)

Committee: HEA-PIP

99- 271 - (4-5.1.1.3 and Figure 4-5.1.1.3): Accept in Principle

SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.

RECOMMENDATION: Delete ~~Level 3 Patient Gas Supply Systems~~ and insert Level 3 Air-Powered Devices Supply Systems. This includes Figure 4-5.1.1.3 as the title is also incorrect.

SUBSTANTIATION: Level 3 Air Compressor is not a patient air system. See Chapter 2 definition and the appendix. This would be uniform with 4-5.1.1.4, Level 3 Gas-Powered Devices Supply Systems.

COMMITTEE ACTION: Accept in Principle.

COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-269 (Log #246).

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #237)

Committee: HEA-PIP

99- 272 - (4-5.1.1.3, Figure 4-5.1.1.3): Accept in Principle

SUBMITTER: J. Richard Wagner, The Poole & Kent Company

RECOMMENDATION: Revise text as follows:

4-5.1.1.3 Level 3 ~~Patient Gas Supply~~ Compressed Air Supply Systems.

4-5.1.1.3(b) Equipment shall be obtained from and be installed under the supervision of a manufacturer(s) or supplier(s) who is (are) familiar with the proper practices for its ~~construction~~ installation and use. ~~Maintenance programs, in accordance with the recommendations of manufacturer(s), shall be established for the dental air compressor supply system as connected in each individual installation.~~ Maintenance programs that incorporate the equipment manufacturer's recommendations shall be established for each Level 3 compressed air system.

4-5.1.1.3(i) ~~The service outlet~~ Station outlets for Level 3 compressed air shall not be interchangeable with ~~the~~ medical air station ~~outlet~~ outlets.

Figure 4-5.1.1.3 Level 3 ~~patient gas~~ compressed air supply system ~~(typical~~

SUBSTANTIATION: The existing section covers Level 3 compressed air systems, not all patient gases.

The existing language requires maintenance only on dental compressed air systems, not any Level 3 system.

COMMITTEE ACTION: Accept in Principle.

Change "station outlets" to "service outlets".

In addition, add the following at the end of the second recommendation:

"Systems shall be maintained and repaired in accordance with the manufacturers instructions."

COMMITTEE STATEMENT: The intent was to provide service outlets in Level 3.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #247)
Committee: HEA-PIP

99- 273 - (4-5.1.1.3(b)): Accept in Principle in Part
SUBMITTER: Fred Quarnstrom, American Dental Association
RECOMMENDATION: Revise text as follows:
(b) Equipment shall be ~~obtained from and~~ installed according to manufacturer's instructions ~~under the supervision of a manufacturer(s) or supplier(s) familiar with proper practices for its construction and use~~. Maintenance programs, in accordance with the recommendations of manufacturer(s), shall be established for the dental air compressor supply system as connected in each individual installation.
SUBSTANTIATION: This source of the product does not relate to safety and therefore it should not be included in this document. Installation according to manufacturer's instruction is appropriate as manufacturers are the best source of information on how the product should be installed.
COMMITTEE ACTION: Accept in Principle in Part.
Accept the part regarding the manufacturers instructions and incorporate into Proposal 99-272 (Log #237).
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-272 (Log #237).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
RIDENOUR: This allows anyone with the will and desire to install Level 3 equipment. The dentist, doctor or garbage collector can now install repair, and change out manifolds, pumps, and compressors in Level 3 facilities. Level 3 facilities are not just dentist offices.

(Log #248)
Committee: HEA-PIP

99- 274 - (4-5.1.1.3(e)): Accept
TCC NOTE: The Technical Correlating Committee directs that the Committee Action be revised to read as Accept in Priniciple.
SUBMITTER: Fred Quarnstrom, American Dental Association
RECOMMENDATION: Revise text as follows:
(e) Level 3 compressed air systems shall be equipped with intake filter-muffler(s) of the dry type; receiver(s); shutoff valves; air dryer(s); in-line final particulate filters rated at 5 microns, 98 percent efficiency, with filter-status indicator; and downstream pressure regulator(s) to ensure the delivery of compressed air with a maximum allowable 0.05 ppm liquid oil and 40 percent relative humidity at operating pressure and temperature. Alternatively, the system should comply with American National Standard/American Dental Association Specification No. 94, Dental Compressed Air Quality.
SUBSTANTIATION: As there is an American National Standard/American Dental Association Specification No. 94, Dental Compressed Air Quality, applicable to this area, it should be allowed to provide a viable alternative. A copy of the ANSI/ADA Specification No. 94 is submitted with this proposal.
Note: Supporting material is available for review at NFPA Headquarters.
COMMITTEE ACTION: Accept.
Change the word "alternatively" to "or" and change "should" to "shall".
COMMITTEE STATEMENT: The changes conform to the Manual of Style.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #249)
Committee: HEA-PIP

99- 275 - (4-5.1.1.3(h)): Reject
SUBMITTER: Fred Quarnstrom, American Dental Association
RECOMMENDATION: Revise text as follows:
(h) If desired, an ~~An~~ oil indicator sensor per 4-5.1.1.3(e) ~~shall~~ could be located downstream of the receiver as shown in Figures 4-5.1.1.3 and 4-5.1.1.4. The oil indication device shall be capable of measuring an oil concentration of 0.05 ppm with an accuracy of ± 0.03 ppm in compressed air at 80 to 100 psig (552 to 689 kPa).
SUBSTANTIATION: Clarify this section by making the oil sensor optional. Figure 4-5.1.1.3 indicates that the oil monitor is optional (as denoted by dotted lines). There is no automatic oil indicator sensor commercially available, so no dental manufacturers can comply with this requirement. For oil-less compressor systems, this requirement does not apply.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Level III does not only include dental air but other pneumatic powered devices. Oil indicator sensors are commercially available.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #250)
Committee: HEA-PIP

99- 276 - (4-5.1.1.4): Reject
SUBMITTER: Fred Quarnstrom, American Dental Association
RECOMMENDATION: 4.5.1.1.4 Level 3 Gas-Powered Devices Supply Systems. Question: Nitrogen oil-free, dry is defined in Chapter 2. Is there a need for a dryer and optional oil monitor as indicated in Figure 4-5.1.1.4?
SUBSTANTIATION: Clarify the requirements in 4.5.1.1.4 and Figure 4-5.1.1.4. The discrepancy between 4.5.1.1.4 and Figure 4-5.1.1.4 needs to be clarified.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The submitter did not offer specific wording for change.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #324)
Committee: HEA-PIP

99- 277 - (4-5.1.2): Accept
SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.
RECOMMENDATION: Revise as follows:
"4-5.1.2 ~~Distribution for Patients Level 3~~ (Manifold,..."
"4-5.1.2 Level 3 Source Distribution (Manifold,..."
SUBSTANTIATION: The intent was not to distribute patients, but explain the Level 3 requirements from the source (gases, vacuum, and air power) to the end station inlet or outlet.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #238)
Committee: HEA-PIP

99- 278 - (4-5.1.2.8): Accept in Principle
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise text as follows:
4-5.1.2.8 Warning Systems for Gases.
~~(a) An automatic pressure switch, which will actuate a visual and audible alarm when the line pressure drops below or increases above normal line pressure, shall be connected to each main supply line within a single treatment facility. [See 4-5.4.1.3(f).] The automatic pressure switch shall be installed downstream from any main supply line shutoff valve that may be required by the provisions of 4-5.1.2.11(b)2 and 3.~~
~~(b) A warning system as required in 4-5.1.2.8(a) shall be installed in each single treatment facility served by the supply system. The warning system shall be comprised of an audible and noncancellable visual signal and shall be installed to be heard and seen at a continuously attended location during the time of operation of the facility.~~
~~(c) A warning system as outlined in 4-5.1.2.8(b) shall be installed to indicate whenever automatic changeover occurs or is about to occur. The signal shall remain uncancellable until the reserve supply bank has been replenished. The sensor alarm shall be independent of the sensor actuator of 4-5.1.2.8(a). When two treatment facilities are served by a common supply system, the automatic changeover alarm shall indicate in both facilities.~~

~~(d) A signal shall be indicated separately for each medical gas piping system when the pressure in the main line increases 20 percent or decreases 20 percent above the normal operating pressure. The actuating switch for these signals shall be installed in the main line immediately downstream (on the piping distribution side) of the main line shutoff valve or the source valve if the main line shutoff valve is not required. (See C-4.1.)~~

~~(e) A pressure gauge shall be installed in the main line adjacent to the actuating switch. It shall be appropriately labeled and be readily visible from a standing position. (See C-4.2.1.4.)~~

(a) There shall be an alarm system in each single treatment facility that initiates a separate noncancellable visual alarm and cancellable audible alarm for each gas system under the following conditions:

1. When the gas pipeline pressure drops to 20 percent below or increases to 20 percent above the normal gas system operating pressure.

2. In manifolded gas cylinder systems having manual changeover, when the gas pressure from the primary bank is too low to maintain the system pressure and manual changeover is necessary.

3. When changeover occurs in manifolded gas cylinder systems having automatic changeover.

(b) To provide the alarm required by 4-5.1.2.8(a)1, an alarm pressure switch or sensor shall be installed in the main line immediately downstream from any main line or emergency shutoff valve (if installed) or the source shutoff valve if a main line or emergency shutoff valve is not installed. A pressure gauge that is appropriately labeled and readable from a standing position shall be installed at the alarm initiating device.

(c) Visual and audible alarm indicators shall be installed to be seen and heard in a location that is continuously attended when the facility is in operation.

(d) When two treatment facilities are served by a common gas supply system, separate noncancellable visual alarms and individually cancellable audible alarms shall be provided in each facility.

SUBSTANTIATION: 4-5.1.2.8(d) is not coordinated with 4-5.1.2.8(a) with regards to the location of alarm pressure switches.

4-5.1.2.8(c) requires alarms on automatic changeover, but 4-5.1.1.4(f) and 4-5.1.2.6(b) permit manual changeover. Automatic changeover is required in 4-5.1.2.7(b) only when a system supplies two single treatment facilities.

The two existing references to Appendix C are incorrect.

COMMITTEE ACTION: Accept in Principle.

COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-152 (Log #226) and Proposal 99-219 (Log #233).

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

COMMENT ON AFFIRMATIVE:

WAGNER: All of the proposed changes in this Log do not appear to be addressed in Log #226.

(Log #323)
Committee: HEA-PIP

99- 279 - (4-5.1.2.8): Accept

SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.

RECOMMENDATION: Revise as follows:

4-5.1.2.8 Warning Systems for ~~Gases.~~ (replace with) Oxygen and Nitrous Oxide.

SUBSTANTIATION: The existing wording to some may include Air, Nitrogen, or Vacuum. The only alarm supplied by all manufacturers of Level 3 is for Oxygen and Nitrous Oxide.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

COMMENT ON AFFIRMATIVE:

WAGNER: I'm not sure that this Log (A) has been incorproated in Log #226.

(Log #329)
Committee: HEA-PIP

99- 280 - (4-5.1.2.10(3)): Accept in Principle

SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.

RECOMMENDATION: Delete "...Main and Branches shall be not less than ~~1/2~~ (insert) 3/8 in. OD nominal size."

SUBSTANTIATION: This conflicts with Appendix A-4-5.1.2.10, where the intent is explained. This was accepted as Comment 99-74 (Log #16) on Page 150 of the F98 ROC. This has caused many problems and all Level 3 is supplied as 1/2 in. OD for Oxygen and 3/8 in. OD for other gases and vacuum. The chance for cross connection has been reduced.

COMMITTEE ACTION: Accept in Principle.

Delete "nominal".

COMMITTEE STATEMENT: Editorial.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 21

NEGATIVE: 1

NOT RETURNED: 1 Bancroft

EXPLANATION OF NEGATIVE:

RIDENOUR: This allows Level 3 gas systems to be piped in 3/8 in. O.D. or 1/4 in. nominal tubing. Before it was 1/2 in. O.D. which shouldn't have been changed.

COMMENT ON AFFIRMATIVE:

SHOEMAKER: Word to ensure that oxygen can not be run in any pipe sized less than 1/2 in. O.D. (3/8 in. nominal) and that "other gases" such as N_2O be run in 3/8 in. O.D. (1/4 in. nominal).

WAGNER: Log #329 (AIP) is not coordinated with Log #239 (AIP). Log #329 calls for 3/8 in. OD minimum pipe sizes (which covers gases other than oxygen). Oxygen is normally 1/2 in. OD in Level 3 systems. The standard should call for 1/2 in. OD minimum for oxygen and 3/8 in. OD minimum for gases other than oxygen. Otherwise, people can install 3/8 in. OD for oxygen.

(Log #239)
Committee: HEA-PIP

99- 281 - (4-5.1.2.10(a)): Accept in Principle

TCC NOTE: The Technical Correlating Committee directs that the proposal be returned to committee. The proposal and Committee Action are difficult to decipher; the Committee Statement is not germane to the proposal or Committee Action.

SUBMITTER: J. Richard Wagner, The Poole & Kent Company

RECOMMENDATION: Revise 4-5.1.2.10(a) as follows:

3. Piping shall be ASTM B819 specification hard copper seamless medical gas tubing; ASTM B819 tubing is identified by the markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in green (Type K) or blue (Type L). Mains and branches shall be not less than 1/2 in. nominal size. Factory-installed tube on station outlets (or inlets) shall be permitted to be 3/8 in. O.D. (1/4 in. nominal) size. ~~Connections to~~ Connecting tubing for gauges and alarm switches and runouts to alarm panels shall be permitted to be 1/4 in. O.D. (1/8 in. nominal) size.

Exception: For systems operated at pressures between 200 and 300 psig (1380 and 2070 kPa, respectively), ASTM B819, Type K copper shall be used.

4. ~~Copper tube shall, wherever possible, be installed overhead or below floor level. Only where the installation requires installing in a slab, exceptions below are permitted to apply:~~ Piping shall be installed overhead or below floor level wherever possible. The following exceptions are permitted only when piping must be run within a floor slab to reach the service outlets/inlets:

a. Annealed (soft temper) ASTM B88 (Type K or L) copper tube, up to 1/2 in. O.D. (3/8 in. nominal) size, that has been prepared for oxygen service according to CGA Pamphlet G-4.1, Cleaning Equipment for Oxygen Service, shall be permitted to be used. ~~up to 1/2 in. O.D. (3/8 in. nominal) size.~~

b. ~~The tube shall be installed in conduit sufficiently large to accept the following gases (if used) O_2, N_2O, N_2, MA, DA, Level 3 vacuum.~~ A conduit(s) shall be embedded in the floor slab that is sufficiently large and has adequate bend radii to permit subsequent installation of the necessary gas and/or vacuum lines.

c. ~~The pipe shall be a continuous run from entry to exit of the conduit. PVC conduit shall be permitted for Level 3 vacuum only.~~ Each line pulled into the conduit shall be a continuous length of tube having no joints within the conduit.

d. ~~All station outlets (inlets) shall be permitted to be completed after the slab is complete.~~

~~4.~~ 5. Except as provided...

~~5.~~ 6. Valves, fittings, and other...
~~6.~~ 7. Piping systems shall...
~~7.~~ 8. Piping shall be supported...
~~8.~~ 9. Joints in medical gas...
~~9.~~ 10. Listed or approved...
~~10.~~ 11. Turns, offsets, and other...
~~11.~~ 12. Piping shall be protected...
~~12.~~ 13. Medical gas risers...
~~13.~~ 14. Piping shall not be installed...
~~14.~~ 15. Medical gas piping shall be...
~~15.~~ 16. Piping exposed in corridors...
~~16.~~ 17. Where a system...

SUBSTANTIATION: The 1/4 in. O.D. size applies to the connecting tubing for gauges and alarm switches, not the connections themselves.

To clarify the special exception and requirements for installing soft copper tube in Level 3 piping systems.

COMMITTEE ACTION: Accept in Principle.

Delete the proposed "Exception" and revise as follows:

Revise 4-5.1.2.10(a) as follows:

3. Strike the exception:

* Exception: For systems operated at pressures between 200 and 300 psig (1380 and 2070 kPa, respectively), ASTM B819, Thype K copper shall be used.

4. Copper tube shall, wherever possible, be installed overhead or below floor level. Only where the installation requires installing in a slab, exceptions below are permitted to apply:

Delete the added in wording .

** Piping shall be installed overhead or below floor level wherever possible.

Continue, with added words to read:

The following shall be permitted only when piping must be run underground or within a floor slab to reach the service outlets/inlets:

a. No updates.

b. Add in the same update as stated above:

The tube shall be installed in conduit sufficiently larege to accept the following gases (if used O2, N2O, N2, MA, DA, Level 3 vacuum. Conduits, when run underground or embedded in the floor slab, shall be large enough to permit subsequent installation of the necessary gas and/or vacuum lines.

c. No updates

d. Remainder, no changes.

COMMITTEE STATEMENT: The wording was changed to agree with previous wording. In addition, this issue falls under the building code, is job specific, and not under the scope of the committee.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

COMMENT ON AFFIRMATIVE:

SHOEMAKER: See my Comment on Affirmative on Proposal 99-280 (Log #329).

WAGNER: In the Committee Action on 4b, the following should be deleted: ~~The tube shall be installed in conduit sufficiently large to accept the following gases (if used O2, N2), N2, MA, DA, Level 3 vacuum.~~

The following change should be made in 4-5.1.2.10(a)3 to accomplish the intent of Log #329. Mains and branches shall be not less than ~~1/2 in. nominal size~~ 1/2 in. O.D. (3/8 in. nominal) size for oxygen and 3/8 in. OD (1/4 in. nominal) size for other gases and vacuum.

The following change should be made in 4-5.1.2.10(a)3 to be consistent with Log #291: Connecting tubing for gauges and alarm switches and runouts to alarm panels shall be permitted to be ~~1/4 in. O.D. (1/8 in. nominal)~~ 3/8 in. O.D. (1/4 in. nominal) size.

(Log #71)
Committee: HEA-PIP

99- 282 - (4-5.1.2.10(a)3): Accept

SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.

RECOMMENDATION: Revise text as follows:

"Connection to gauges and alarm switches and runouts to alarm panels shall be permitted to be ~~1/4 in. O.D. (1/8 in. nominal)~~ 3/8 in. O.D. (1.4 in. nominal) size."

SUBSTANTIATION: ASTM B819 is not made in 1/4 in. O.D. (1/8 in. nominal).

COMMITTEE ACTION: Accept.

Editorial.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #72)
Committee: HEA-PIP

99- 283 - (4-5.1.2.10(a)3 c): Accept in Principle

SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.

RECOMMENDATION: Revise text as follows:

"The pipe shall be a continuous run from entry to exit of the conduit without any joints within the conduit. ~~PVC conduit shall be permitted for Level 3 vacuum only.~~"

SUBSTANTIATION: All piping is a continuous run. If the intent is to have no joint within the conduit, it needs to be spelled out. The PVC in this sentence refers to the material of the vacuum piping, not the conduit (encasement piping). Vacuum piping run in PVC piping requires joints within the conduit which in the first sentence is prohibited. Running vacuum piping in a conduit would require annealed copper tubing for a continuous run from entry to exit of the conduit.

COMMITTEE ACTION: Accept in Principle.

COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-281 (Log #239).

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #198)
Committee: HEA-PIP

99- 284 - (4-5.1.2.10(a)7): Accept

SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Eng

RECOMMENDATION: Revise text as follows:

"Vertical risers, all sizes. Every floor, but not to exceed ~~1.5~~ 15 ft (4.57 m)."

SUBSTANTIATION: Editorial change.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #240)
Committee: HEA-PIP

99- 285 - (4-5.1.2.10(a)7): Accept

SUBMITTER: J. Richard Wagner, The Poole & Kent Company

RECOMMENDATION: Revise as follows:

4-5.1.2.10(a)7 Vertical risers, all sizes. Every floor, but not to exceed ~~1.5~~ 15 ft (4.57 m).

SUBSTANTIATION: To correct an apparent typographical error.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #273)
Committee: HEA-PIP

99- 286 - (4-5.1.2.10(b)1): Accept in Principle

SUBMITTER: David D. Eastman, Metro Detroit Plumbing Industry Center

RECOMMENDATION: Delete text as follows:

"Brazed tube joints shall be of the socket type ... Brazing filler metals shall comply with ANSI/AWS A5.8, Specifications for Brazing Filler Metal, ~~except that filler metals having compositions not conforming to the exact ANSI/AWS A5.8 classifications shall be permitted when used according to the manufacturer's instructions.~~"

SUBSTANTIATION: The current wording allows the use of virtually any brazing filler metal, whether it is suitable for the purpose or not, as long as the installer follows the manufacturer's instructions. The referenced ANSI/AWS standards allow a wide

choice of readily available filler metals with proven characteristics of chemical composition and thermal integrity.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-183 (Log #289).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #241)
Committee: HEA-PIP

99- 287 - (4-5.1.2.10(b)11): Accept
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise text as follows:
11. Brazed joints that are found to be defective under 4-5.1.2.10(b)10, conditions a, c, d, f, or g, shall be permitted to be repaired, except that no joint shall be ~~repaired~~ reheated more than once before being replaced. Brazed joints that are found to be defective under 4-5.1.2.10(b)10, conditions b and e, shall be replaced.
SUBSTANTIATION: To indicate that joints must be replaced if they cannot be repaired after one attempt at reheating.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
RIDENOUR: This rejection allows Level 3 facilities with oxygen, nitrogen, nitrous oxide, carbon dioxide, etc., to be installed by the doctor's nephew or the garbage collector, if he desires. Keep in mind the mind set of the committee was dentist but this covers many doctor offices, surg-centers, etc.

(Log #199)
Committee: HEA-PIP

99- 288 - (4-5.1.2.10(b)12): Reject
SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Add the following text:
"Brazing procedures and brazer performance shall be qualified as required under 4-3.1.2.12."
SUBSTANTIATION: Brazing procedures and brazer performance requirements are not covered in Level 3 systems. Level 3 brazing requirements should be the same as Level 1 requirements.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Level 3 systems do not need to be installed by certified brazers.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 21
NEGATIVE: 1
NOT RETURNED: 1 Bancroft
EXPLANATION OF NEGATIVE:
MOHILE: We wish to speak in opposition to the Committee's rejection of this proposal. Why are the installers of medical oxygen and nitrous oxide systems in level 3 locations not required to have to meet the same brazing performance requirements as the installers of medical oxygen and nitrous oxide systems in hospitals?
As review of the Level 3 requirements it would now appear to be as follows:
1. The installer does not have to have any special qualifications as far as brazing medical gas pipelines.
2. Soft tempered tubing is permitted on positive pressure gases in certain circumstances while it is prohibited in hospitals.
3. Tubing that is not specifically marked as ASTM B-819 (cleaned for medical gas service) is permitted to be used.
4. Flared fittings are permitted to be used while they are prohibited in hospitals.
5. Testing for actual gas content (oxygen, nitrous oxide, etc.), as required in hospitals per 4-3.4.1.3(i) is not required in office-based facilities.
Why do we not remove the Level 3 systems from the requirements of NFPA 99 entirely?

(Log #73)
Committee: HEA-PIP

99- 289 - (4-5.1.2.10(h)3): Accept
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"On-Site Recleaning. On-site recleaning of the interior surfaces of tubes, valves, fittings, and other components shall be limited to re-cleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Such surfaces shall be cleaned by washing in a clean, hot water/alkaline solution, such as sodium carbonate or trisodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot potable water."
SUBSTANTIATION: This was a change in 1999 that failed to make the Standard in the 1999 edition.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #CP717)
Committee: HEA-PIP

99- 290 - (4-5.1.2.10(h)3): Accept
SUBMITTER: Technical Committee on Piping Systems
RECOMMENDATION: Modify 4-5.1.2.10(h)3 as follows:
3. On-Site Re-Cleaning. On-site re-cleaning of the interior surfaces of tubes, valves, fittings, and other components shall be limited to recleaning surfaces in the immediate vicinity of the joints that have become contaminated prior to brazing. Such surfaces shall be cleaned by washing in an aqueous cleaning solution as recommended in CGA Pamphlet G-4.1-1996, "Cleaning Equipment for Oxygen Service" and listed in CGA Pamphlet O2-DIR- 2000, "2000 Directory of Cleaning Agents for Oxygen Service" a clean, hot water/alkaline solution, such as sodium carbonate or trisodium phosphate (1 lb to 3 gal of potable water). Interior surfaces shall be thoroughly scrubbed and rinsed with clean, hot potable water.
SUBSTANTIATION: Solutions such as sodium carbonate or trisodium phosphate are require to be dissolved into, and used with water having a minimum temperature of 140°F. If inadequately heated and/or temperature not maintained, cleaning will not be accomplished. If inadequately rinsed the sodium carbonate or trisodium phosphate will crystallize during drying and attach to the surfaces of object cleaned.
This changes allows the use of new aqueous cleaning solutions that are recommended to the manufacturers of "oxygen cleaned" equipment.
COMMITTEE ACTION: Accept.
COMMITTEE STATEMENT: This proposal will be editorially inserted into 99-293 (Log #251).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #242)
Committee: HEA-PIP

99- 291 - (4-5.1.2.11(a)): Accept
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Delete text as follows:
~~4-5.1.2.11(a) Non-Emergency Shutoff Valves. Systems operating at varying operating pressures from 0.200 psig (1380 kPa), and not operating at a constant regulated 50 psig (345 kPa), shall have a manual shutoff valve within the facility between the source and all service outlets.~~
SUBSTANTIATION: It is not clear which gas systems require non-emergency shutoff valves, and why.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #243)
Committee: HEA-PIP

99- 292 - (4-5.1.2.12): Accept in Principle
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise text as follows:
4-5.1.2.12 Gas Station Outlets. ~~See C-4.2.~~
~~(a) Station outlets shall be located at an appropriate height above the floor to prevent physical damage to equipment attached to the outlet.~~
~~Floor mounts for Level 3 gas systems shall not be recessed and shall be permitted to be mounted in or on the dental junction box, when mounted to the floor.~~
~~(b)~~ (a) Outlets shall be located to avoid physical damage to the ~~valve~~ outlet and attached equipment.
(b) Floor outlets shall not be recessed and shall be permitted to be installed in or on a junction box.
SUBSTANTIATION: To delete redundant text and the reference to only dental junction boxes. C-4.2 does not apply to gas station outlets in Level 3 systems.
COMMITTEE ACTION: Accept in Principle.
Revise text as follows:
4-5.1.2.12 Gas Station Outlets. ~~See C-4.2.~~
~~(a) Station outlets shall be located at an appropriate height above the floor to prevent physical damage to equipment attached to the outlet.~~
~~Floor mounts for Level 3 gas systems shall not be recessed and shall be permitted to be mounted in or on the dental junction box, when mounted to the floor.~~
~~(b)~~ (a) Outlets shall be located to avoid physical damage to the ~~valve~~ outlet and attached equipment.
(b) Floor outlets shall not be recessed and shall be permitted to be installed in or on a recessed junction box.
COMMITTEE STATEMENT: Recessed was added to clarify the options available.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #251)
Committee: HEA-PIP

99- 293 - (4-5.1.2.12): Accept in Principle
SUBMITTER: Fred Quarnstrom, American Dental Association
RECOMMENDATION: Revise text as follows:
4.5.1.2.12 Gas Station Outlets.
(a) Station outlets shall be located at an appropriate height above the floor to prevent physical damage to equipment attached to the outlet. Floor mounts for Level 3 gas systems shall not be recessed and shall be permitted to be mounted in or on the dental junction box, when recessed or mounted on the floor.
SUBSTANTIATION: In dental offices, recessed junction boxes have been shown to perform adequately. This arrangement should be included in this section.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-292 (Log #243).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #103)
Committee: HEA-PIP

99- 294 - (4-5.1.3.4(a)): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: In 4-5.1.3.4(a), delete "as well as Level 3 vacuum systems." Paragraph would read:
"(a) Gases used to power devices, such as in a compressed air or nitrogen system, shall not be required to have an alarm system."
SUBSTANTIATION: Section 4-5.1.3 covers distribution requirements for gas-powered devices. Subject of alarms for vacuum systems is addressed in 4-5.2.2.7.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #104)
Committee: HEA-PIP

99- 295 - (4-5.2.1.2): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: In paragraph 2, sentence 2, delete "dental" from "the dental air compressor supply." Sentence would read:
"Maintenance programs, in accordance ... shall be established for the air compressor supply system ..." (remainder of sentence the same).
SUBSTANTIATION: Chapter 4 is supposed to be facility non-specific.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #244)
Committee: HEA-PIP

99- 296 - (4-5.2.1.2): Accept in Principle
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise text as follows:
4-5.2.1.2 Level 3 vacuum pumps shall be suitable for the intended purpose. Wet vacuum piping ~~system~~ systems shall ~~have~~ include a liquid/air separator ~~in the system~~. [See Figures 4-5.2.1.2(a) through (d).]
Equipment shall be obtained from and be installed under the supervision of a manufacturer(s) or supplier(s) who is (are) familiar with the proper practices for its ~~construction~~ installation and use. ~~Maintenance programs, in accordance with the recommendations of manufacturer(s), shall be established for the dental air compressor supply system as connected in each individual installation.~~ Maintenance programs that incorporate the equipment manufacturer's recommendations shall be established for each Level 3 vacuum system.
SUBSTANTIATION: This section addresses the installation of equipment, not its construction. To delete the reference to dental air compressor supply system in Level 3 vacuum.
COMMITTEE ACTION: Accept in Principle.
Add the following:
"Systems shall be maintained and repaired in accordance with the manufacturers instructions." to the end of the recommendation.
COMMITTEE STATEMENT: This was added to be consistent with Proposal 99-273 (Log #247).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #328)
Committee: HEA-PIP

99- 297 - (4-5.2.1.2): Accept in Principle
SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.
RECOMMENDATION: Editorial error: Delete "..., shall be established for the ~~dental air compressor~~ and insert Level 3 vacuum supply system as..."
SUBSTANTIATION: This is incorrect text.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-295 (Log #104).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #245)
Committee: HEA-PIP

99- 298 - (4-5.2.1.6 and 4-5.2.1.8): Accept
SUBMITTER: J. Richard Wagner, The Poole & Kent Company
RECOMMENDATION: Revise text as follows:
4-5.2.1.6 Exhaust to the outdoors shall be protected against the entry of insects, vermin, debris, and precipitation. Exhaust lines shall be sized to minimize back pressure in accordance with the vacuum pump manufacturer's requirements.
4-5.2.1.8 ~~*Vacuum exhaust from separate pumps shall follow the manufacturer's recommendations.~~

SUBSTANTIATION: The explanatory material in Appendix A discusses exhaust from dual pumps. 4-5.2.1.8 addresses separate pumps.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #105)
Committee: HEA-PIP

99- 299 - (4-5.2.2.1 and 4-5.2.2.3): Accept in Principle
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Delete Paragraph 4-5.2.2.1. Renumber Section 4-5.2.2.2 to 4-5.2.2.7 as 4-5.2.2.1 to 4-5.2.2.6, respectively.
SUBSTANTIATION: Paragraph 4-5.2.2.3 was added in the 1996 edition of NFPA 99 (adding the allowance of PVC schedule 40 among other changes). It is almost identical to Paragraph 4-5.2.2.3. It would appear that this paragraph (4-5.2.2.3) was intended to replace 4-5.2.2.1.
COMMITTEE ACTION: Accept in Principle.
In addition to the proposed change, revise 4-5.2.2.3 by changing the word "per" to "when recommended by".
COMMITTEE STATEMENT: This change makes the requirement more clear.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #327)
Committee: HEA-PIP

99- 300 - (4-5.3): Accept
SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.
RECOMMENDATION: Revise text as follows:
"Piped WAGD (insert) (Scavenging) Systems-Level 3."
SUBSTANTIATION: Scavenging is the preferred use for Level 3. Scavenging is by the American Dental Association and in OSHA documents.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #106)
Committee: HEA-PIP

99- 301 - (4-5.4.1.1): Reject
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: In paragraph 1, delete in the parenthesis the following:
"and Level 3 vacuum."
Parenthesis would read:
"including oxygen, nitrous oxide, nitrogen, Level 3 compressed air."
SUBSTANTIATION: Section 4-5.4.1 covers piped patient gas systems. Inspection and testing criteria for Level 3 piped vacuum systems should be covered in Section 4-5.4.3.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The wording does apply to level 3 vacuum.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #107)
Committee: HEA-PIP

99- 302 - (4-5.4.1.1): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Delete paragraph 3 of 4-5.4.1.1 ("An existing system ... hazard to life.")
SUBSTANTIATION: This text is already stated in 4-1.4. If this text is not deleted, then Section 4-5.4 does not correlate with 4-3.4.1.1 and 4-4.4.1.1.
Alternatively, this information can be included in 4-5.5, which covers existing systems.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #326)
Committee: HEA-PIP

99- 303 - (4-5.4.1.3):
TCC NOTE: The Technical Correlating Committee directs that this proposal be returned to Committee. The committee's action was not clear. Are paragraph headers being revised, or text and substantiation being revised, or are the requirements of paragraph 4-5.4.1.3 being deleted?
SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.
RECOMMENDATION: Delete ~~4-5.2.1.3~~ and insert 4-5.4.4.
SUBSTANTIATION: The paragraph numbers should be corrected for correct testing. The test required by existing 4-5.4.1.3 must be done after the walls are closed. Therefore, the test required by existing 4-5.4.2 and 4-5.4.3 are done before the walls are closed.
Note: Supporting material is available for review at NFPA Headquarters.
COMMITTEE ACTION: Accept.
Note: This is to delete the entire section 4-5.4.1.3.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #124)
Committee: HEA-PIP

99- 304 - (4-5.5.2.3): Accept
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Move these requirements to Chapters 12, 13, 16, 17, and 20.
Submitter's Note: See related proposals on 12/13/16/17, 3-4.1.
SUBSTANTIATION: The requirements contained in this paragraph no longer belong here. The selection of a level for a facility is governed by Chapters 12, 13, 16, 17, and 20 and there should not be these limitations within the level itself.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #288)
Committee: HEA-PIP

99- 305 - (4-5.5.2.3): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: 1. Move Paragraph 4-5.5.2.3(a) in its entirety between 4-5.1 and 4-5.1.1, without assigning it a paragraph number.
2. Move Paragraph 4-5.5.2.3(b)3 to Section 4-5.1.2, and number it new 4-5.1.2.12.
3. Move Paragraph 4-5.5.2.3(d) after new paragraph 1 under 4-5.1 (proposal number 1 above).
4. Move Paragraph 4-5.5.2.3(e) to Section 4-5.1.2, and number it new 4-5.1.2.13, new 4-5.1.3.5, and new 4-5.2.2.8.
SUBSTANTIATION: 1. Section 4-5.5 applies to existing installation. Text of 4-5.5.2.3(a) is "scope" material.
2. This text applies to new manufactured assemblies, and thus belongs in Section 4-5.1.2.
3. This text relates to Paragraph 4-5.5.2.3(a), and thus should be moved to the same new section as that text.
4. This text is installation criteria and belongs in Sections 4-5.1 and 4-5.2.
Text under 4-5.1, but before 4-5.1.1, would read as follows:
"*Level 3 nonflammable medical gas systems cover installations that:
1. Have not more than 3000 ft^3 (85 m^3) total capacity of all gases (excluding nitrogen and medical air in cylinder for powered devices) connected and in storage at one time, except that the total capacity of all gases shall be permitted to be increased to 5000 ft^3

(143 m^3) excluding nitrogen and medical air for powered devices) if oxygen is used in a DOT Specification 4L (liquid) cylinder, and

2. Have a listed pressure regulator directly connected to each cylinder, and

3. Supply only a single treatment facility and also as a minimum comply with the specific requirements of 4-5.1.2.6, or

4. Supply a maximum of two adjoining single treatment facilities and also as a minimum comply with the specific requirements of 4-5.1.2.7.

Medical gas systems not specifically provided for in above paragraph, such as systems within a hospital served by a central supply system, or systems serving three or more treatment facilities, as might be found in a medical or dental office building, shall comply in all respects with Level 1 systems."

New section 4-5.1.2.12 would read as follows:

"4-5.1.2.12 Manufactured assemblies in which are intended to be piped nitrous oxide or oxygen shall be (a) constructed of metal, or (b) tested to pass a minimum 200 flame spread rating and 200 smoke developed index in accordance with NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, or, if constructed of polymers (plastic, fiberglass, etc.), a rating of 94 VO or better."

New Section 4-5.1.2.13 would read as follows:

"4-5.1.2.13 Equipment shall be obtained from and be installed under the supervision of a manufacturer or supplier familiar with proper practices for its construction and use."

New section 4-5.1.3.5 would read as follows:

"4-5.1.3.5 Equipment shall be obtained from and be installed under the supervision of a manufacturer or supplier familiar with proper practices for its construction and use."

New section 4-5.2.2.8 would read as follows:

"4-5.2.2.8 Equipment shall be obtained from and be installed under the supervision of a manufacturer or supplier familiar with proper practices for its construction and use."

Section 4-5.5.2.3 would read as follows:

4-5.5.2.3 Patient Gas Systems — Level 3.

(a) Material Oxygen Compatibility.

1.* Oxygen system components including, but not limited to, containers, valves, valve seats, lubricants, fittings, gaskets, and interconnecting equipment including hoses, shall have adequate compatibility with oxygen under the conditions of temperature and pressure to which the components may be exposed in the containment and use of oxygen. Easily ignitable materials shall be avoided unless they are parts of equipment or systems that are approved, listed, or proved suitable by tests or by past experience.

2. The provisions of 4-5.5.2.3(a)1 also apply to nitrous oxide, oxygen-nitrous oxide mixtures, and to other medical gas mixtures containing more than 23.5 percent oxygen.

(b) Maintenance programs in accordance with the manufacturer's recommendations shall be established for the medical air compressor supply system as connected in each individual installation.

(c) Every facility shall establish a procedure for manually turning off the gas supply at the cylinder valves at the end of the work day, or when the facility is not in use. No other method such as Emergency Shutoff Valves or remote actuators [4-5.1.2.11(b)] shall be used to turn off the gas supply.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #74)
Committee: HEA-PIP

99- 306 - (4-5.5.2.3(a)4): Accept
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Revise text as follows:
"Supply a maximum of two adjoining single ~~tr\eatment~~ treatment facilities and also as a minimum comply with the specific requirements of 4-5.1.2.7."
SUBSTANTIATION: Editorial.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #210)
Committee: HEA-PIP

99- 307 - (4-5.5.2.3(c)(i)): Accept in Principle
SUBMITTER: Richard E. Hoffman, Compressed Gas Association
RECOMMENDATION: Add:
Reference: "CGA Pamphlet E-10, Maintenance of Medical Gas and Vacuum Systems in Health Care Facilities."
SUBSTANTIATION: Need reference to E-10 as a guide.
COMMITTEE ACTION: Accept in Principle.
Add the following to the annex A-4-5.5.2.3(c):
"See CGA Pamphlet E-10, Maintenance of Medical Gas and Vacuum Systems in Health Care Facilities."
COMMITTEE STATEMENT: This informational guideline were moved to the annex.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #CP707)
Committee: HEA-PIP

99- 308 - (4-6): Accept
TCC NOTE: The Technical Correlating Committee refers this proposal to the Technical Committee on Laboratories for review, comment and correlation with the Technical Committee on Piping Systems.
SUBMITTER: Technical Committee on Piping Systems
RECOMMENDATION: Move all of 4-6 to Chapter 10 except 4-6.2.2 which would become 4-3.2.2.1(b).
Existing 4-3.2.2.1 would become 4-3.2.2.1(a).
SUBSTANTIATION: Laboratory gas piping more appropriately belongs in Chapter 10.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #108)
Committee: HEA-PIP

99- 309 - (4-6.1.2.3): Reject
TCC NOTE: The Technical Correlating Committee refers this proposal to the Technical Committee on Laboratories for review, comment and correlation with the Technical Committee on Piping Systems.
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Revise 4-6.1.2.3 to read:
"Piping systems for nonflammable gases shall comply with 4-3.1.2 as specified in Chapter 4. (Wording changed is underlined.)
SUBSTANTIATION: To clarify that only the section on piping distribution is to be applied since 4-6.1.2 covers only distribution portion of system.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Proposal 99-308 (Log #CP707) which reads as follows:
Move all of 4-6 to Chapter 10 except 4-6.2.2 which would become 4-3.2.2.1(b).
Existing 4-3.2.2.1 would become 4-3.2.2.1(a).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #75)
Committee: HEA-PIP

99- 310 - (4-6.2.3 (New)): Reject
TCC NOTE: The Technical Correlating Committee refers this proposal to the Technical Committee on Laboratories for review, comment and correlation with the Technical Committee on Piping Systems.
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Add the following text:
"Vacuum piping shall comply with 4-3.2.2.2, Vacuum System Piping Network."
SUBSTANTIATION: The piped vacuum system for Level 4 has no requirements with regard to the material or joining methods.
COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: See Committee Proposal 99-308 (Log #CP707).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #76)
Committee: HEA-PIP

99- 311 - (4-6.4.3 (New)): Reject
TCC NOTE: The Technical Correlating Committee refers this proposal to the Technical Committee on Laboratories for review, comment and correlation with the Technical Committee on Piping Systems.
SUBMITTER: Dale J. Dumbleton, American Medical Gas Inst.
RECOMMENDATION: Add the following text:
"WAGD piping shall comply with 4-3.2.2.2, Vacuum System Piping Network."
SUBSTANTIATION: WAGD piped system for Level 4 has no requirements with regard to the material or joining methods.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Proposal 99-308 (Log #CP707) which reads as follows:
Move all of 4-6 to Chapter 10 except 4-6.2.2 which would become 4-3.2.2.1(b).
Existing 4-3.2.2.1 would become 4-3.2.2.1(a).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #CP104)
Committee: HEA-ELE

99- 312 - (Chapter 7): Accept
SUBMITTER: Technical Committee on Electrical Equipment
RECOMMENDATION: Delete, rewrite as a requirement, or move to annex, all "exceptions" unless qualified by the Manual of Style as an exception.
SUBSTANTIATION: See Committee Proposal 99-2 (Log #CP100).
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 4 Aronow, Carlson, Meyer, Peglow

(Log #CP105)
Committee: HEA-ELE

99- 313 - (Chapter 7): Accept
SUBMITTER: Technical Committee on Electrical Equipment
RECOMMENDATION: Revise text to read as follows:
~~Chapter 7~~ Chapter 8 Electrical Equipment
8.1 Applicability.
~~7.1* Scope.~~
~~7.1.1 This chapter covers the performance, maintenance, and testing of electrical equipment used within health care facilities.~~
8.1.1 ~~7.1.2 Although~~ An appliance that yields erroneous data or functions poorly ~~can be~~ is dangerous~~,~~ ~~q~~Quality and assurance of full appliance performance is not covered except as it relates to direct electrical or fire injury to patients or personnel.
8.1.2 ~~7.1.3 This chapter does not require formal approval or listing of any appliance.~~ (Log #CP102)
8.1.3 ~~7.1.4~~ Experimental or research apparatus built to order or under development shall be used under qualified supervision and shall have a degree of safety equivalent to that described herein or have a degree of safety that has been deemed acceptable by the facility.
8.2* ~~7.2*~~ Nature of Hazards.
8.2.1* ~~7.2.1*~~ Fire and Explosion.
C.8.2.1 Transmission of electricity generates heat. The normal operating temperature of a device is a function of material and design. Equipment or wiring faults can cause abnormal temperature increases. These abnormal temperatures can cause fire and explosions. Use of oxygen or other oxidizing agents lowers ignition temperatures. Normal operating temperatures of equipment not designed for use in oxygen-enriched atmospheres can cause fires if used in oxygen-enriched atmospheres.
8.2.2 ~~7.2.2~~ Electrical Shock.
8.2.2.1* ~~7.2.2.1~~ Elimination of Shock Hazards.
C.8.2.2.1 ~~7.2.2.1.2~~ Adequate grounding for electrical equipment is an important safeguard against fire and electric shock (see 3-3.3.2 and 7-5.1.2.2).
~~7.2.2.2*~~ Effects of Moisture. Moisture, in the form of liquids, vapors, or mists, can degrade insulation to the point where fire, equipment malfunction, and electric shock hazard become a threat. Moisture can enter equipment as a result of defective seals, leaks, or inadvertent spillage. Vessels containing liquids should not be placed on electrical equipment.
8.2.2.1.1 ~~7.2.2.1.1 Personnel are cautioned to be aware of the hazards presented by defective or improperly employed electrical equipment (see 7-2.2.2) and to avoid the use of defective electrical equipment (see 7-6.2.2.4).~~ Personnel shall be trained to recognize the shock hazards created by the use of defective or improperly used electrical equipment.
8.2.3* ~~7.2.3~~ Burns.
8.2.3.1* ~~7.2.3.1~~ Heated Surfaces.
C.8.2.3.1 Sustained skin contact with surfaces of equipment that have temperatures in excess of 42°C (107°F) can cause burns. Caution is ~~required~~ advised when exposing patients to warmed surfaces~~., particularly when they are helpless.~~
8.2.3.2* ~~7.2.3.2*~~ High-~~F~~frequency ~~E~~electromagnetic ~~F~~fields~~.~~
C.8.2.3.2 ~~P~~particularly those from electrosurgical generators and from lasers, are used to intentionally destroy tissue. Inadvertent burns, or ignition of combustible materials, is a hazard.
8.2.4 ~~7.2.4~~ Interruption of Power. (Reserved)
8.2.5* ~~7.2.5*~~ RF Interference.
~~7.2.6 Mechanical Injury. (Reserved)~~
~~7.3 Source.~~
8.3* ~~7.3.1*~~ Electrical System.
~~7.3.2 Battery. (Reserved)~~
~~7.4 Distribution. (Reserved)~~
8.4 ~~7.5~~ Performance Criteria and Testing.
8.4.1 ~~7.5.1~~ Patient-Care-Related Electrical Appliances and Equipment.
8.4.1.1 ~~7.5.1.1~~ Permanently Connected (Fixed).
~~7.5.1.1.1 Grounding of Appliances.~~ Patient-connected electric appliances shall be grounded to the equipment grounding bus in the distribution panel by an insulated grounding conductor run with the power conductors.
8.4.1.2 ~~7.5.1.2~~ Cord- and Plug-Connected (Portable).
~~7.5.1.2.1 General.~~ All patient-care-related electrical equipment supplied by a flexible cord and plug, carrying 20 V or more, shall meet the requirements of 8.4.1.2 ~~7.5.1.2~~.
8.4.1.2.1 ~~7.5.1.2.2~~ Grounding of Appliances.
8.4.1.2.1.1 All cord-connected electrically powered appliances used in the patient care vicinity shall be provided with a three-wire power cord and a three-pin grounding-type plug.
8.4.1.2.1.2 ~~Exception:~~ Double-insulated appliances shall be permitted to have two conductor cords.
8.4.1.2.2 ~~7.5.1.2.3~~ Attachment Plugs. Attachment plugs installed by the facility shall meet the requirements of 9-2.1.2.1.
8.4.1.2.3 ~~7.5.1.2.4~~ Power Cords. Power cords installed by the facility shall meet the requirements of 9-2.1.2.2.
8.4.1.2.4 ~~7.5.1.2.5~~ Line Voltage Equipment - Anesthetizing Locations. Flexible cord for portable lamps or portable electric appliances operating at more than 12 V between conductors, intended for use in anesthetizing locations, shall meet all of the following requirements: ~~be continuous and without switches from the appliance to the attachment plug and of a type designated for extra-hard usage in accordance with Section 501-11 of NFPA 70, National Electrical Code. Cords shall be protected at the entrance to equipment by a suitable insulating grommet. The flexible cord shall be of sufficient length to reach any position in which the portable device is to be used, and the attachment plug shall be inserted only in a fixed, approved receptacle. For correct use and maintenance of adapters, the provisions of 7-6.2.1.5 shall apply.~~
(a) Be continuous
(b) Be without switches from the appliance to the attachment plug
(c) Be of a type designated for extra-hard usage in accordance with NFPA 70, National Electrical Code
(d) Be protected at the entrance to equipment by an insulating grommet
(e) Be of sufficient length to reach any position in which the portable device is to be used

(f) The attachment plug shall be inserted only in a fixed approved receptacle.

(g) Adaptors shall be used and maintained in accordance with 8.5.2.5.

8.4.1.2.4.1 ~~Exception No. 1:~~ Foot-treadle-operated controllers ~~are~~ shall be permitted in any anesthetizing location if appended to portable electric appliances in an approved manner. Foot-treadle-operated controllers and their connector shall be splashproof. Exception No. 2: Two or more power receptacles supplied by a flexible cord ~~are~~ shall be permitted to be used to supply power to plug-connected components of a movable equipment assembly that is rack-, table-, or pedestal-mounted provided all of the following conditions are met:

(a) The receptacles are an integral part of the equipment assembly, permanently attached; and

(b) The sum of the ampacity of all appliances connected to the receptacles shall not exceed 75 percent of the ampacity of the flexible cord supplying the receptacles; and

(c) The ampacity of the flexible cord ~~is suitable and~~ shall be in accordance with ~~the current edition of~~ NFPA 70, National Electrical Code~~; and~~

(d) The electrical and mechanical integrity of the assembly is regularly verified and documented through an ongoing maintenance program.

(e) ~~Exception No. 3:~~ Overhead power receptacles ~~are~~ shall be permitted to be supplied by a flexible cord with strain relief (ceiling drop) that is connected at a ceiling-mounted junction box and either of the following ways:

(a) Permanently; or

(b) Utilizing a locking-type attachment plug ~~cap~~ and receptacle combination, or other method of retention. ~~In either connection mode, suitable strain relief shall be provided.~~

8.4.1.2.5 ~~7.5.1.2.6~~ Adapters and Extension Cords. Adapters and extension cords shall meet the following requirements:

(a) Attachment plugs shall meet the requirements of 9-2.1.2.1.

(b)* Power cords shall ~~be adequate for the application to avoid overload (i.e., 16 AWG or greater) and shall~~ meet the requirements of 9-2.1.2.2.

8.4.1.3 ~~7.5.1.3~~ Testing Requirements (Fixed and Portable).

8.4.1.3.1 ~~7.5.1.3.1~~ Physical Integrity. The physical integrity of the power cord assembly composed of the power cord, ~~and~~ attachment plug and cord-strain relief shall be confirmed by visual inspection or other applicable ~~appropriate~~ tests.

8.4.1.3.2* ~~7.5.1.3.2*~~ Resistance. For appliances that are used in the patient care vicinity t~~T~~he resistance between the appliance chassis, or any exposed conductive surface of the appliance, and the ground pin of the attachment plug ~~shall be measured. The resistance~~ shall be less than 0.50 ohm under the following conditions:

(a) The cord shall be flexed at its connection to the attachment plug or connector. ~~and~~

(b) The cord shall be flexed at its connection to the strain relief on the chassis during the resistance measurement. ~~This measurement shall apply only to appliances that are used in the patient care vicinity. (See A-7.5.1.3.2 for suggested test methods.)~~

Exception: The requirement shall ~~does~~ not apply to escutcheons or nameplates, small screws, and so forth, that are unlikely to become energized.

8.4.1.3.3* ~~7.5.1.3.3*~~ Leakage Current Tests - General. The following requirements shall apply to all tests.

(a) Resistance Test. The resistance tests of 7-5.1.3.2 shall be conducted before undertaking any leakage current measurements.

(b) Techniques of Measurement. Each test shall be performed with the appropriate connection to a properly grounded ac power system at nominal voltage of the equipment.

(c) * Frequency of Leakage Current. The leakage current limits stated in 7-5.1.3.4, 7-5.1.3.5, and 7-5.1.3.6 shall be rms values for ~~dc and~~ sinusoidal waveforms up to 1 kHz. For frequencies above 1 kHz, the leakage current limits shall be the values given in 7-5.1.3.4, 7-5.1.3.5, and 7-5.1.3.6 multiplied by the frequency, in kHz, up to a maximum of 10 mA.

(d) Leakage Current in Relation to Polarity. Leakage current measurements shall be made as follows:

(1) with the polarity of the power line normal,

(2) with the power switch of the appliance in the position shown in Table 7-5.1.3.3(d), ~~and~~

(3) with all operating controls in the position to cause maximum leakage current readings.

Table 7-5.1.3.3(d) Leakage Current Tests-Power Switch Setting

	Power Switch Setting	
Par. No.	**On and Off**	**On**
7-5.1.3.4	X	
7-5.1.3.5	X	
7-5.1.3.6(a)		X
7-5.1.3.6(b)		X
7-5.1.3.6(c)	X	
7-5.1.3.6(d)		X
7-5.1.3.6(e)		X

8.4.1.3.4 ~~7-5.1.3.4~~ Chassis Leakage Current, Fixed Equipment.

8.4.1.3.4.1 Permanently wired appliances in the patient care vicinity shall be tested prior to installation while the equipment is temporarily insulated from ground.

8.4.1.3.4.2 The leakage current from frame to ground of permanently wired appliances installed in general or critical patient care areas shall not exceed 5.0 mA with all grounds lifted.

8.4.1.3.5 Chassis Leakage Current, Portable Equipment.

8.4.1.3.5.1* Leakage Current Limits. The leakage current for cord-connected appliances shall not exceed 300 microamperes.

A.8.4.1.3.5.1 Where existing equipment exceeds 500 microamperes, methods to reduce leakage current, such as the addition of small isolation transformers to that device, or methods that provide equivalent safety by adding redundant equipment ground are permissible.

8.4.1.3.5.2 ~~Exception No. 1:~~ Chassis leakage current between 300 and 500 microamperes shall be permitted on existing or special equipment (such as mobile X-ray machines) under following conditions:

(a) The grounding conductor is intact

(b) A documented maintenance schedule, such as three months, is established to ensure the integrity of the grounding connection. The health care facility shall be permitted to establish a protocol with shortened or lengthened time intervals, depending on the intensity of the use of the appliance and prior test data.

8.4.1.3.5.3 If multiple devices are connected together and one power cord supplies power, the leakage current shall be measured as an assembly.

8.4.1.3.5.4 When multiple devices are connected together and more than one power cord supplies power, the devices shall be separated into groups according to their power supply cord and the leakage current shall be measured independently for each group as an assembly.

8.4.1.3.5.5 ~~7.5.1.3.5.2~~ Chassis Leakage Test Procedure. Measurements shall be made using the circuit, as illustrated in Figure 8.4.1.3.5.5, with the appliance ground broken in two modes of appliance operation as follows:

(a) Power plug connected normally with the appliance on

(b) Power plug connected normally with the appliance off (if equipped with an on/off switch)

(c) If the appliance has fixed redundant grounding (e.g., permanently fastened to the grounding system), the chassis leakage current test shall be conducted with the redundant grounding intact.

(d) Test shall be made with Switch A in Figure 8.4.1.3.5.5 closed.

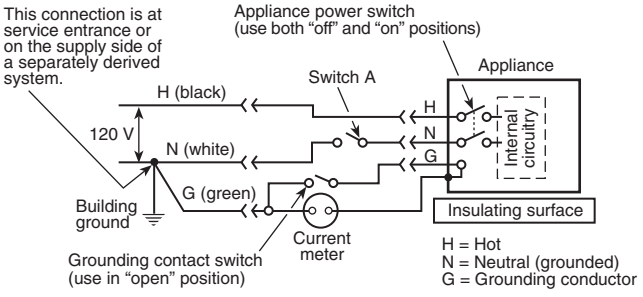


Figure 8.4.1.3.5.5 Test circuit for measuring chassis leakage current.

~~7-5.1.3.5 Chassis Leakage Current, Portable Equipment.~~

~~(a) The leakage current for cord-connected appliances shall be measured. The limit shall be 300 microamperes. Figure 7-5.1.3.5 shows one method of performing this test.~~

~~If multiple devices are connected together and one power cord supplies power, the leakage current shall be measured as an assembly.~~
~~When multiple devices are connected together and more than one power cord supplies power, the devices shall be separated into groups according to their power supply cord and the leakage current shall be measured independently for each group as an assembly.~~
~~Exception No. 1: Where existing or special equipment (such as mobile X-ray machines) exhibits chassis leakage current between 300 and 500 microamperes, this condition does not represent a hazard to the patient as long as the grounding connection is intact. Such equipment shall be permitted to be kept in service provided a documented maintenance schedule is established to ensure the integrity of the grounding connection. A three-month interval is a nominal period. Depending on the intensity of the use of the appliance and prior test data, the hospital shall be permitted to establish a protocol with shortened or lengthened time intervals.~~
~~Exception No. 2: Where existing equipment exceeds 500 microamperes, methods to reduce leakage current, such as the addition of small isolation transformers to that device, or methods that provide equivalent safety by adding redundant equipment ground are permissible.~~
~~Figure 7-5.1.3.5 Test circuit for measuring chassis leakage current.~~
~~(b) Measurements shall be made with the appliance ground broken in two modes of appliance operation: power plug connected normally and with the appliance both on and off (if equipped with an on/off switch). When the appliance has fixed redundant grounding (e.g., permanently fastened to the grounding system), the chassis leakage current test shall be conducted with the redundant grounding intact. Test shall be made with Switch A in Figure 7-5.1.3.5 closed.~~
8.4.1.3.6 ~~7-5.1.3.6~~ Lead Leakage Current Tests and Limits, Portable Equipment.
8.4.1.3.6.1 ~~(a)*~~ Lead to Ground (Nonisolated Input). The leakage current between all patient leads connected together and ground shall be measured with the power plug connected normally and the device on~~:~~. ~~Figure 7-5.1.3.6(a) is an example of a~~An acceptable test configuration shall be as illustrated in Figure 8.4.1.3.6.1. The leakage current shall not exceed 100 microamperes for ground wire open and closed.

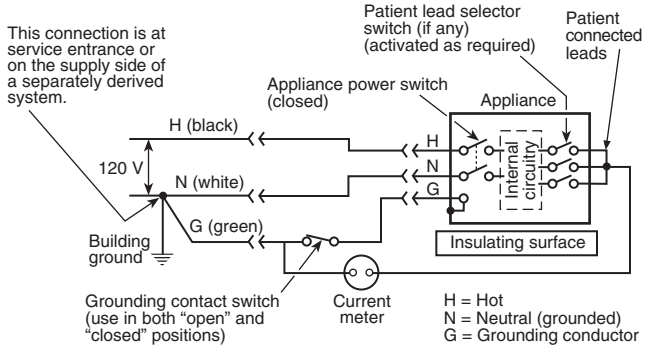


Figure 8.4.1.3.6.1 ~~7-5.1.3.6(a)~~ Test circuit for measuring leakage current between patient leads and ground (nonisolated).

8.4.1.3.6.2 ~~(b)~~ Lead to Ground (Isolated Input). The leakage current between each patient lead and ground for an appliance with isolated leads shall be measured with the power plug connected normally and the device on~~:~~. ~~Figure 7-5.1.3.6(b) is an example of a~~An acceptable test configuration shall be as illustrated in Figure 8.4.1.3.6.2. The leakage current shall not exceed 10 microamperes with the ground intact and 50 microamperes with the ground open.

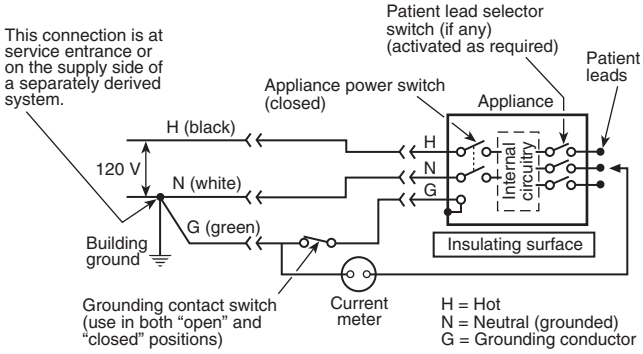


Figure 8.4.1.3.6.2 ~~7-5.1.3.6(b)~~ Test circuit for measuring leakage current between patient leads and ground (isolated).

8.4.1.3.6.3 ~~(c)~~ Isolation Test (Isolated Input). Only isolated patient leads shall be connected to intracardiac catheters or electrodes. The current driven into the leads of an appliance that has isolated leads, when an external power source at line voltage and frequency is applied between each lead and ground, shall be measured in accordance with Figure 8.4.1.3.6.3 ~~7-5.1.3.6(c)~~. The leakage current shall not exceed 50 microamperes in each case. The test shall be made with the appliance's normal patient cables.

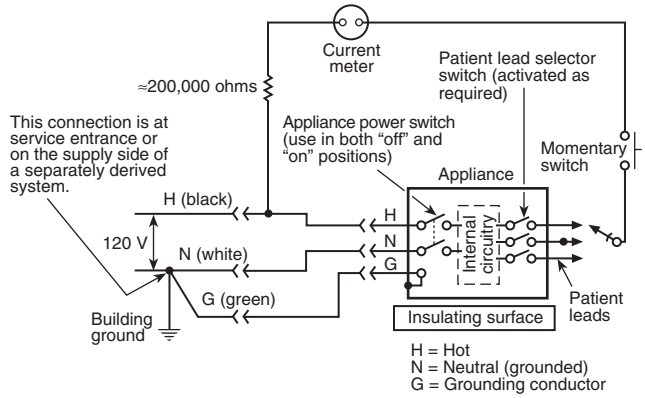


Figure 8.4.1.3.6.3 ~~7-5.1.3.6(c)~~ Test circuit for measuring the electrical isolation of isolated patient leads.

~~Suitable s~~Safety precautions (such as including a resistance in series to limit the current, insulation of the meter, and a momentary switch) shall be taken to protect the operator. The following test procedures shall be followed for the indicated test conditions:

(a) In appliances without a power cord ~~or~~ with ungrounded, exposed conductive surfaces, measurements shall be made with the exposed conductive surfaces temporarily grounded.

(b) If there is no exposed conductive surface, measurement shall be made with a simulated surface, as described in 9-2.1.13.4(b), ~~Appliances with No Exposed Conductive Surfaces,~~ that is also temporarily grounded.

~~Only isolated patient leads shall be connected to intracardiac catheters or electrodes.~~

8.4.1.3.6.4 ~~(d)~~ Between Leads (Nonisolated Input). The leakage current between any one lead (not ground) and each other lead shall be measured. ~~Figure 7-5.1.3.6(d)/(e) is an example of a~~An acceptable test configuration shall be as illustrated in Figure 8.4.1.3.6.4. The leakage current shall not exceed 50 microamperes for the ground wire open and closed.

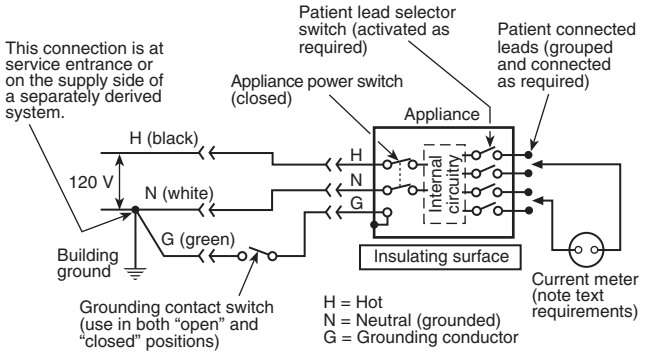


Figure 8.4.1.3.6.4 ~~7-5.1.3.6(d)/(e)~~ Test circuit for measuring leakage current between patient leads (nonisolated and isolated).

8.4.1.3.6.4 ~~(e)~~ Between Leads (Isolated Input). The leakage current between any one lead (not ground) and each other lead shall be measured. ~~Figure 7-5.1.3.6(d)/(e) is an example of a~~An acceptable test configuration shall be as illustrated in Figure 8.4.1.3.6.4. The leakage current shall not exceed 10 microamperes with the ground intact and 50 microamperes with the ground open.
8.4.2 ~~7-5.2~~ Nonpatient Electrical Appliances and Equipment.
8.4.2.1 ~~7-5.2.1~~ Permanently Connected (Fixed). (Reserved)
8.4.2.2 ~~7-5.2.2~~ Cord- and Plug-Connected (Portable).
8.4.2.2.1 ~~7-5.2.2.1~~ Patient Care Area.
8.4.2.2.1.1 The leakage current for facility-owned appliances (e.g., housekeeping or maintenance appliances) that are used in a patient care vicinity shall not exceed 500 microamperes. ~~and are likely to contact the patient shall be measured. The leakage current shall be less than 500 microamperes.~~ Tests shall be made with Switch A in Figure 8.4.1.3.5 ~~7-5.1.3.5~~ in the open position for two-wire equipment that is not double-insulated.
8.4.2.2.1.2 Household or office appliances not commonly equipped with grounding conductors in their power cords shall be permitted provided they are not located within the patient care vicinity. For example, electric typewriters, pencil sharpeners, and clocks at nurses' stations, or electric clocks or TVs that are normally outside the patient care vicinity but might be in a patient's room, shall not be required to have grounding conductors in their power cords.
8.4.2.2.2* ~~7-5.2.2.2*~~ Laboratory.
8.4.2.2.2.1 ~~(a)~~ Portable equipment intended for laboratory use shall be grounded ~~or otherwise arranged with an approved method~~ to protect personnel against shock.
8.4.2.2.2.2 ~~(b)~~ All electrical heating equipment to be used for laboratory procedures shall be equipped with overtemperature-limit controls so arranged that thermostatic failure will not result in hazardous temperatures.
8.4.2.2.2.3 When electrical heating ~~such~~ equipment is intended for use with flammable or combustible liquids, its electrical components shall be at least one of the following:

(1) Explosion proof
(2) Intrinsically safe
(3) Ventilated ~~explosionproof, intrinsically safe, or ventilated in a manner that will prevent accumulation of flammable atmospheres under normal conditions of operation.~~

8.4.2.2.2.4 ~~(c)~~ When electrical heating equipment equipped with fans shall be arranged with an interlock arranged to disconnect the heating elements when the fan is inoperative, unless the fan is not essential to safe operation.
8.4.2.2.2.5 ~~(d)*~~ Electrical equipment intended for use in laboratories shall meet the requirements of NFPA 45, Standard for Laboratories Using Chemicals.
8.5 ~~7-6~~ Administration.
8.5.1 ~~7-6.1~~ Responsibilities of Governing Body. (Reserved)
8.5.2 ~~7-6.2~~ Policies.
8.5.2.1 ~~7-6.2.1~~ General.
8.5.2.1.1 ~~7-6.2.1.1~~ Medical and surgical electrical instrumentation and monitoring devices, as well as all electric appliances used for the care and entertainment of the patient, ~~purchased or otherwise~~ acquired for use by the facility (e.g., purchased, leased, donated, constructed on-site, loaned, etc.), shall meet the safety performance criteria of 9-2.1. ~~, Patient-Care-Related Electrical Appliances, in Chapter 9, "Manufacturer Requirements."~~
8.5.2.1.2 ~~7-6.2.1.2~~ Testing Intervals.
8.5.2.1.2.1 ~~(a)~~ The facility shall establish policies and protocols for the type of test and intervals of testing for each appliance.
8.5.2.1.2.2 ~~(b)~~ All appliances used in patient care areas shall be tested in accordance with 7-5.1.3 or 7-5.2.2.1 before being put into service for the first time and after repair or modification. Patient-care-related electrical appliances shall be retested at intervals determined by their normal location or area of normal use, but not exceeding the intervals listed below:

General care areas — 12 months
Critical care areas — 6 months
Wet locations — 6 months

Exception No. 1: The testing intervals listed are intended to be nominal values, and facilities shall be permitted to adopt a protocol using either longer or shorter intervals provided that there is a documented justification based on previous safety testing records for the equipment in question, unusually light or heavy utilization, or similar considerations.
Exception No. 2: Facility-owned household or other appliances that are used in the patient care vicinity, but that are not intended to contact the patient, shall be tested at intervals deemed appropriate by the facility. ~~Some equipment in this category requires only an infrequent visual inspection.~~ The facility shall be permitted to structure a testing protocol and frequency for some equipment that might be more limited than that prescribed in 8.4.1.3 ~~7-5.1.3~~.
8.5.2.1.3 ~~Exception No. 3:~~ The tests specified in 8.4.1.3.6 ~~7-5.1.3.6, Lead-Leakage-Current Tests and Limits, Portable Equipment,~~ shall be required only for incoming inspections and following repairs and modifications that might have compromised the patient lead leakage current.
8.5.2.1.4* ~~Exception No. 4:*~~ After the installation of fixed equipment, it shall be tested periodically in accordance with 3-3.3.2.3, and meet the following criteria:

(a) 500 mV for general care areas
(b) 40 mV for critical care areas

8.5.2.1.5 ~~7-6.2.1.3~~ Protection of Patients with Direct Electrical Pathways to the Heart.
8.5.2.1.5.1 Only equipment that is specifically designed to be connected directly to electrically conductive pathways to a patient's heart (e.g., intracardiac electrodes such as implanted pacemaker leads and guide wires) shall be provided with isolated patient leads or connections. ~~Only equipment that is specifically designed for the purpose, that is, provided with suitable isolated patient leads or connections (see 9-2.1.12, Direct Electrical Pathways to the Heart), shall be connected directly to electrically conductive pathways to a patient's heart. Such electrically conductive pathways include intracardiac electrodes such as implanted pacemaker leads and guide wires.~~
8.5.2.1.5.2 The facility shall have a policy that prohibits the use of external cardiac pacemakers and pacing leads with external terminals that are not properly protected from potentially hazardous contact with conductive surfaces.
8.5.2.1.6 ~~7-6.2.1.4~~ Controls. Electrical appliance controls (such as bed, pillow speakers, television, and nurse-call controls) that do not meet the minimum requirements of 9-2.1, Patient-Care-Related Electrical Appliances, shall be mounted so that they cannot be taken into the bed. ~~Exception:~~ Existing low-voltage controls used in general patient-care areas shall be permitted.
8.5.2.1.7 ~~7-6.2.1.5~~ Adapters and Extension Cords. ~~Adapters and extension cords shall be permitted to be used.~~
8.5.2.1.7.1 Adapters and extension cords shall meeting the requirements of ~~7-5.1.2.6~~ 8.5.1.2.5 shall be permitted to be used.
8.5.2.1.7.2 ~~Exception:~~ Three-to-two-prong adapters shall not be permitted.
8.5.2.1.7.3 The wiring shall be tested for:

(1) physical integrity,
(2) polarity, and
(3) continuity of grounding at the time of assembly and periodically thereafter.

8.5.2.1.8* ~~7-6.2.1.6*~~ Appliances Intended to Deliver Electrical Energy. Electrical-energy-delivering appliances shall conform to the leakage, grounding, and other requirements of this chapter when powered but not delivering energy.
8.5.2.1.9 ~~7-6.2.1.7~~ Specification of Conditions of Purchase. The procurement authority shall include in its purchasing documents ~~any appropriate~~ requirements or conditions specifically related to the facility's use of the appliance ~~, including, but not restricted to,~~ These requirements and conditions shall include but not be limited to the following:

(a) The type of appliance listing or certification required, if any
(b) The delivery of manufacturer's test data, where pertinent
(c) Special conditions of use (such as in anesthetizing or other locations with special hazards)
(d) Unusual environmental conditions (such as high humidity, moisture, salt spray, etc.)
(e)* The type of electric power system (i.e., grounded or isolated) intended to energize the appliance
(f) The nature of the overcurrent devices, and
(g) The use of auxiliary emergency power~~., and so forth, when pertinent~~

8.5.2.1.10* ~~7-6.2.1.8*~~ Manuals for Appliances. Purchase specifications shall require the vendor to supply ~~suitable~~ manuals for operators or users upon delivery of the appliance as follows: ~~The manuals shall include~~

(1) installation and operating instructions,
(2) inspection and testing procedures, and
(3) maintenance details. [See 9-2.1.8.1~~(m)~~.]

8.5.2.1.11 ~~7-6.2.1.9~~ System Demonstration.

8.5.2.1.11.1 Any system consisting of several electric appliances shall be demonstrated as a complete system, after installation, by the vendor designated to assume system responsibility, and prior to acceptance of the system by the facility. The vendor shall demonstrate the operation of the system and provide ~~appropriate~~ initial instruction to operators and maintenance personnel.

8.5.2.1.11.2 Subparagraph 8.5.2.11.1 shall not apply to facilities that assemble their own systems.

~~Exception: Facilities that assemble their own systems.~~

8.5.2.1.12 ~~7-6.2.1.10~~ Electrical Equipment Systems. Purchase contracts for electrical equipment systems, such as nurse call and signaling, that consist of interconnected elements, shall require all of the following:

(1) that the elements be listed to function together,
(2) that the manufacturers provide ~~appropriate~~ documentation for such interconnection, ~~and~~
(3) that the systems be installed by personnel qualified to do such installations.

8.5.2.1.13 ~~7-6.2.1.11~~ Appliances Not Provided by the Facility. Policies shall be established for the control of appliances not supplied by the facility.

8.5.2.2 ~~7-6.2.2~~ Servicing and Maintenance of Equipment.

8.5.2.2.1 ~~7-6.2.2.1~~ Service manuals, instructions, and procedures provided by the manufacturer shall be used in the maintenance of equipment.

8.5.2.2.2 ~~7-6.2.2.2~~ A scheduled preventive maintenance program shall be followed.

8.5.2.2.3 ~~7-6.2.2.3~~ Areas designated for the servicing of oxygen equipment shall be clean, free of oil and grease, and not used for the repair of other equipment.

8.5.2.2.4 ~~7-6.2.2.4~~ Defective electrical apparatus shall be tagged and repaired or discarded.

8.5.2.2.5 ~~7-6.2.2.5 Administrative vigilance shall be exercised to~~ The health care facility shall monitor the use of appliances and portable electrical equipment, such as drills, that can cause electrical interference during operative procedures.

8.5.2.3 ~~7-6.2.3~~ During Surgery.

8.5.2.3.1 ~~7-6.2.3.1~~ Active electrodes or other applicators of electrosurgical~~, devices shall be properly secured,~~ surgical laser, or fiber optic devices shall be secured as recommended by the manufacturer of the device, when not in active use. ~~This includes, but is not limited to, electrosurgical devices, surgical lasers, electrocautery, and fiberoptics.~~

8.5.2.3.2 ~~7-6.2.3.2~~ The cable that provides power from the electrosurgical generator to the active electrode shall be disconnected from the generator when contamination occurs.

8.5.2.4 ~~7-6.2.4~~ During Administration of Respiratory Therapy.

8.5.2.4.1* ~~7-6.2.4.1*~~ Electrical equipment used within the site of intentional expulsion shall have no hot surfaces.

8.5.2.4.2 When only the remote control or signal leads of a device are to be used in the site of intentional expulsion, only the control or signal leads shall be required to comply with 8.5.2.4.1 ~~this section~~.

8.5.2.4.3 ~~Exception:~~ Subparagraphs 8.5.2.4.1 and 8.5.2.4.2 shall not apply to s~~S~~mall (less than 2 W), hermetically sealed heating elements such as light bulbs.

8.5.2.4.4* ~~7-6.2.4.2*~~ Electrical equipment used within oxygen delivery equipment shall be listed for use in oxygen-enriched atmospheres.~~, or~~

8.5.2.4.5 Electrical equipment sold with the intent to be used in oxygen-enriched atmospheres shall be listed for use in oxygen enriched atmospheres.

8.5.2.4.6* ~~7-6.2.4.3* When h~~High-energy-delivering probes (such as defibrillator paddles) or other electrical devices that do not comply with 8.5.2.4.1 and 8.5.2.1.4.2 ~~7-6.2.4.1~~ are deemed essential to the care of an individual patient and must be used within a site of administration or within oxygen delivery equipment, they shall be permitted ~~used with extreme caution~~.

A.8.5.2.4.6 In these instances extreme caution should be exercised.

8.5.2.5 ~~7-6.2.5~~ Laboratory.

8.5.2.5.1* ~~7-6.2.5.1*~~ The laboratory shall establish policies and protocols for the type of test and intervals of testing for each appliance.

8.5.2.5.2* ~~7-6.2.5.2*~~ The physical integrity of the power cord and attachment plug and cord strain-relief shall be confirmed at least annually by visual inspection and other appropriate tests.

8.5.3 ~~7-6.3~~ Recordkeeping.

8.5.3.1 ~~7-6.3.1~~ Patient Care Appliances.

8.5.3.1.1 ~~7-6.3.1.1~~ Instruction Manuals.

8.5.3.1.1.1 A permanent file of instruction and maintenance manuals as described in 9-2.1.8.1 shall be maintained and be accessible.

8.5.3.1.1.2 It shall ~~preferably~~ be in the custody of the engineering group responsible for the maintenance of the appliance.

8.5.3.1.1.3 Duplicate instruction and maintenance manuals shall be available to the user. (Log #CP103)

8.5.3.1.1.4 Any safety labels and condensed operating instructions on an appliance shall be maintained in ~~readable~~ legible condition.

8.5.3.1.2* ~~7-6.3.1.2*~~ Documentation.

8.5.3.1.2.1 A record shall be maintained of the tests required by this chapter and associated repairs or modifications.

8.5.3.1.2.2 At a minimum, this record shall contain all of the following: ~~the~~

(1) date,
(2) unique identification of the equipment tested, ~~and an~~
(3) indication of which items have met or have failed to meet the performance requirements of 8.5.3.1.2 ~~this section~~.

8.5.3.1.3 ~~7-6.3.1.3~~ Test Logs. A log of test results and repairs shall be maintained and kept for ~~an appropriate time~~ a period of time in accordance with a health care facility's record retention policy.

8.5.4 ~~7-6.4~~ Use. (Reserved)

8.5.5 ~~7-6.5~~ Qualification and Training of Personnel.

8.5.5.1 ~~7-6.5.1~~ Personnel concerned with the application and maintenance of electric appliances, including physicians, nurses, nurse aids, engineers, and technicians, and orderlies, shall be cognizant of the risks associated with their use.

8.5.5.1.1 ~~To achieve this end, t~~The ~~hospital~~ health care facilities shall provide ~~appropriate~~ programs of continuing education for its personnel.

8.5.5.1.2 ~~This~~ These program~~s~~ shall include periodic review of manufacturers' safety guidelines and usage requirements for electrosurgical units and similar appliances.

8.5.5.2 ~~7-6.5.2~~ Personnel involved in the use of energy-delivering devices~~,~~ including, but not limited to~~,~~ electrosurgical, ~~units,~~ surgical lasers~~, electrocauterizers~~, and fiberoptics~~s~~ devices, shall receive periodic training in fire suppression.

8.5.5.3 ~~7-6.5.3~~ Equipment shall be serviced by qualified personnel only.

SUBSTANTIATION: Editorial restructuring to conform with the 2000 edition of the NFPA Manual of Style.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 4 Aronow, Carlson, Meyer, Peglow
COMMENT ON AFFIRMATIVE:
LIPSCHULTZ: Although I am voting in favor of Log #CP105, there is a serious flaw in Section 8.4.2.2.1.1 that must be corrected in the next go around. What was meant to be simple editorial change to comply with the manual of style will have a major implication for health care facilities in my opinion.
Section 8.4.2.2.1.1 used to have the qualifier that only equipment "likely to contact the patient" needs to be measured. The new proposed wording takes out this restriction. Without the restriction, every vacuum cleaner, electric drill, floor buffer, etc., will have to have electrical leakage current measured. This issue has been thoroughly discussed in the committee before and the very clear conclusion was that most of these devices were extremely unlikely

to have patient contact. Because they were very unlikely to have patient contact, most institutions do not routinely check this type of device for leakage current. The change in the wording will impose a large unnecessary burden on these institutions.

(Log #CP102)
Committee: HEA-ELE

99- 314 - (7-1.3): Accept
SUBMITTER: Technical Committee on Electrical Equipment
RECOMMENDATION: Delete this paragraph.
SUBSTANTIATION: The chapter does require listing in some instances. Listed is defined in Chapter 2 definitions.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 4 Aronow, Carlson, Meyer, Peglow

(Log #CP101)
Committee: HEA-ELE

99- 315 - (7-2.6, 7-3, 7-3.1, 7-3.2, and 7-4): Accept
SUBMITTER: Technical Committee on Electrical Equipment
RECOMMENDATION: Delete paragraphs 7-2.6, 7-3, 7-3.2, and 7-4. Renumber 7.3.1* as 8.3*.
SUBSTANTIATION: Editorial. The committee has no foreseeable plans to amend the standard in these areas.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 4 Aronow, Carlson, Meyer, Peglow

(Log #CP103)
Committee: HEA-ELE

99- 316 - (7-6.3.1.1): Accept
SUBMITTER: Technical Committee on Electrical Equipment
RECOMMENDATION: Insert "and maintenance" between "instruction" and "manuals" in the third sentence.
SUBSTANTIATION: Editorial clarification.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 4 Aronow, Carlson, Meyer, Peglow

(Log #CP306)
Committee: HEA-GAS

99- 317 - (Chapter 8): Accept
SUBMITTER: Technical Committee on Gas Delivery Equipment
RECOMMENDATION: Revise text as follows:

Chapter 8 Gas Equipment

8.1* ~~Scope.~~ Applicability.

~~8.1.1 This chapter covers the performance, maintenance, and testing of gas equipment used within health care facilities.~~

8.1.1* ~~8.1.2*~~ This chapter applies to the use, at normal atmospheric pressure, of the following:

(a) nonflammable medical gases,

(b) vapors and aerosols, and

(c) equipment required for their administration.

8.1.2 ~~8.1.3~~ When used in this chapter, the term *oxygen* is intended to mean 100 percent oxygen as well as mixtures of oxygen and air.

8.1.3 ~~8.1.4*~~ This chapter does not apply to special atmospheres, such as those encountered in hyperbaric chambers.

8.2 Nature of Hazards. (See Annex C).

C.8.2 Nature of Hazards.

C-8.2.1 Fire and Explosions.
~~8.2.1.1 Inhalation Anesthetizing Locations.~~

C.8.2.1.1 ~~8.2.1.1.1~~ Oxygen and nitrous oxide, the gases normally used for relative analgesia and as components of general anesthesia, are strong oxidizing gases and individually or as a mixture support combustion quite readily.

C.8.2.1.2 ~~8.2.1.1.2~~ Inhalation gases or vapors introduce fire, chemical, mechanical, and electrical hazards that are all interrelated. Any mixture of inhalation gases will support combustion. In an oxygen-enriched atmosphere, materials that are flammable and combustible in air ignite more easily and burn more vigorously. The materials that could be found on or near patients include the following:

(a) hair oils, oil-based lubricants, and skin lotions,

(b) clothing, linens, paper, rubber,

(c) alcohols, acetone, and some plastics.

C.8.2.1.3 ~~8.2.1.1.3~~ A hazard exists if any of the components of an oxygen or nitrous oxide supply system become contaminated with oil or grease.

~~8.2.1.1.4*~~ Delete Appendix A paragraph (it is being inserted here)

C.8.2.1.4 Sources of ignition can include open flames, burning tobacco, electric heating coils, defective electrical equipment, and adiabatic heating of gases. Sudden compression or recompression of a gas to high pressure can generate large increase in temeprature [up to 1093°C (2000°F)] that can ignite any organic material present, including grease. (See also NFPA 53, Recommended Practice on Materials, Equipment, and Systems Used in Oxygen Enriched Atmospheres.)

C.8.2.1.5 ~~8.2.1.1.5~~ A hazard exists if either oxygen or nitrous oxide leaks into a closed space, creating an oxygen-enriched atmosphere.

C.8.2.1.6 ~~8.2.1.1.6~~ A hazard exists if improper components are employed to connect equipment containing pressurized oxygen or nitrous oxide.

~~8.2.1.2 During Respiratory Therapy Administration.~~

C.8.2.1.7 ~~8.2.1.2.1~~ The occurrence of a fire is dependent on ~~requires~~ the presence of combustible or flammable materials, an atmosphere of oxygen or other oxidizing agents, and a source of ignition. When combustible materials are ~~can be unavoidably~~ present and ~~when~~ oxygen is being administered, ~~but~~ flammable liquids and gases and ignition sources are to be avoid~~able~~ed.

C.8.2.1.8 Any mixture of breathing gases used in respiratory therapy will support combustion. In an oxygen-enriched atmosphere, materials that are combustible and flammable in air ignite more easily and burn more vigorously. Materials not normally considered to be combustible change their characteristics ~~may be so~~ in an oxygen-enriched atmosphere.

C.8.2.1.9 ~~8.2.1.2.2~~ Combustible materials that could be found near patients who are to receive respiratory therapy include the following items:

(a) hair oils, oil-based lubricants, skin lotions, facial tissues,

(b) clothing, bed linen, tent canopies,

(c) rubber and plastic articles, gas-supply and suction tubing,

(d) ether, alcohols, and acetone.

C.8.2.1.10 ~~8.2.1.2.3~~ A particular hazard exists when oxygen equipment becomes contaminated with oil, grease, or other combustible materials. Such contaminants will ignite readily and burn more rapidly in the presence of high oxygen concentrations and make it easier to ignite less combustible materials with which they come in contact.

C.8.2.1.11 An oxygen-enriched atmosphere normally exists in the following respiratory therapy administration locations:

(a) an oxygen tent, croup tent,

(b) incubator, and

(c) similar devices when supplemental oxygen is being employed in them.

These devices are designed to maintain a concentration of oxygen higher than that found in the atmosphere.

Oxygen-enriched atmospheres ~~can~~ exist in the immediate vicinity of all oxygen administration equipment. *(See definition of Site of Intentional Expulsion in Section 3-2.)*

C.8.2.1.12 The transfer of liquid oxygen from one container to another container, can create an oxygen-enriched atmosphere within the vicinity of the containers.

C.8.2.1.13 If oxygen is supplied by a container that stores the oxygen as a liquid, there will be a small amount of oxygen vented into the vicinity of the container after a period of nonuse of the equipment. Larger amounts of oxygen will be vented if the container is accidentally tipped over or placed on its side. This venting may create an oxygen-enriched atmosphere if the container is stored in a confined space *[see 4-3.1.1.2(a)9].*

C.8.2.1.14 ~~8.2.1.2.4~~ Sources of ignition include not only the usual ones in ordinary atmospheres, but others that become significant hazards in oxygen-enriched atmospheres *(see 8.2.1.2.1)* such as the following:

(a) open flames,

(b) burning tobacco, ~~and~~

(c) electric radiant heaters,

(d) electrosurgical units, ~~can serve as a source of ignition~~

(e) the discharge of a cardiac defibrillator, ~~can serve as a source of ignition~~

(f) arcing and excessive temperatures in electrical equipment. ~~are sources of ignition.~~

(g) electrically powered oxygen apparatus and electrical equipment intended for use in an oxygen-enriched atmosphere ~~are sources of ignition~~ if electrical defects are present,

(h) electrical equipment not conforming to the requirements of 7-6.2.4.1, which ~~can~~ include, but are not limited to:

(1) electric razors,

(2) electric bed controls,

(3) hair dryers,

(4) remote television controls, and telephone handsets, ~~can create a source of ignition~~ if introduced into an oxygen-enriched atmosphere *(see 7-6.2.4.1),*

(i) a static discharge having an energy content that can be generated under normal conditions in respiratory therapy will not constitute an ignition source as long as easily ignited substances (such as alcohols, acetone, oils, greases, or lotions) are not present.

~~(j)~~(f) rapid opening of cylinder valves which can cause a sudden increase in downstream gas pressure and temperature caused by the adiabatic heat of recompression with consequent ignition of combustible materials in contact with the hot gas downstream, including the valve seat.

C.8.2.2 Toxicity.

~~8.2.2.1 During Respiratory Therapy Administration.~~

C.8.2.2.1 ~~8.2.2.1.1~~ Chemical hazards can be associated with the presence of residual sterilant in high-pressure equipment.

C.8.2.2.2 ~~8.2.2.1.2~~ Some breathing mixtures ~~can~~ decompose when in contact with heat ~~hot surfaces~~ and produce toxic or flammable substances *(see 8.6.2).*

C.8.2.2.3 ~~8.2.2.1.3~~ Smoldering combustion of ~~flammable~~ substances ~~can occur with the production of significant amounts of~~ may produce toxic gases and fumes.

C.8.2.3 ~~Safety (Mechanical Injury; Cross-Connection, and So Forth)~~ Mechanical.

~~8.2.3.1 Inhalation Anesthetizing Locations.~~

C.8.2.3.1 A large amount of energy is stored in a cylinder of compressed gas. If the valve of a cylinder is struck (or strikes something else) hard enough to break off the valve, the contents of the cylinder could be discharged with sufficient force to impart dangerous reactive movement to the cylinder.

~~8.2.3.2 During Respiratory Therapy Administration.~~

~~8.2.3.2.1 Mechanical Hazards.~~

C.8.2.3.2 Cylinders and containers can be heavy and can cause personal injury or property damage (including to the cylinder or container) if improperly handled. In cold climates, cylinders or containers stored outdoors or in unheated ventilated rooms can become extremely cold *[see 4-3.5.2.1(b)30 and 4-3.5.2.1(b)31].* A hazardous situation could develop if these cylinders or containers are heated *[see 4-3.5.2.1(b)29].*

C.8.2.3.3 ~~8.2.3.2.2~~ Improper maintenance, handling, or assembly of equipment can result in personal injury, property damage, or fire.

C.8.2.3.4 ~~8.2.3.2.3~~ A hazardous condition exists if cylinders or containers are improperly located so that they ~~can~~ become overheated or tipped over. If a container is tipped over or placed on its side, liquid oxygen could be spilled. The liquid can cause frostbite if on contact with skin.

C.8.2.3.5 ~~8.2.3.2.4~~ A hazardous condition exists if there is improper labeling of cylinders or containers or inattention to the manufacturer's label or instructions.

C.8.2.3.6 ~~8.2.3.2.5~~ A hazardous condition exists if care is not exercised in making slip-on and other interchangeable connections when setting up equipment.

C.8.2.3.7 ~~8.2.3.2.6~~ Safety features, including relief devices, valves, and connections, are provided in equipment and gas supply systems. Altering or circumventing these safety features by means of adapters creates a hazardous condition.

C.8.2.3.8 ~~8.2.3.2.7~~ Extreme danger to life and property can result when compressed gases are mixed or transferred from one cylinder to another.

C.8.2.3.9 ~~8.2.3.2.8~~ A hazardous condition exists if devices, such as fixed or adjustable orifices and metering valves, are directly connected to cylinders or systems without a pressure-reducing regulator.

C.8.2.3.10 ~~8.2.3.2.9~~ Hazardous conditions are created when pressure-reducing regulators or gauges are defective.

~~8.2.4* Electric Shock. (Reserved)~~

8.3 Cylinder and Container Source.

~~8.3.1 Cylinders and Containers.~~

8.3.1 ~~8.3.1.1~~ Cylinders and containers shall comply with 4-3.1.1.1(a).

8.3.2 ~~8.3.1.2~~ Cylinder valve outlet connections shall conform to CGA V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections* (ANSI B57.1) (includes Pin-Index Safety System for medical gases). *[See 4-3.1.1.1(a).]*

8.3.3 ~~8.3.1.3~~ When low-pressure threaded connections are employed, they shall be in accordance with the Compressed Gas Association standard for noninterchangeable, low-pressure connections for medical gases, air, and suction, CGA Pamphlet V-5, *Diameter-Index Safety System*.

8.3.4 ~~8.3.1.4~~ Low-pressure quick-coupler connections shall be noninterchangeable between gas services.

8.3.5 ~~8.3.1.5~~ Regulators and gauges intended for use in high-pressure service shall be listed for such service.

8.3.6 ~~8.3.1.6~~ Pressure-reducing regulators shall be used on high-pressure cylinders to reduce the pressure to working pressures.

8.3.7 ~~8.3.1.7~~ Approved regulators or other gas-flow control devices shall be used to reduce the cylinder pressure of every cylinder used for medical purposes. All such devices shall have connections so designed that they attach only to cylinders of gas for which they are designated.

8.3.8 ~~8.3.1.8*~~ Equipment that will permit the intermixing of different gases, either through defects in the mechanism or through error in manipulation in any portion of the high-pressure side of any system in which these gases might flow, shall not be used for coupling cylinders containing compressed gases.

8.3.9 ~~8.3.1.9~~ Cylinder valve outlet connections for oxygen shall be Connection No. 540 as described in CGA V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections* (ANSI B57.1).

8.3.10 ~~8.3.1.10~~ Cylinder valve outlet connections for nitrous oxide shall be Connection No. 326 as described in CGA V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections* (ANSI B57.1).

8.4 ~~8.3.1.11~~ Cylinder and Container Storage Requirements.

8.4.1 ~~8.3.1.11.1~~ Storage for nonflammable gases equal to or greater than 85 m^3 (3000 ft^3) uncompressed shall comply with 4-3.1.1.2 and 4-3.5.2.2. (Log #CP302)

8.4.2 ~~8.3.1.11.2~~ Storage for nonflammable gases greater than 8.5m^3 (300 ft^3) but less than 85 m^3 (3000 ft^3), uncompressed. (Log #CP302)

(1) ~~(a)~~ Storage locations shall be outdoors in an enclosure or within an enclosed interior space of noncombustible or limited-combustible construction, with doors (or gates outdoors) that can be secured against unauthorized entry.

(2) ~~(b)~~ Oxidizing gases, such as oxygen and nitrous oxide, shall not be stored with any flammable gas, liquid, or vapor.

(3) ~~(c)~~ Oxidizing gases such as oxygen and nitrous oxide shall be separated from combustibles or materials by ~~either~~ one of the following:

(1) A minimum distance of 6.1 m (20 ft), or

(2) A minimum distance of 1.5 m (5 ft) if the entire storage location is protected by an automatic sprinkler system designed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems,* or

(3) An enclosed cabinet of noncombustible construction having a minimum fire protection rating of one-half hour. ~~for cylinder storage. An approved flammable liquid storage cabinet shall be permitted to be used for cylinder storage.~~

(4) Liquefied gas container storage shall comply with 4-3.1.1.2(b)4.

(5) Cylinder and container storage locations shall meet 4-3.1.1.2(a)11e with respect to temperature limitations.

(6) Electrical fixtures in storage locations shall meet 4-3.1.1.2(a)11d.

(7) Cylinder protection from mechanical shock shall meet 4-3.5.2.1(b)13.

(8) Cylinder or container restraint shall meet 4-3.5.2.1(b)27.

(9) Smoking, open flames, electric heating elements, and other sources of ignition shall be prohibited within storage locations and within 6.1 m (20 ft) of outside storage locations.

(10) Cylinder valve protection caps shall meet 4-3.5.2.1(b)14.

8.4.3 ~~8.3.1.11.3~~ Signs.

8.4.3.1 A precautionary sign, readable from a distance of 1.5 m (5 ft), shall be displayed on each door or gate of the storage room or enclosure.

8.4.3.2 The sign shall include the following wording as a minimum:

CAUTION

OXIDIZING GAS(ES) STORED WITHIN

NO SMOKING

8.5 Performance Criteria and Testing.

8.5.1 ~~8.5.1.2~~ Portable Patient Care Gas Equipment.

8.5.1.1* ~~(a)~~ Anesthetic apparatus shall be subject to approval by the authority having jurisdiction.

8.5.1.2* ~~(b)*~~ Each yoke on anesthetic apparatus constructed to permit attachment of small cylinders equipped with flush-type valves shall have two pins installed as specified in CGA V-1 (Pin-Index Safety System) (ANSI B57.1).

8.5.1.3 ~~(c)~~ Testing. ~~After any adjustment or repair involving use of tools, or any modification of the gas piping supply connections or the pneumatic power supply connections for the anesthesia ventilator, or other pneumatically powered device if one is present, and before use on patients, the gas anesthesia apparatus shall be tested at the final common path to the patient to determine that oxygen and only oxygen is delivered from the oxygen flowmeters and the oxygen flush valve if any. Interventions requiring such testing shall include, but not be limited to, the following:~~

8.5.1.3.1 Interventions requiring testing shall include, but not be limited to, the following:

1. Alteration of pipeline hoses or fittings
2. Alteration of internal piping
3. Adjustment of selector switches or flush valves
4. Replacement or repair of flowmeters or bobbins

8.5.1.3.2 After any adjustment or repair involving use of tools, or any modification of the gas piping supply connections or the pneumatic power supply connections for the anesthesia ventilator, or other pneumatically powered device if one is present, and before use on patients, the gas anesthesia apparatus shall be tested at the final common path to the patient to determine that oxygen and only oxygen is delivered from the oxygen flowmeters and the oxygen flush valve if any.

8.5.1.3.3 ~~8.5.1.1.4.3~~ Before the gas anesthesia apparatus is returned to service, each fitting and connection shall be checked to verify its proper indexing to the respective gas service involved.

~~An oxygen analyzer, or a similar device, known to be accurate at 0 percent, 21 percent, and 100 percent oxygen, is a suitable test instrument *(see C-12.2).*~~

8.5.1.3.4 ~~8.5.1.1.4.4~~ Before the gas anesthesia appartus is returned to service, an oxygen analyzer, or a similar device, shall be used to verify the oxygen concentration.

8.5.1.4* ~~(d)*~~ Yoke-type connections between anesthesia apparatus and flush-type cylinder valves (commonly used with anesthetic gas cylinders) shall be Connection No. 860 in accordance with CGA V-1, *Compressed Gas Cylinder Valve Outlet and Inlet Connections* (ANSI B57.1).

8.5.2 ~~8.5.1.2.2~~ Apparatus for Administering Respiratory Therapy.

~~(a) Oxygen tent circulation/conditioning apparatus, pressure breathing apparatus, and other equipment~~

8.5.2.1 Oxygen delivery equipment intended to rest on the floor shall be equipped with a base designed to render the entire assembly stable during storage, transport, and use. If casters are used, they shall conform to Class C of U.S. Government Commercial Standard 223-59, *Casters, Wheels, and Glides for Hospital Equipment.* (Log #CP303)

~~(b) Oxygen tent canopies having flexible components shall be fabricated of materials having a maximum burning rate classification of "slow burning."~~

8.5.2.2 Oxygen enclosures of rigid materials shall be fabricated of noncombustible materials. (Log #CP303)

8.5.2.3 ~~(c)~~ Equipment supplied from cylinders or containers shall be designed and constructed for service at full cylinder or container pressure, or constructed for use with, or equipped with pressure-reducing regulators.

8.5.2.4 ~~(d)~~ Humidification or reservoir jars containing liquid to be dispersed into a gas stream shall be made of clear, transparent material, impervious to contained solutions and medications, and shall permit observation of the liquid level and consistency.

8.5.2.5 ~~(e)~~ Humidifiers and nebulizers shall be equipped with provisions for overpressure relief or alarm if the flow becomes obstructed.

8.5.2.6 ~~(f)~~ Humidifiers and nebulizers shall be incapable of tipping or shall be mounted so that any tipping or alteration from the vertical shall not interfere with function or accuracy.

8.5.3 ~~8.5.2~~ Nonpatient Gas Equipment.

8.5.3.1 ~~8.5.2.1~~ Carts and Hand Trucks.

8.5.3.1.1 ~~8.5.2.1.1~~ Construction. Carts and hand trucks for cylinders and containers shall be constructed for the intended purpose, be self-supporting and be provided with appropriate chains or stays to retain cylinders or containers.

8.5.3.1.2 ~~8.5.2.1.2~~ Use. Carts and hand trucks that are intended to be used in anesthetizing locations or cylinder and container storage rooms communicating with anesthetizing locations shall comply with the appropriate provisions of 12-4.1.

8.5.3.2 ~~8.5.2.2~~ Gas Equipment — Laboratory. Gas appliances shall be of an approved design and installed in accordance with NFPA 54, *National Fuel Gas Code*. Shutoff valves shall be legibly marked to identify the material they control.

8.6 Administration.

8.6.1 ~~8.6.2~~ Policies.

8.6.1.1 ~~8.6.2.1~~ Elimination of Sources of Ignition.

8.6.1.1.1 ~~8.6.2.1.1~~ Smoking materials (matches, cigarettes, lighters, lighter fluid, tobacco in any form) shall be removed from patients receiving respiratory therapy. ~~and from the area of administration.~~

8.6.1.1.2* ~~8.6.2.1.2*~~ No sources of open flame, including candles, shall be permitted in the area of administration.

8.6.1.1.3* ~~8.6.2.1.3*~~ Sparking toys shall not be permitted in any patient care area.

8.6.1.1.4 ~~8.6.2.1.4~~ Nonmedical appliances that have hot surfaces or sparking mechanisms shall not be permitted within oxygen delivery equipment or within the site of intentional expulsion.

8.6.1.2 ~~8.6.2.2~~ Misuse of Flammable Substances.

8.6.1.2.1 ~~8.6.2.2.1~~ Flammable or combustible aerosols or vapors, such as alcohol, shall not be administered in oxygen-enriched atmospheres as outlined in C.8.2.1.11.

8.6.1.2.2 ~~8.6.2.2.2~~ Oil, grease, or other flammable substances shall not be used on/in oxygen equipment.

8.6.1.2.3 ~~8.6.2.2.3~~ Flammable and combustible liquids shall not be permitted within the site of intentional explusion.

8.6.1.3 ~~8.6.2.4~~ Servicing and Maintenance of Equipment.

8.6.1.3.1 ~~8.6.2.4.1~~ Defective equipment shall be immediately removed from service.

8.6.1.3.2 ~~8.6.2.4.2~~ Defective electrical apparatus shall not be used.

8.6.1.3.3 ~~8.6.2.4.3~~ Areas designated for the servicing of oxygen equipment shall be clean, free of oil and grease, and not used for the repair of other equipment.

8.6.1.3.4 ~~8.6.2.4.4~~ Service manuals, instructions, and procedures provided by the manufacturer shall be used in the maintenance of equipment.

8.6.1.3.5 ~~8.6.2.4.5~~ A scheduled preventive maintenance program shall be followed.

8.6.2 ~~8.6.2.5~~ Gases in Cylinders and Liquefied Gases in Containers.

8.6.2.1 ~~8.6.2.5.1~~ Transfilling Cylinders.

(a) Mixing of compressed gases in cylinders shall be prohibited.

(b) Transfer of gaseous oxygen from one cylinder to another shall be in accordance with CGA Pamphlet P-2.5, *Transfilling of High Pressure Gaseous Oxygen to Be Used for Respiration*.

(c) Transfer of any gases from one cylinder to another in patient care areas of health care facilities shall be prohibited.

8.6.2.2 ~~8.6.2.5.2~~ Transferring Liquid Oxygen. Transferring of liquid oxygen from one container to another shall be accomplished at a location specifically designated for the transferring that is as follows:

(a) Separated from any portion of a facility wherein patients are housed, examined, or treated by a separation of a fire barrier of 1-hour fire-resistive construction; and

(b) The area is mechanically ventilated, is sprinklered, and has ceramic or concrete flooring; and

(c) The area is posted with signs indicating that transferring is occurring, and that smoking in the immediate area is not permitted.

Transferring shall be accomplished utilizing equipment designed to comply with the performance requirements and producers of CGA Pamphlet P-2.6, *Transfilling of Low-Pressure Liquid Oxygen to be Used for Respiration*, and adhering to those procedures.

The use and operation of small portable liquid oxygen systems shall comply with the requirements of CGA Pamphlet P-2.7, *Guide for the Safe Storage, Handling and Use of Portable Liquid Oxygen Systems in Health Care Facilities*.

8.6.2.3 ~~8.6.2.6~~ Ambulatory Patients. Ambulatory patients on oxygen therapy shall be permitted access to all flame and smoke free areas within the health care facility.

8.6.3 ~~8.6.4~~ Use (Including Information and Warning Signs).

8.6.3.1 ~~8.6.4.1~~ Labeling.

8.6.3.1.1 ~~8.6.4.1.1~~ Equipment listed for use in oxygen-enriched atmospheres shall be so labeled.

8.6.3.1.2 ~~8.6.4.1.2~~ Oxygen-metering equipment and pressure-reducing regulators shall be conspicuously labeled:

OXYGEN — USE NO OIL

8.6.3.1.3 ~~8.6.4.1.3~~ Flowmeters, pressure-reducing regulators, and oxygen-dispensing apparatus shall be clearly and permanently labeled, designating the gas or mixture of gases for which they are intended.

8.6.3.1.4 Apparatus whose calibration or function is dependent on gas density shall be labeled as to the proper supply gas pressure (psig/kPa) for which it is intended.

~~8.6.4.1.4* Canopies or enclosures intended to contain patients shall be labeled with the information that oxygen is in use and that precautions related to the hazard shall be observed. The labels shall be located on the enclosure interior in a position to be read by the patient and on two or more opposing sides of the enclosure exterior.~~

~~*Exception: In health care facilities where smoking is prohibited and signs are prominently (strategically) placed at all major entrances, secondary signs with no-smoking language are not required. The nonsmoking policies shall be strictly enforced.*~~ (Log #CP304)

8.6.3.1.5 ~~8.6.4.1.5~~ Oxygen-metering equipment, pressure-reducing regulators, humidifiers, and nebulizers shall be labeled with the name of the manufacturer or supplier.

8.6.3.1.6 ~~8.6.4.1.6~~ Cylinders and containers shall be labeled in accordance with ANSI/CGA C-4, *Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained*. Color coding shall not be utilized as a primary method of determining cylinder or container content.

8.6.3.1.7 ~~8.6.4.1.7~~ All labeling shall be durable and withstand cleansing or disinfection.

8.6.3.2* ~~8.6.4.2*~~ Signs.

8.6.3.2.1 In health care facilities where smoking is not prohibited precautionary signs, readable from a distance of 1.5 m (5 ft), shall be conspicuously displayed wherever supplemental oxygen is in use, and in aisles and walkways leading to that area; they shall be attached to adjacent doorways or to building walls or be supported by other appropriate means.

8.6.3.2.2 ~~Exception~~: In health care facilities where smoking is prohibited and signs are prominently (strategically) placed at all major entrances, secondary signs with no-smoking language are not required.

8.6.3.2.3 The nonsmoking policies shall be strictly enforced.

8.6.3.3 ~~8.6.4.3~~ Transportation, Storage, and Use of Equipment.

8.6.3.3.1 ~~8.6.4.3.1~~ Flow-control valves on administering equipment shall be closed prior to connection and when not in use.

8.6.3.3.2 ~~8.6.4.3.2~~ Apparatus shall not be stored or transported with liquid agents in reservoirs.

8.6.3.3.3 ~~8.6.4.3.3~~ Care shall be observed in attaching connections from gas services to equipment and from equipment to patients.

8.6.3.3.4 ~~8.6.4.3.4~~ Fixed or adjustable orifice mechanisms, metering valves, regulators, and gauges shall not be connected directly to high-pressure cylinders unless specifically listed for such use and provided with appropriate safety devices.

~~8.6.4.3.5 Nasal respiratory therapy catheters shall be color coded green. Verification of proper connection to oxygen therapy equipment is necessary to prevent accidental attachment to gastric or intestinal catheters.~~ (Log #CP305)

8.6.3.3.5 Equipment shall only be serviced by qualified personnel ~~only~~.

SUBSTANTIATION: To editorially conform to NFPA Manual of Style (MOS) as rewritten, regarding mandatory language, annex information, paragraphing, exceptions, and separating multiple requirements.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 8
NOT RETURNED: 3 Bancroft, Mills, Swope
COMMENT ON AFFIRMATIVE:
HOFFMAN: 8.6.2.3 Ambulatory patients on oxygen therapy shall be permitted access only to flame and smoke free areas within the health care facility.
Substantiation: editorial to reflect the intent of the requirement.
8.6.3.1 ANSI/CGA C-7 Guide to Preparation of Precautionary Labeling and Marking of Compressed Gas Containers (2000).
Substantiation: correct the reference. C-4 was combined with C-7 (See Log #209a).
General: The text makes reference to "listed" and "approved" products. These begs the question as to who "lists" or "approves". This issue is not unique to Chapter 8.

(Log #14)
Committee: HEA-GAS

99- 318 - (8-3.1.11.1): Reject
SUBMITTER: Alan Lipschultz, Christiana Care Health Services
RECOMMENDATION: Storage for nonflammable gases with a total volume (compressed) of greater than 150 cu ft shall comply with 4-3.1.1.2.
SUBSTANTIATION: Original section referred to 3000 cu ft without specifying if that volume referred to gases in the compressed state, or if it referred to the volume that would exist if the gas was released from the cylinder.
The committee has interpreted the wording to be compressed. 3000 cu ft compressed is a lot of cylinders. This proposal sets the volume in the section to be approximately what would have been intended if the original volume had been interpreted as uncompressed.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The committee believes the accepted and commonly referenced 3000 cubic feet should be retained. See Committee Proposal 99-323 (Log #CP301).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 8
NOT RETURNED: 3 Bancroft, Mills, Swope

(Log #31)
Committee: HEA-GAS

99- 319 - (8-3.1.11.1 (New)): Reject
SUBMITTER: Western Regional Fire Code Dev. Committee
RECOMMENDATION: Add a new section and renumber the remaining:
8-3.1.11 Storage Requirements.
8-3.1.11.1 Storage for nonflammable gases with an aggregate capacity of the cylinders of 300 cubic ft or less for impending use.
a. Shall be kept in a supervised location or in accordance with 8-3.1.11.3(a).
b. Oxidizing gases, such as oxygen and nitrous oxide shall not be stored with any flammable gas, liquid, or vapor.
c. Oxidizing gases such as oxygen and nitrous oxide shall be separated from combustibles or incompatible materials.
d. Liquefied gas container storage shall comply with 4-3.1.1.2(b)4.
e. Cylinder and container storage locations shall meet 4-3.1.1.2(a)11e with respect to temperature limitations.
f. Electrical fixtures in storage locations shall meet 4-3.1.1.2(a)11d.
g. Cylinder protection from mechanical shock shall meet 4-3.5.2.1(b)13.
h. Cylinder or container restraint shall meet 4-3.5.2.1(b)27.
i. Smoking, open flames, electric heating elements, and other sources of ignition shall be prohibited within storage locations.
SUBSTANTIATION: It is a common practice within hospitals to keep small quantities of oxygen on hand at nursing stations to rotate out for ambulatory patients empty cylinders. These few containers are no more hazardous and even less so than the cylinders that the patients are wheeling around with them. As currently written, this requirement is difficult to enforce. I believe that it must be recognized that there is a difference between 300 cubic ft of oxygen and 3000 cubic ft. (12 vs. vs 120 cylinders). As I have observed, storing a few cylinders in an open supervised location is actually more secure than as required by this section in that they are required to be stored in a room with doors that only need to be able to be secured against unauthorized entry. Too often these rooms are out of view of nursing staff and are rarely locked or even closed. This proposal would make this requirement more enforceable and safer. This exception actually makes the requirement for these small quantities less restrictive.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Proposal 99-320 (Log #CP302).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NEGATIVE: 1
NOT RETURNED: 3 Bancroft, Mills, Swope
EXPLANATION OF NEGATIVE:
DAVID: Accept in Principle: Language provided is not clear as to the cylinders capacity (is it when they are full?), to the nature of the required "supervised location", and as to nature of "separation from combustibles materials".

(Log #CP302)
Committee: HEA-GAS

99- 320 - (8-3.1.11.1, 8-3.1.11.2): Accept
SUBMITTER: Technical Committee on Gas Delivery Equipment
RECOMMENDATION: Revise as follows:
"8-3.1.11.1 Storage for nonflammable gases equal to or greater than 85 m^3 (3000 ft^3), uncompressed shall be...".
8-3.1.11.2 Storage for nonflammable gases greater than 8.5m^3 (300 ft^3) but less than 85 m^3 (3000 ft^3), uncompressed.
SUBSTANTIATION: Clarification. See Committee Statement on Proposal 99-318 (Log #14) and Committee Proposal 99-323 (Log #CP301).
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 8
NOT RETURNED: 3 Bancroft, Mills, Swope

(Log #15)
Committee: HEA-GAS

99- 321 - (8-3.1.11.2): Reject
SUBMITTER: Alan Lipschultz, Christiana Care Health Services
RECOMMENDATION: Change first sentence to:
"Storage for nonflammable gases with a total volume (compressed) of less than 150 cu ft and greater than 5 cu ft."
SUBSTANTIATION: See substantiation for proposals on section 8-3.1.11.1 and 8-3.11.3 (new).
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Statement on Proposal 99-318 (Log #14) and Committee Proposal 99-323 (Log #CP301).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 8
NOT RETURNED: 3 Bancroft, Mills, Swope

(Log #109)
Committee: HEA-GAS

99- 322 - (8-3.1.11.2(d)): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Revise Subparagraph (d) to read:
"Gas cylinder and liquefied gas container storage shall comply with 4-3.1.1.2(c)."

SUBSTANTIATION: Current text [Subparagraph (d)] addresses venting only for liquefied containers. It would seem appropriate to include requirements for venting for both cylinders and containers. Recommendation would have requirement the same as that in Chapter 4 for storage rooms holding <3000 ft^3 of gas, irrespective of state of gas (liquefied or gaseous).
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 8
NOT RETURNED: 3 Bancroft, Mills, Swope

(Log #CP301)
Committee: HEA-GAS

99- 323 - (8-3.11.1 and 8-3.11.2): Reject
SUBMITTER: Technical Committee on Gas Delivery Equipment
RECOMMENDATION: Background: Both sections refer to 3000 ft^3 (85 m^3) without specifying if the volume refers to the gases in the compressed sate (in cylinders) or the uncompressed state (out of cylinders).

Question: Does the volume measurement [3000 ft^3 (85 m^3)] mentioned in Sections 8-3.11.1 and 8-3.11.2 refer to gases in the compressed state?

Answer: Yes.
SUBSTANTIATION: The Regulations Governing Committee Projects require that a proposal be processed to clarify the text of a document on which a Formal Interpretation has been issued. After issuance of the next edition of the document, the Formal Interpretation will no longer be published.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The committee has reconsidered the intent of 3,000 cubic feet to mean uncompressed volume.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 8
NOT RETURNED: 3 Bancroft, Mills, Swope

(Log #16)
Committee: HEA-GAS

99- 324 - (8-3.11.3): Reject
TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee for further consideration. The Technical Committee Statement did not address the submitter's substantiation.
SUBMITTER: Alan Lipschultz, Christiana Care Health Services
RECOMMENDATION: Insert new Section 8-3.11.3 with text as follows. Renumber current 8-3.11.3.

"Storage for nonflammable gases with a a total volume (compressed) of less than or equal to 5 cu ft and greater than .20 cu ft.

(a) Storage locations shall not be located where heavy moving objects are likely to strike them.

(b) Cylinders shall be stored in a secure manner so as to prevent falling."
SUBSTANTIATION: The primary risk when storing relatively small quantities of nonflammable gases is that of kinetic energy released from physical damage to the cylinder. They need to be secured to prevent damage to the neck.

The previous language made these small storage locations comply with inappropriately stringent requirements. In hospitals around the country, it is very common to store 6-16 "E" oxygen cylinders or an "H" cylinder in a location with no other precautions than securing the tank. No incidents or problems have been reported as a result of this practice to my knowledge. The onus should be on the committee to document the hazard if they feel more stringent requirements are needed.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The committee believes the existing requirements are appropriate.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 8
NOT RETURNED: 3 Bancroft, Mills, Swope

(Log #CP303)
Committee: HEA-GAS

99- 325 - (8-5.1.2.2(a) and (b)): Accept
SUBMITTER: Technical Committee on Gas Delivery Equipment
RECOMMENDATION: Revise as follows:

"(a) ~~Oxygen tent circulation/conditioning apparatus, pressure breathing apparatus, and other equipment~~ Oxygen delivery equipment intended to rest on the floor...".

"(b) ~~Oxygen tent canopies having flexible components shall be fabricated of materials having a maximum burning rate classification of "slow burning.~~ Oxygen enclosures of rigid...".
SUBSTANTIATION: Oxygen tents are no longer a common treatment modality.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 8
NOT RETURNED: 3 Bancroft, Mills, Swope

(Log #CP304)
Committee: HEA-GAS

99- 326 - (8-6.4.1.4): Accept
SUBMITTER: Technical Committee on Gas Delivery Equipment
RECOMMENDATION: Delete paragraph and appendix.
SUBSTANTIATION: See Committee Proposal 99-325 (Log #CP303).
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 8
NOT RETURNED: 3 Bancroft, Mills, Swope

(Log #CP305)
Committee: HEA-GAS

99- 327 - (8-6.4.3.5): Accept
SUBMITTER: Technical Committee on Gas Delivery Equipment
RECOMMENDATION: Delete paragraph.
SUBSTANTIATION: The committee believes the requirement is no longer relevant.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 8
NOT RETURNED: 3 Bancroft, Mills, Swope

(Log #CP106)
Committee: HEA-ELE

99- 328 - (Chapter 9): Accept
SUBMITTER: Technical Committee on Electrical Equipment
RECOMMENDATION: Reword the following sections of Chapter 9 (new Chapter 10) to read as follows:

~~Chapter 9~~ Chapter 10 Manufacturer Requirements

~~9-1* Scope. This chapter covers the performance, maintenance, and testing, with regard to safety, required of manufacturers of equipment used within health care facilities.~~

~~9-2 Electrical Equipment.~~

10.1 Applicability. This chapter applies to equipment manufactured for use in the delivery of patient care.

10.2* ~~9-2.1*~~ Patient-Care-Related Electrical Appliances.

10.2.1 ~~9-2.1.1~~ Mechanical Construction.

10.2.1.1 ~~9-2.1.1.1~~ Separation of Patient Circuits. Patient-connected circuits within an appliance shall be ~~sufficiently~~ separated or insulated from all other circuits within the appliance to prevent accidental contact with hazardous voltages or currents.

10.2.1.2 ~~9-2.1.1.2~~ Mechanical Stability. The appliance shall be mechanically stable in the position of normal use. If the appliance is intended for use in an anesthetizing location, 12-4.1 ~~applies~~ shall apply.

10.2.2 ~~9-2.1.2~~ Electrical Requirements — Appliances Equipped with Power Cords.

10.2.2.1* ~~9-2.1.2.1~~ Attachment Plugs. ~~(a)* General.~~ Attachment plugs listed for the purpose shall be used on all cord-connected appliances.

10.2.2.1.1 ~~(b)*~~ Construction and Use. The attachment plug ~~(cap)~~ shall be a two-pole, three-wire grounding type.

10.2.2.1.2 ~~Exception No. 1:~~ Appliances used in special locations or for special purposes, shall be equipped with attachment plugs equipped with plugs approved for the location [e.g., 3-3.2.1.2(d)].
10.2.2.1.3 ~~Exception No. 2: If the p~~Power cords of an appliance that does not require and does not contain a grounding conductor, ~~it~~ shall not be fitted with a grounding-type plug [see 9-2.1.2.2(e), ~~Cords without Grounding Conductors~~].
10.2.2.1.4 ~~Exception No. 3:~~ Appliances supplied by other than 120-V single-phase systems shall use the grounding-type plug (cap) appropriate for the particular power system ~~(e.g., ANSI C73.16, C73.17, C73.18, C73.28, C73.83, C73.84, C73.86, C73.87, C73.88, C73.89, C73.90, C73.91, C73.92, C73.94, and C73.95)~~.
10.2.2.1.5 ~~The grounding prong shall be constructed so that it cannot be easily broken.~~ The grounding prong of the plug shall be the first to be connected to and the last to be disconnected from the receptacle.
10.2.2.1.6 If screw terminals are used, the stranded conductor shall be twisted to prevent stray strands, but the bundle shall not be tinned after twisting.
10.2.2.1.7 If the conductor is not twisted, it shall be attached by an approved terminal lug.
10.2.2.1.8 The power cord conductors shall be arranged so that the conductors are not under tension in the plug.
10.2.2.1.9 The grounding conductor shall be the last one to disconnect when a failure of the plug's strain relief allows the energized conductors to be disrupted.
10.2.2.1.10 ~~(c)~~ Strain Relief. Strain relief shall be provided.
10.2.2.1.10.1 The strain relief shall not cause thinning of the conductor insulation.
10.2.2.1.10.2 The strain relief of replaceable plugs shall be capable of being disassembled.
10.2.2.1.10.3 Plugs ~~are~~ shall be permitted to be integrally molded onto the cord jacket if the design is listed for the purpose.
10.2.2.1.11 ~~(d)~~ Testing. The wiring of each cord assembly shall be tested for continuity and polarity at the time of manufacture, when assembled into an appliance, and when repaired.
10.2.2.2 ~~9-2.1.2.2~~ Power Cords.
10.2.2.2.1* ~~(a)*~~ Material and Gauge.
10.2.2.2.1.1 The flexible cord, including the grounding conductor, shall be of a type ~~suitable~~ for the particular application, listed for use at a voltage equal to or greater than the rated power line voltage of the appliance, and have an ampacity, as given in Table 400-5(A) of NFPA 70, National Electrical Code, equal to or greater than the current rating of the device.
10.2.2.2.1.2* "Hard Service" (SO, ST, or STO) or "Junior Hard Service" (SJO, SJT, or SJTO) or equivalent listed flexible cord shall be used except where an appliance with a cord of another designation has been listed for the purpose.
A.10.2.2.2.1.2 (see Table 400-4 of NFPA 70, National Electrical Code).
10.2.2.2.2 ~~(b)~~ Grounding Conductor.
10.2.2.2.2.1 Each electric appliance shall be provided with a grounding conductor in its power cord.
10.2.2.2.2.2 The grounding conductor shall be no smaller than No. 18 AWG.
10.2.2.2.2.3 The grounding conductor of cords longer than 4.6 m (15 ft) shall be no smaller than No. 16 AWG.
10.2.2.2.2.4 Grounding conductors shall meet the resistance requirements of 10.2.3.2. ~~9-2.1.13.2, Grounding Circuit Continuity.~~
10.2.2.2.2.5 ~~Exception:~~ A grounding conductor in the power cord shall not be required ~~need not be provided~~ for listed double-insulated appliances, but such a grounding conductor shall be permitted to be used to ground exposed conductive surfaces (see 10.2.3.2 ~~9-2.1.3.2, Grounding of Exposed Conductive Surfaces~~).
10.2.2.2.3 ~~(c)~~ Separable Cord Sets.
10.2.2.2.3.1 A separable power cord set shall be permitted to be used if it can be shown that an accidental disconnection does not pose a hazard. ~~is unlikely or not hazardous.~~
10.2.2.2.3.2 Separable power cord sets shall be designed so that the grounding conductor is the first to be connected and the last to be disconnected.
10.2.2.2.3.3 Cord-set plugs and receptacles at the appliance shall be polarized in accordance with ANSI C73.13 and C73.17.
Appliances with separable cord sets shall meet the grounding-wire-resistance requirements of 9-2.1.13.2, Grounding Circuit Continuity—Measurement of Resistance, when the cord set is connected to the appliance.
10.2.2.2.3.4 Both the cord set and the means of connection to the appliance shall be listed for the purpose.
10.2.2.2.4 ~~(d)~~ Connection to Circuit and Color Codes.
10.2.2.2.4.1* Power cords, regardless of whether intended for use on grounded or isolated power systems, shall be connected in accordance with the conventions of a grounded system.
A.10.2.2.2.4.1 (See Sections 200-2 through 200-10 of NFPA 70, National Electrical Code.)
10.2.2.2.4.2* The circuit conductors in the cord shall be connected to the plug and the wiring in the appliance so that any of the following devices, when used in the primary circuit, are connected to the ungrounded conductor:
(1) the center contact of an Edison base lampholder;
(2) a solitary fuseholder;
(3) a single-pole, overcurrent-protective device; and
(4) any other single-pole, current-interrupting device.
A.10.2.2.2.4.2 [See Exception No. 2 to Section 210-5(b) of NFPA 70, National Electrical Code.]
10.2.2.2.4.3 ~~Exception: If a~~ A second fuseholder or other overcurrent-protective device ~~is~~ provided in the appliance, ~~it~~ shall be permitted to be placed in the grounded side of the line.
10.2.2.2.5 ~~(e)~~ Cords Without Grounding Conductors. ~~If t~~The power cord of an appliance that does not require and does not contain a grounding conductor, ~~it~~ shall not be fitted with a grounding-type plug.
10.2.2.2.6 ~~(f)~~ Testing. The wiring of each cord assembly shall be tested for continuity and polarity at the time of manufacture, when assembled into an appliance, and when repaired.
10.2.2.2.7 ~~(g)~~ Cord Strain Relief.
10.2.2.2.7.1 Cord strain relief shall be provided at the attachment of the power cord to the appliance so that mechanical stress, either pull, twist, or bend, is not transmitted to internal connections.
10.2.2.2.7.2 ~~If the~~ A strain relief ~~is~~ molded onto the cord, ~~it~~ shall be bonded to the jacket and shall be of compatible material.
10.2.2.2.8* ~~(h)*~~ Storage.
10.2.3 ~~9-2.1.3~~ Wiring Within Appliances Equipped with Power Cords.
10.2.3.1 ~~9-2.1.3.1~~ Protection of Wiring in Appliances. Within the appliance, the power conductors of the cord and the associated primary wiring (other than the grounding conductor) shall be mounted and dressed to minimize ~~the likelihood of~~ accidental electrical contact with the frame or exposed conductive parts of the appliance.
10.2.3.2 ~~9-2.1.3.2*~~ Grounding of Exposed Conductive Surfaces. All exposed conductive surfaces of an electric appliance ~~likely to~~ that become energized from internal sources shall be bonded together to provide electric continuity with the connection to the grounding conductor.
10.2.3.3 ~~9-2.1.3.3~~ Replacement Connection ~~Connection to Permit Replacement. The connection of the power cord to the appliance shall permit ready replacement of the cord except where the power cord is not intended to be replaced by the user.~~ Ready replacement of the power cord shall be permitted except where the power cord is not intended to be replaced by the user.
10.2.3.4 ~~9-2.1.3.4~~ Connection of the Grounding Conductor.
10.2.3.4.1 The grounding conductor shall be connected to the exposed metal or frame of the appliance by a terminal or bolt so that an ~~reliable~~ electrical connection is always maintained.
10.2.3.4.2 The grounding connection shall ~~be arranged so that it will not be broken~~ remain intact during electrical or mechanical repair of the appliance, except during replacement of the power cord.
10.2.3.4.3 ~~The power cord shall be arranged so that the grounding conductor is the last to disconnect when a failure of the strain relief at the appliance allows the cord to be pulled free.~~ The grounding conductor shall be the last conductor to disconnect when a failure of the plug's strain relief at the appliance allows the erngized conductors to be disrupted.
10.2.3.4.4 When a grounding conductor is not required and is not provided, the appliance shall be ~~visibly~~ labeled to indicate that fact.
10.2.3.5 ~~9-2.1.3.5~~ Connections with Grounding Conductor. Any component, such as a filter or test circuit, within an appliance that intentionally reduces the impedance between the energized conductors and the grounding conductor shall be in operation when the leakage current tests specified in 10.2.13.4 ~~9-2.1.13.4, Leakage Current from Appliance to Ground,~~ are performed.
10.2.3.6* ~~9-2.1.3.6*~~ Overcurrent Protection.
10.2.3.6.1 An overcurrent protective device shall be permitted to be placed in any of the following locations:
(1) in the attachment plug,

(2) in the power cord,
(3) ~~or~~ in the main body of the appliance.
10.2.3.6.2 The overcurrent protective device shall precede any other components within the appliance, including the primary power-control switch.
10.2.3.6.3 ~~Exception:~~ Listed insulated terminal blocks or strips, listed connecting devices, and RFI filters for use on power systems shall be permitted to precede the overcurrent device (see 10.2.3.5 ~~9-2.1.3.5~~).
10.2.3.6.4 ~~This requirement shall not preclude t~~The use of overcurrent protective devices within the appliance shall be permitted.
10.2.3.6.5 The power-control switch and overcurrent protective device shall be permitted to be combined into one component provided it is identified to indicate the combined function.
10.2.3.7 ~~9-2.1.3.7~~ Primary Power-Control Switch.
10.2.3.7.1 ~~When a~~ A primary power-control switch when ~~is~~ provided on an appliance, ~~it~~ shall interrupt all primary power conductors, including the neutral conductor.
10.2.3.7.2 The grounding conductor shall not be interrupted by the switch.
10.2.3.7.3 ~~Exception:~~ When the primary power wiring of an appliance is polarized a primary power control switch shall not be required to interrupt the neutral conductor, ~~so as to ensure the proper connection of its neutral conductor to the electric distribution system of the building, that neutral conductor need not be interrupted by a primary power-control switch.~~
10.2.3.7.4 An in-line switch shall be permitted in a primary power cord only if the switch is listed with the appliance with which it is intended to be used.
10.2.3.8 ~~9-2.1.3.8~~ Rack- or Cart-Mounted Equipment.
10.2.3.8.1 Each appliance mounted in an equipment rack or cart, when rated by the manufacturer as a stand-alone appliance, shall independently meet the requirements of 9-2.1.13.
10.2.3.8.2 When multiple appliances, as designated by the manufacturer, are mounted together in a cart or rack, and one power cord supplies power, the cart or rack shall meet the requirements of 9-2.1.13.
10.2.4 ~~9-2.1.4~~ Connectors and Connections to Devices.
10.2.4.1 ~~9-2.1.4.1~~ Indexing of Receptacles for Patient Leads.
10.2.4.1.1 Receptacles on appliances shall be designed and constructed so that those contacts that deliver electric current in a way and of a magnitude greater than 500 microamperes, when measured in accordance with 9-2.1.13.5(a), (b), (d), and (e), are female and indexed.
10.2.4.1.2 Receptacles and plugs shall be polarized if improper orientation can create a hazard.
10.2.4.2* ~~9-2.1.4.2*~~ Distinctive Receptacles for Patient Leads. Where reversal or misconnection of patient leads to an appliance ~~might~~ constitutes a possible hazard (for example: reversal of active and dispersive electrodes of electrosurgical machines), distinctive, noninterchangeable connections shall be employed.
10.2.4.3 ~~9-2.1.4.3~~ Patient Lead Connections.
10.2.4.3.1 ~~(a)~~ Lead Termination. The connector, distal to the patient, on a patient lead shall be constructed so that the connector cannot be inserted to make contact with the live parts of a power receptacle or to engage any part of the appliance that can introduce a risk of electric shock, fire, or personal injury.
10.2.4.3.2 ~~(b)~~ Isolated Patient Lead. The appliance connector of an isolated patient lead shall be constructed so that, when not inserted properly in the appliance, the end of the conductor of the lead cannot electrically contact ~~a surface that might~~ any conductive surface ~~be grounded~~.
10.2.5* ~~9-2.1.5*~~ Line Voltage Variations and Transients — General. All appliances shall be capable of operating within line voltage variations that conform with ANSI C84.1, Voltage Ratings: Electric Power Systems and Equipment.
10.2.6 ~~9-2.1.6~~ General Design and Manufacturing Requirements.
10.2.6.1 ~~9-2.1.6.1~~ Thermal Standards.
10.2.6.1.1 Electric appliances not designed to supply heat to the patient, and operated within reach of a nonambulatory patient, shall not have exposed surface temperatures in excess of 50°C (122°F).
10.2.6.1.2 Surfaces maintained in contact with the skin of patients and not intended to supply heat shall not be hotter than 40°C (104°F).
10.2.6.2 ~~9-2.1.6.2~~ Toxic Materials.
10.2.6.2.1 Surfaces that contact patients shall be free of materials that commonly cause ~~toxic~~ adverse reactions.
10.2.6.2.2 Coatings used on these surfaces shall conform to ANSI Z66.1, Specifications for Paints and Coatings Accessible to Children to Minimize Dry Film Toxicity.
10.2.6.3* ~~9-2.1.6.3*~~ Chemical Agents. Electric appliances containing hazardous chemicals shall be designed to facilitate the replenishment of these chemicals without spillage to protect the patient, the operating personnel, and the safety features of the appliance from such chemicals.
10.2.6.4 ~~9-2.1.6.4~~ Electromagnetic Compatibility. All appliances shall be designed so that they are capable of operating in a radio frequency electromagnetic environment where limits are established by IEC 60601-1-2.
10.2.6.5 ~~9-2.1.6.5~~ Operation with Essential Electrical System.
10.2.6.5.1 ~~(a)~~ General. Equipment (fixed or appliances) shall be designed to operate normally when energized by a standby power source that conforms to the requirements of Chapter 3.
10.2.6.5.2 ~~(b)~~ Power Transfer.
10.2.6.5.2.1 Following transfer of power between the normal power system and the essential electrical system, a patient-care-related appliance shall resume function in the mode of operation that existed prior to the transfer.
10.2.6.5.2.2 ~~Exception:~~ If the appliance cannot maintain its mode of operation in the event of a power transfer, it shall default to a nonhazardous status and clearly indicate by audible or visible signals that its mode of operation has changed.
10.2.6.5.3 ~~(c)~~ Programmable Appliances.
10.2.6.5.3.1 Deenergization of the power supply of a programmable appliance shall not result in the loss or change of any part of the program or data required for normal operation.
10.2.6.5.3.2 ~~Exception No. 1: This requirement does not apply~~ Applies to computers and programmable appliances that are not directly related to patient care.
10.2.6.5.3.3 ~~Exception No. 2:~~ Patient-care-related appliances that ~~could~~ suffer a loss of program or vital data shall default to a start-up status and clearly indicate by audible or visual signals that its program or data has been altered or lost.
10.2.7 ~~9-2.1.7~~ Fire and Explosion Hazards.
10.2.7.1 ~~9-2.1.7.1~~ Materials and Supplies.
10.2.7.1.1 Materials used in the construction of, and supplies for, electric appliances shall be noncombustible or flame retardant and impermeable to liquids (such as water and intravenous solutions) and gases to the extent practicable; or the materials used in the construction of, and supplies for, electric appliances shall not ignite from internal heating or arcing resulting from any and all possible fault conditions. ~~This includes spillage of liquids such as water and intravenous solutions onto the appliance.~~
10.2.7.1.2 ~~Exception:~~ Materials used in the construction and operation of electric appliances shall be permitted to be combustible when it is essential to their intended function.
10.2.7.2* ~~9-2.1.7.2*~~ Oxygen-Enriched Atmospheres. Electric appliances employing oxygen, or that are intended to be used in oxygen-enriched atmospheres, shall comply with all of the following ~~the appropriate provisions of~~
(1) Chapter 9 ~~8, "Gas Equipment," and~~
(2) Chapter 20 ~~19, "Hyperbaric Facilities,"~~
(3) in addition to all applicable provisions of this chapter.
10.2.7.3 ~~9-2.1.7.3~~ Inhalation Anesthetizing Locations. Electric appliances used in inhalation anesthetizing locations shall comply with all of the following ~~the provisions of~~
(1) Chapter 8 ~~7, "Electrical Equipment," and~~
(2) 13.4.1 ~~12.4.1~~,
(3) in addition to all applicable provisions of this chapter.
10.2.8 ~~9-2.1.8~~ Instruction Manuals and Labels.
10.2.8.1 ~~9-2.1.8.1~~ Manuals.
10.2.8.1.1 The manufacturer of the appliance shall furnish operator's, maintenance, and repair manuals with all units.
10.2.8.1.2 These manuals shall include operating instructions, maintenance details, and testing procedures~~.~~ and ~~The manuals~~ shall include the following where applicable:
(1) ~~(a)~~ Illustrations that show location of controls
(2) ~~(b)~~ Explanation of the function of each control
(3) ~~(c)~~ Illustrations of proper connection to the patient and other equipment
(4) ~~(d)~~ Step-by-step procedures for proper use of the appliance
(5) ~~(e)~~ Safety considerations in application and in servicing
(6) ~~(f)~~ Difficulties that might be encountered, and care to be taken if the appliance is used on a patient simultaneously with other electric appliances

(7) ~~(g)~~ Schematics, wiring diagrams, mechanical layouts, parts lists, and other pertinent data for the appliance as shipped
(8) ~~(h)~~ Functional description of the circuit
(9) ~~(i)~~ Electrical supply requirements (volts, frequency, amperes, and watts), heat dissipation, weight, dimensions, output current, output voltage, and other pertinent data
(10) ~~(j)~~ The limits of electrical supply variations — performance specifications of the appliance shall be given for the applicable limits of electrical supply variations.
(11) ~~(k)~~ Technical performance specifications including design levels of leakage current
(12) ~~(l)~~ Instructions for unpacking ~~(readily available upon opening)~~, inspecting, installing, adjusting, and aligning
(13) ~~(m)~~ Comprehensive preventive and corrective maintenance and repair procedures

10.2.8.1.3 ~~Where appropriate, t~~The information itemized shall be permitted to be supplied in the form of a separate operating manual and a separate maintenance manual, except that the separate maintenance manual shall also include ~~essentially~~ all the information included in the operating manual.

10.2.8.2 ~~9-2.1.8.2~~ Operating Instructions on Appliances. Condensed operating instructions shall be ~~visibly and~~ permanently attached to, or displayed on, any appliance that is intended to be used in emergency situations and that ~~could~~ result~~s~~ in injury or death to the operator or patient if improperly used.

10.2.8.3 ~~9-2.1.8.3~~ Labeling.

10.2.8.3.1 The manufacturer shall furnish, for all appliances, labels that are ~~readily visible and~~ legible and that remain so after being in service for the expected life of the appliance under hospital service and cleaning conditions.

10.2.8.3.2 Controls and indicators shall be labeled to indicate their function.

10.2.8.3.3 ~~When appropriate, a~~Appliances shall be labeled with precautionary statements if applicable.

10.2.8.3.4 All appliance~~s~~ labeling shall include the following: ~~shall be labeled with~~
(1) model numbers,
(2) date of manufacture,
(3) manufacturer's name, ~~and the~~
(4) electrical ratings including voltage, frequency, current, and/or wattage of the device.

10.2.8.3.5 Date of manufacture shall be permitted to be a code, if its interpretation is provided to the user.

10.2.8.3.6 Appliances shall be labeled to indicate if they ~~(1)~~ are listed for use as medical equipment and ~~(2)~~ have isolated patient leads.

10.2.8.3.7 Appliances intended for use in anesthetizing locations shall be labeled in an approved manner. (See ~~12-4.1~~ 13.4.1.)

10.2.9 ~~9-2.1.9~~ Additional Requirements for Special Appliances.

10.2.9.1 ~~9-2.1.9.1~~ Signal Transmission Between Appliances.

10.2.9.1.1* ~~(a)*~~ General. Signal transmission lines from an appliance in a patient location to remote appliances shall employ a signal transmission system designed to prevent hazardous current flowing in the grounding interconnection of the appliances.

10.2.9.1.2 ~~(b)~~ Outdoor Signal Transmission. Outdoor signal transmission lines from appliances attached to patients shall be equipped with surge protection appropriate to the type of transmission line used. Such appliances or signal transmission lines shall be designed to prevent a hazard to the patient from exposure of the lines to lightning, power contact, power induction, rise in ground potential, radio interference, and so forth.

10.2.9.2 ~~9-2.1.9.2~~ Appliances Intended to Deliver Electrical Energy.

10.2.9.2.1* ~~(a)*~~ Conditions for Meeting Safety Requirements. Electrical-energy-delivering appliances shall conform to the leakage, grounding, and other requirements of this chapter when powered but not delivering energy.

10.2.9.2.2 ~~(b)~~ Specific Requirements by Type of Device.

10.2.9.2.2.1* ~~1.*~~ Electrically Powered Transducers. Exposed metal parts of these devices shall be considered electrodes and meet the applicable requirements of 10.2.13 ~~9-2.1.13~~, ~~Manufacturers' Tests for Safety of Patient-Care-Related Electrical Appliances~~.

10.2.9.2.2.2 Connectors shall be designed to prevent inadvertent interchange of leads if interchange ~~could~~ constitute~~s~~ a hazard to the patient or operator.

10.2.9.2.2.3* ~~2.*~~ Patient Impedance Measuring Devices. For a particular application, the combination of frequency and current levels shall limit the applied current to the minimum necessary to achieve the medical purposes, and shall ~~but~~ not ~~to~~ exceed the limits given in 10.2.13.5 ~~9-2.1.13.5, Lead Leakage Current Tests and Limits~~.

~~Exception: The limits given in 9-2.1.13.5~~ These limits shall be permitted to be exceeded if essential for the intended clinical function.

10.2.9.2.2.4* ~~3.*~~ Electrotherapeutic Devices. Appliances that require specific pulse forms or high power levels shall be designed to protect the operator and attendant personnel from accidental electric shock.

10.2.9.2.2.5* ~~4.*~~ Electrosurgery. Electrosurgical devices shall meet the requirements of 9-2.1.9.2(a), Conditions for Meeting Safety Requirements.

10.2.9.2.2.6* ~~5.*~~ Cardiac Defibrillation. Cardiac defibrillators shall be designed to protect the operator and attendant personnel from accidental electric shock.

10.2.9.3 ~~9-2.1.9.3~~ Electrical Equipment in Oxygen-Enriched Atmospheres.

Appliances or part(s) of an appliance or system (e.g., pillow speaker, remote control, pulse oxymeter probe) to be used in the site of intentional expulsion shall comply ~~with the requirements of this section. Those parts of an appliance or system not within oxygen delivery equipment, or not intended to be used in the site of intentional expulsion, shall not be required to comply with this section. Electrically powered equipment intended to be used within oxygen delivery equipment shall comply~~ with (a), (b), (c) or (d) as listed below.

(a) Listed for use in oxygen-enriched atmospheres.

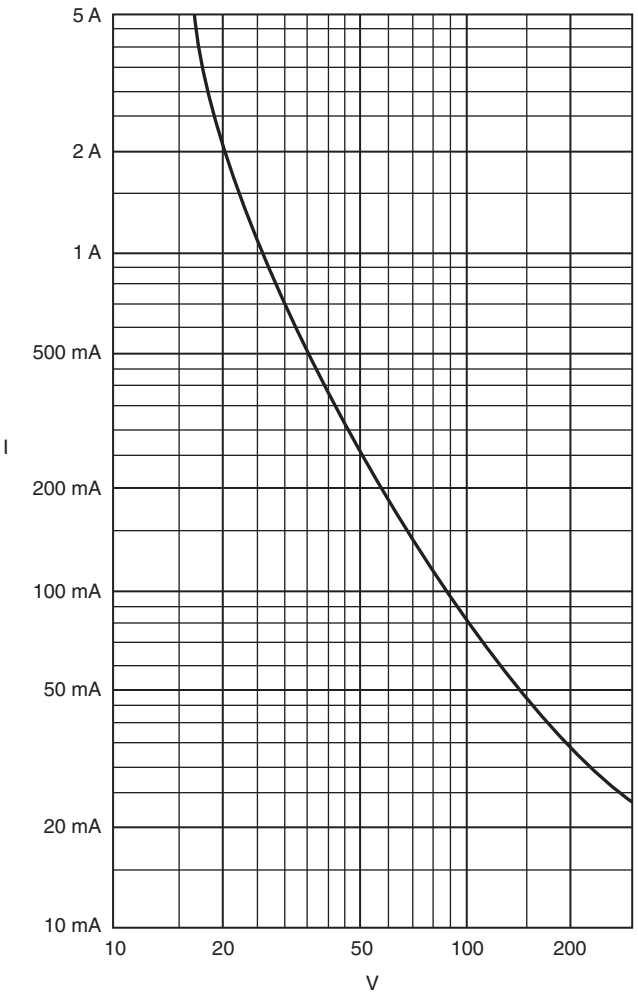


Figure 10.2.9.3(a) ~~9-2.1.9.3(a)~~ Resistance circuits (L < 1 mH). Minimum igniting currents, applicable to all circuits containing cadmium, zinc, or magnesium.

(b) Sealed so as to prevent an oxygen-enriched atmosphere from reaching electrical components. The sealing material shall be of the type that will still seal even after repeated exposure to water,

oxygen, mechanical vibration, and heating from the external circuitry.

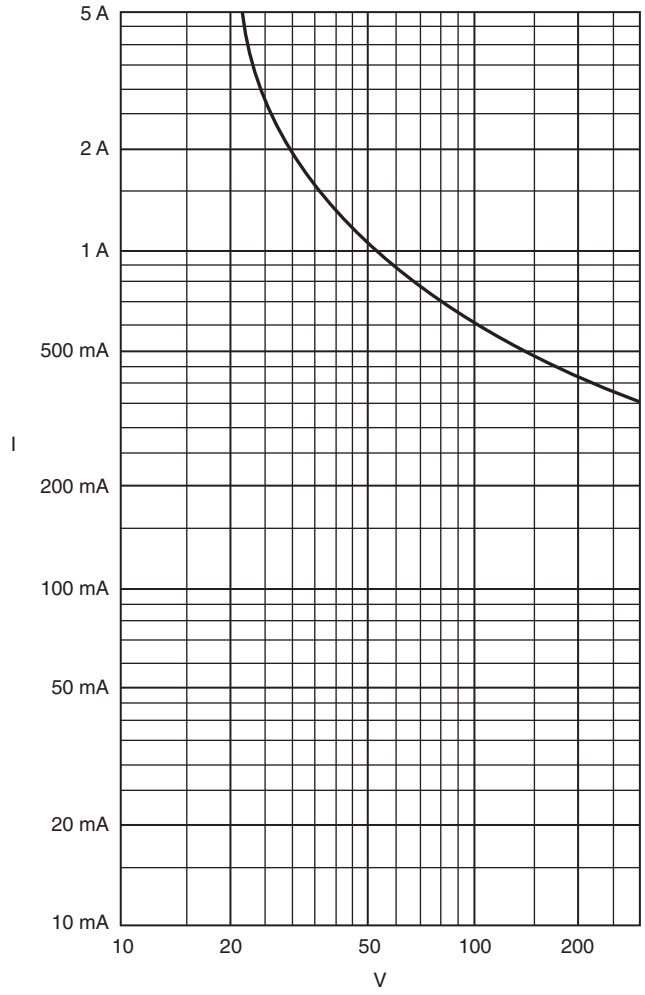


Figure 10.2.9.3(b) ~~9-2.1.9.3(b)~~ Resistance circuits (L < 1 mH). Minimum igniting currents, applicable to circuits where cadmium, zinc, or magnesium can be excluded.

(c) Ventilated so as to limit the oxygen concentration surrounding electrical components to below 23.5 percent by volume.

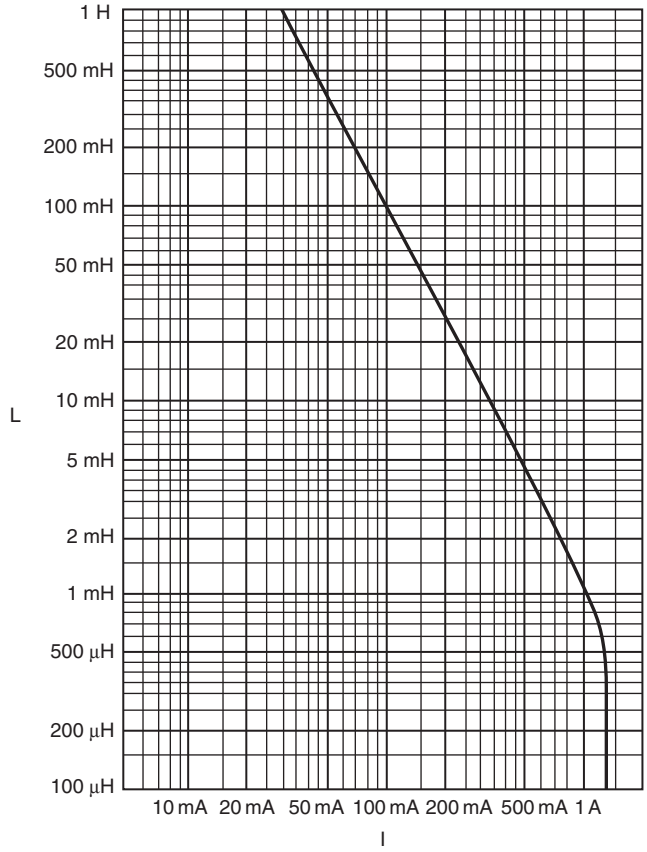


Figure 10.2.9.3(c) ~~9-2.1.9.3(c)~~ Inductance circuits (L > 1 mH). Minimum igniting currents at 24 V, applicable to all circuits containing cadmium, zinc, or magnesium.

(d) Both of the following:

1. No hot surfaces over 300°C (573°F). except for ~~Exception: S~~small (less than 2-W) hermetically sealed heating elements such as light bulbs.
2. No exposed switching or sparking points of electrical energy that fall to the right of the curve for the appropriate type of circuit illustrated ~~contained~~ in Figures 10.2.9.3 ~~9-2.1.9.3~~(a) through (f). The dc (or peak ac) open-circuit voltage and short-circuit current shall be used.

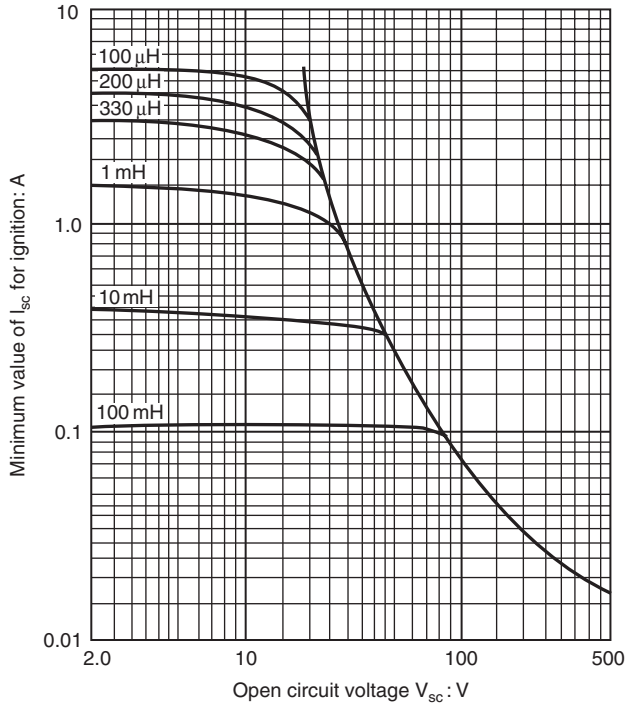


Figure 10.2.9.3(d) ~~9-2.1.9.3(d)~~ Inductance circuits (L > 1 mH). Minimum igniting currents for various voltages, applicable to all circuits containing cadmium, zinc, or magnesium.

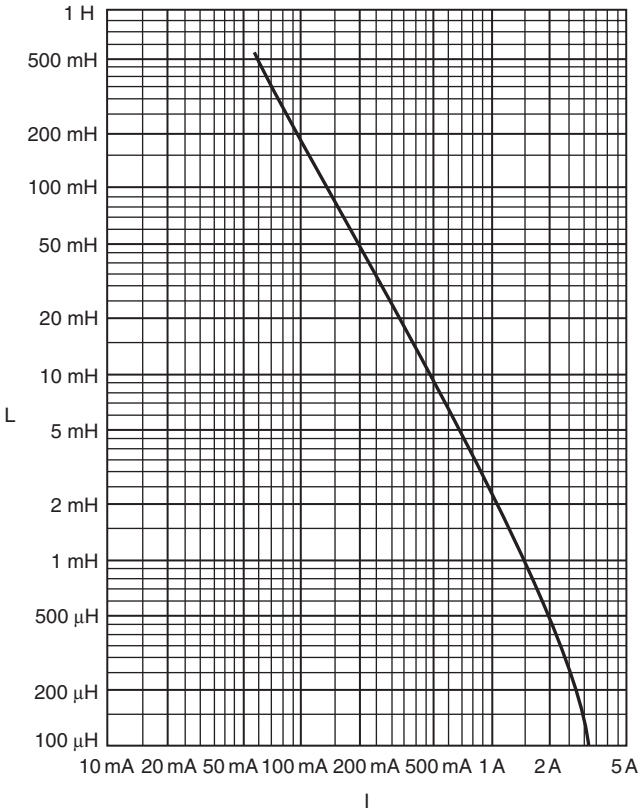


Figure 10.2.9.3(e) ~~9-2.1.9.3(e)~~ Inductance circuits (L > 1 mH). Minimum igniting currents at 24 V, applicable only to circuits where cadmium, zinc, or magnesium can be excluded.

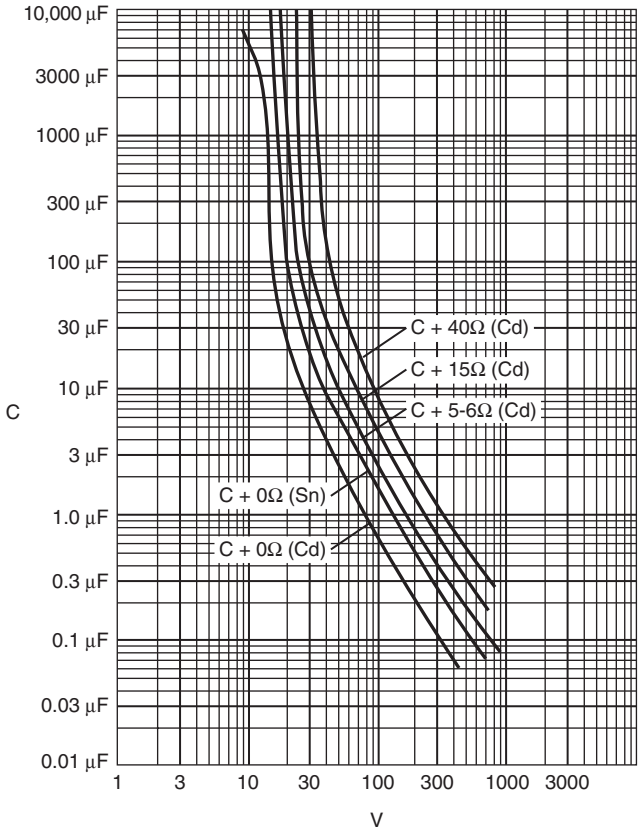


Figure 10.2.9.3(f) ~~9-2.1.9.3(f)~~ Capacitance circuits minimum ignition voltages. The curves correspond to values of current-limiting resistance as indicated. The curve marked Sn is applicable only where cadmium, zinc, or magnesium can be excluded.

10.2.10 ~~9-2.1.10~~ Low-Voltage Appliances and Appliances Not Connected to the Electric Power Distribution System.

10.2.10.1 ~~9-2.1.10.1~~ General. Appliances and instruments operating from batteries or their equivalent or from an external source of low voltage or that are not connected to the electric power distribution system shall conform to all applicable requirements of Section 10.2 ~~9-2.1, Patient-Care-Related Electrical Appliances~~. This shall include communication except for telephones, signaling, entertainment, remote-control, and low-energy power systems.

~~Exception: Telephones.~~

10.2.10.2 ~~9-2.1.10.2~~ Rechargeable Appliances. Battery-operated appliances that are rechargeable while in use shall meet all the requirements of 10.2.13.3 ~~9-2.1.13.3, Leakage Current Tests, for line-operated appliances~~.

10.2.10.3 ~~9-2.1.10.3~~ Low-Voltage Connectors. Attachment plugs used on low-voltage circuits shall have ~~distinctive~~ configurations that do not permit interchangeable connection with circuits of other voltages.

10.2.10.4 ~~9-2.1.10.4~~ Isolation of Low-Voltage Circuits.

10.2.10.4.1 Circuits of 30 V (dc or ac rms) or less shall be electrically isolated from the power distribution system.

10.2.10.4.2 Grounded low-voltage circuits shall be permitted provided that load currents are not carried in the grounding conductor.

10.2.11* ~~9-2.1.11~~ Cardiac Monitors and Electrocardiographs. Design of electrocardiographs, cardiac monitors, or blood-pressure monitors intended for use on patients in critical care shall include protection against equipment damage during defibrillation of the patient.

A.10.2.11 Monitoring of cardiac activity is crucial to effective defibrillation.

10.2.12* ~~9-2.1.12*~~ Direct Electrical Pathways to the Heart. The requirements of this section shall apply only to manufacturers except where specifically noted.

10.2.12.1 ~~9-2.1.12.1~~ Cardiac Electrodes.

10.2.12.1.1 ~~(a)~~ General. Appliances that have isolated patient leads shall be labeled as having isolated patient leads in accordance with 9-2.1.13.5, Lead Leakage Current Tests and Limits.
10.2.12.1.2* ~~(b)*~~ Insulation of Cardiac Leads. Pacemaker leads and other wires intended for insertion into the heart, together with their adapters and connections to appliances, shall be insulated except for their sensing or stimulation areas.
10.2.12.1.2.1 ~~Exception No. 1:~~ Metal stylets or guide wires temporarily introduced into a vein or artery for purposes of positioning a catheter are not required to ~~need not~~ be insulated.
10.2.12.1.2.2 When ~~such~~ guide wires are inside the heart, the operator shall exercise extreme care to ensure safe use.
10.2.12.1.2.3 When guide wires are used in conjunction with electrical devices (e.g., positioning catheters by use of ECG recordings), they ~~guide wire~~ shall be insulated as required ~~above~~ by 10.2.12.1.2.
10.2.12.1.2.4 ~~Exception No. 2:~~ Insulated wires designed to be introduced through a surgical needle, or other special wires where it is not practicable to maintain insulation, shall not be required to maintain insulation during introduction or manipulation. At such times the operator shall take appropriate safeguards.
10.2.12.1.3 ~~(c)~~ Safety Requirements for Cardiac Electrodes. The electrode catheter, fitting, and associated appliance, when assembled, shall meet the applicable requirements of 10.2.13.5 ~~9-2.1.13.5, Lead Leakage Current Tests and Limits, for isolated patient leads~~.
10.2.12.1.4 ~~(d)~~ Insulation of Pacemaker Connections. Uninsulated or open-type connectors shall not be used for external cardiac pacemaker terminals.
10.2.12.2 ~~9-2.1.12.2~~ Liquid-Filled Catheters.
10.2.12.2.1* ~~(a)*~~ Cardiac Catheter System. Any conductive element of a liquid catheter system that ~~can~~ comes in contact with the liquid column shall be insulated from ground or electric energy sources.
10.2.12.2.2 ~~(b)~~ Nonconductive Cardiac Catheters. A nonconductive catheter containing a conductive liquid, when connected to its transducer ~~appropriate system,~~ shall meet the applicable requirements of 9-2.1.13.5, ~~Lead Leakage Current Tests and Limits,~~ for isolated patient leads, with the patient end of the liquid-filled catheter considered to be an electrode.
10.2.12.2.3 ~~(c)~~ Conductive Cardiac Catheters.
10.2.12.2.3.1 If the liquid column is contained in a catheter made of conductive material having an electrical conductivity approximating that of blood, the system shall not require connection to an isolated patient lead.
10.2.12.2.3.2 Conductive catheters shall be ~~appropriately~~ identified.
10.2.12.3* ~~9-2.1.12.3*~~ Angiographic Catheters. Appliances used to inject contrast media into the heart or major vessels shall meet the same safety requirements as other liquid-filled catheter systems.
10.2.13 ~~9-2.1.13~~ Manufacturers' Tests for Safety of Patient-Care-Related Electrical Appliances.
10.2.13.1* ~~9-2.1.13.1~~ General. The appliance manufacturer shall perform the testing ~~adequate~~ to ensure that each finished appliance will meet the specified test limits of this section.
A.10.2.13.1 This section describes tests by manufacturers for the safe operation of an appliance. The tests in this subsection are in addition to the design requirements of the entire section 10.2 ~~9-2.1~~, Patient-Care-Related Electrical Appliances.
~~Exception:~~ Tests that are potentially destructive need only be performed by the manufacturer to ensure design compliance for new appliances.
10.2.13.2 ~~9-2.1.13.2~~ Grounding Circuit Continuity — Measurement of Resistance. For appliances that are used in the patients care vicinity the ~~The~~ resistance between the appliance chassis, or any exposed conductive surface of the appliance, and the ground pin of the attachment plug ~~shall be measured. The resistance~~ shall be less than 0.15 ohm under the following conditions:
(a) The cord shall be flexed at its connection to the attachment plug or connector~~, and~~
(b) The cord shall be flexed at its connection to the strain relief on the chassis during the resistance measurement.
10.2.13.3* ~~9-2.1.13.3*~~ Leakage Current Tests.
10.2.13.3.1 ~~(a)~~ Techniques of Measurement. Each test shall be performed with the ~~appropriate~~ connection to a ~~properly~~ grounded ac power system.
10.2.13.3.2* ~~(b)*~~ Frequency of Leakage Current.
10.2.13.3.2.1 The leakage current limits stated in 10.2.13.5 ~~9-2.1.13.4, Leakage Current from Appliance to Ground,~~ and 10.2.13.5 ~~9-2.1.13.5, Lead Leakage Current Tests and Limits,~~ shall be rms values for ~~dc and~~ sinusoidal waveforms up to 1 kHz. For frequencies above 1 kHz, the leakage current limits shall be the values given in 10.2.13.4 and 10.2.13.5 ~~9-2.1.13.4 and 9-2.1.13.5~~ multiplied by the frequency, in kHz, up to a maximum of 10 mA.
10.2.13.3.2.2 This "weighting" can be achieved by a frequency-response-shaping network that precedes a flat response meter, or by a meter whose own frequency response characteristic matches 10.2.13.3.2 ~~9-2.1.13.3(b)~~.
10.2.13.3.3 ~~(c)~~ Leakage Current in Relation to Polarity. Leakage current measurements shall be made as follows:
(1) with the polarity of the power line normal and reversed,
(2) with the power switch of the appliance "on" and "off," ~~and~~
(3) with all operating controls in the positions to cause maximum leakage current readings. The leakage current limits in 10.2.13.4 and 10.2.13.5 ~~9-2.1.13.4 and 9-2.1.13.5~~ shall not be exceeded under any of these conditions.
10.2.13.4 ~~9-2.1.13.4~~ Leakage Current from Appliance to Ground.
10.2.13.4.1 ~~(a)~~ Test Methods. The current shall be measured from the exposed conductive surfaces of the appliance to ground with all grounding conductors open at the end nearest the power receptacle. The appliance shall not be grounded by any other means. The current meter shall be inserted between the exposed conductive surfaces and ground. This test shall be made under the conditions of 10.2.13.3 ~~9-2.1.13.3~~. This test is illustrated in Figure 10.2.13.4.1(a) ~~9-2.1.13.4(a)~~.

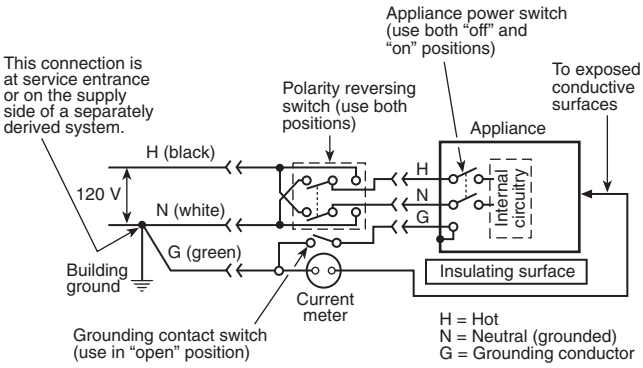


Figure 10.2.13.4.1(a) ~~9-2.1.13.4(a)~~ Test circuit for measuring leakage current from exposed conductive surfaces.

10.2.13.4.2 ~~(b)~~ Appliances with No Exposed Conductive Surfaces. When the appliance has no exposed conductive surface, one shall be simulated by placing a 10 cm by 20 cm (3.9 in. by 7.8 in.) bare metal foil in intimate contact with the exposed surface. This shall be considered the "exposed metal surface" of the appliance and all appropriate tests shall be performed to the foil.
10.2.13.4.3* ~~(c)*~~ Chassis Leakage Current Limits.
10.2.13.4.3.1 ~~1.~~ Cord-Connected Appliances. Cord-connected appliances that are intended for use in the patient care vicinity shall not exceed 300 microamperes of chassis leakage current as measured in 9-2.1.13.4(a), Test Methods.
10.2.13.4.3.2 ~~2.~~ Permanently Wired Equipment. Permanently wired equipment installed in the patient care vicinity shall not have leakage current from the frame to ground in excess of 5.0 mA. The leakage current shall be measured prior to installation by the installer and verified and accepted by the facility. This measurement shall be made in accordance with 9-2.1.13.4(a) while the equipment is temporarily insulated from ground.
10.2.13.5 ~~9-2.1.13.5~~ Lead Leakage Current Tests and Limits.
10.2.13.5.1 ~~(a)~~ Lead to Ground (Nonisolated Input).
10.2.13.5.1.1 The lead leakage current to ground shall be measured under the conditions of 10.2.13.3 ~~9-2.1.13.3, Leakage Current Tests~~.
10.2.13.5.1.2 The test shall be made between each patient lead and ground and between the combined patient leads and ground.
10.2.13.5.1.3 The test shall be made with the patient leads active (e.g., in the case of a multilead instrument, the lead selector switch shall be advanced through all operating positions).
10.2.13.5.1.4 Each measurement shall be performed with the grounding conductors both opened and closed. For this purpose the grounding conductor shall be interrupted at the plug end of the appliance cord. ~~Figure 9-2.1.13.5(a) is an example of an~~ aAcceptable test configuration shall be as illustrated in Figure

10.2.13.5.1. The leakage current shall not exceed 100 microamperes.

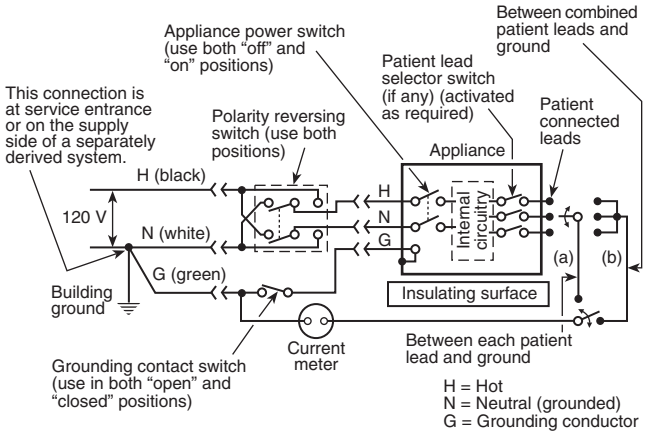


Figure 10.2.13.5.1 ~~9-2.1.13.5(a)~~ Test circuit for measuring leakage current between patient leads and ground (nonisolated).

10.2.13.5.2 ~~(b)~~ Lead to Ground (Isolated Input).
10.2.13.5.2.1 The leakage current to ground between each patient lead and ground shall be measured under the conditions of 10-2.13.3 ~~9-2.1.13.3, Leakage Current Tests~~.
10.2.13.5.2.2 The test shall be made with the patient leads active (e.g., in the case of a multilead instrument, the lead selector switch shall be advanced through all operating positions).
10.2.13.5.2.3 Each measurement shall be performed with the grounding conductors both opened and closed. For this purpose the grounding conductor shall be interrupted at the plug end of the appliance cord. ~~Figure 9-2.1.13.5(b) is an example of a~~An acceptable test configuration shall be as illustrated in Figure 10.2.13.5.2. The leakage current shall not exceed 10 microamperes with the ground intact and 50 microamperes with the ground open.

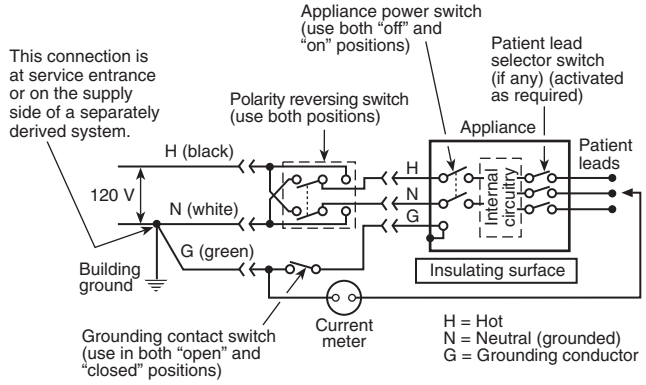


Figure 10.2.13.5.2 ~~9-2.1.13.5(b)~~ Test circuit for measuring leakage current between patient leads and ground (isolated).

10.2.13.5.3 ~~(c)~~ Isolation Test (Isolated Input).
10.2.13.5.3.1 The isolation between each patient lead and ground for an appliance that has been labeled as having isolated patient leads shall be measured by observing the current produced by applying an external source of power-line frequency and voltage between the lead and ground while the leads are approximately 20 cm (8 in.) from a grounded conductive surface.
10.2.13.5.3.2 Similarly, the isolation at the apparatus terminals to the patient cables shall be measured. ~~Figure 9-2.1.13.5(c) is an example of a~~An acceptable test configuration shall be as illustrated in Figure 10.2.13.5.3.

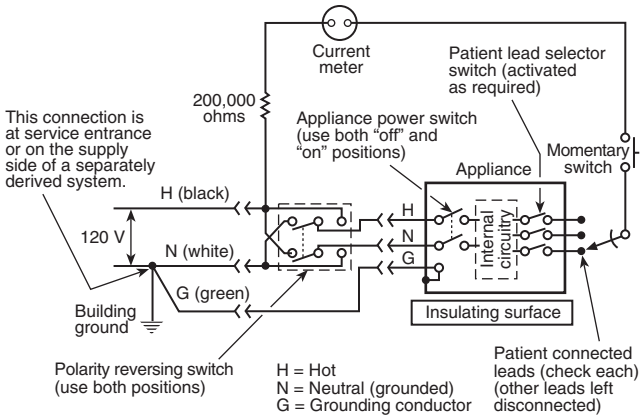


Figure 10.2.13.5.3 ~~9-2.1.13.5(c)~~ Test circuit for measuring the electrical isolation of isolated patient leads.

10.2.13.5.3.3 At the patient end of the leads, the leakage current shall not exceed 50 microamperes and at the apparatus terminals, 25 microamperes.
10.2.13.5.3.4 Only appliances meeting this requirement shall be permitted to be identified as having isolated patient leads.
10.2.13.5.3.5 ~~Suitable s~~Safety precautions (such as including a resistance in series to limit the current, insulation of the meter, and a momentary switch) shall be taken to protect the operator. The following test procedures shall be followed for the inidcated test conditions:

(a) In appliances without a power cord ~~or~~ with ungrounded, exposed conductive surfaces, measurements shall be made with the exposed conductive surfaces temporarily grounded.

(b) If there is no exposed conductive surface, measurement shall be made with a simulated surface, as described in 10.2.13.4.2 ~~9-2.1.13.4(b), Appliances with No Exposed Conductive Surfaces, which~~ that is also temporarily grounded.

10.2.13.5.4 ~~(d)~~ Between Leads (Nonisolated Input).
10.2.13.5.4.1 The current between any pair of leads or any single lead and all others shall be measured under the conditions of 10.2.13.3 ~~9-2.1.13.3, Leakage Current Tests~~. Each measurement shall be performed with the grounding conductors both opened and closed. For this purpose the grounding conductor shall be interrupted at the plug end of the appliance cord. ~~Figure 9-2.1.13.5(d)/(e) is an example of a~~An acceptable test configuration shall be as illustrated in Figure 10-2.13.5.4. The leakage current shall not exceed 50 microamperes.
10.2.13.5.4.2 ~~Exception:~~ Measuring leakage current between any single lead and all other leads shall ~~need only~~ be performed only to ~~as~~ensure the approval agency of design compliance.
10.2.13.5.5 ~~(e)~~ Between Leads (Isolated Input).
10.2.13.5.5.1 The current between any pair of leads or any single lead and all others shall be measured under the conditions of 9-2.1.13.3. ~~Leakage Current Tests~~ Each measurement shall be performed with the grounding conductors both opened and closed. For this purpose the grounding conductor shall be interrupted at the plug end of the appliance cord. ~~Figure 9-2.1.13.5(d)/(e) is an example of a~~An acceptable test configuration shall be as illustrated in Figure 10.2.13.5.4. The leakage current shall not exceed 10 microamperes with the ground intact and 50 microamperes with the ground open.
10.2.13.5.5.2 ~~Exception:~~ Measuring leakage current between any single lead and all other leads shall ~~need only~~ be performed only to ensure the approval agency of design compliance.

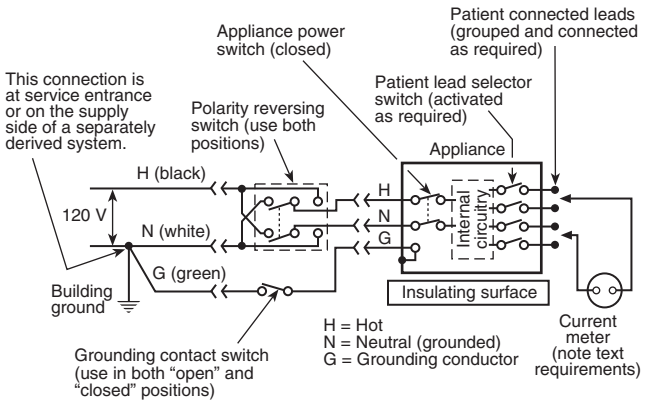


Figure 10.2.13.5.4 ~~9-2.1.13.5(d)/(e)~~ Test circuit for measuring leakage current between patient leads (nonisolated and isolated).

10.2.13.5.5.2 ~~Exception:~~ Measuring leakage current between any single lead and all other leads shall ~~need only~~ be performed only to assure the approval agency of design compliance.
SUBSTANTIATION: To editorially conform to NFPA Manual of Style (MOS) as rewritten to address mandatory requirements, annex information, exceptions, and multiple requirements.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 4 Aronow, Carlson, Meyer, Peglow

(Log #114)
Committee: HEA-ELE

99- 329 - (9-2.1.12.2): Accept
SUBMITTER: Charles Rawlings, SBI
RECOMMENDATION: Revise text as follows:
"Any conductive element of a liquid catheter system that can come in contact with the liquid column shall be insulated from ground ~~or~~ and sources of electric energy ~~sources~~."
SUBSTANTIATION: The "or" indirectly allows connection to ground or source of electric energy. Insulation from ground, for example, would be enough to meet the requirement. Connection to a source of electric energy would then be permissible. Using "and" instead of "or" in the statement calls for insulation from both entities. [Suggestion: Define "source" (in Chapter 2) to avoid exclusion of "sink" in this regard.]
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 4 Aronow, Carlson, Meyer, Peglow

(Log #CP602)
Committee: HEA-LAB

99- 330 - (Chapter 10):
TCC NOTE: It was the action of the Technical Correlating Committee that a portion of this proposal be editorially corrected. In new paragraph 11.5.4, insert "be" between "would" and "classified by the authority..." and insert "as" between "... jurisdiction" and "severe."
SUBMITTER: Technical Committee on Laboratories
RECOMMENDATION: Reword the following sections of Chapter 10 (new Chapter 11) to read as follows:
10-1 (new 11.1) Applicability.
11.1.2 Many of the requirements to protect against fire or explosion such as those for hood exhaust systems, also serve to protect persons from exposure to nonfire health hazards of these materials.
10-1.2.1* (new 11.1.3*) NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals, is the basic NFPA standard for laboratories that covers the construction, ventilation systems, and related fire protection of all laboratories in all facilities. However, this chapter (Chapter 10) has more stringent requirements for laboratories located in health care facilities. Where interface with existing NFPA or other consensus codes and standards occurs, reference is made to the appropriate source in the text.
10-1.2.2 (new 11.1.4) Where necessary, due to the special nature of laboratories, codes and standards are supplemented in this text so as to apply more specifically to buildings or portions of buildings devoted to laboratory usage.
10-2 (new 11.2) Nature of Hazards.
10-2.1 (new 11.2.1) Fire Loss Prevention.
10-2.1.1 (new 11.2.1.1) Hazard Assessment.
10-2.1.1.1 (new 11.2.1.1.1) Reword to read as follows: "An evaluation… begun. The evaluation shall include hazards associated with:
(1) The properties of chemicals used
(2) The operation of the equipment
(3) The nature of the proposed reactions (e.g., evolution of acid vapors or flammable gases)"
10-2.1.1.2 (new 11.2.1.1.2)
10-2.1.1.3* (new 11.2.1.1.3*)
10-2.1.1.4 (new 11.2.1.1.4)
10-2.1.2 (new 11.2.1.2)
10-2.1.3 (new 11.2.1.3)
10-2.1.3.1 (new 11.2.1.3.1) Reword as follows: "Procedures for laboratory emergencies shall be developed, including:
(1) Alarm actuation
(2) Evacuation
(3) Equipment shutdown procedures"
Add new paragraph 11.2.1.3.2 as follows: "Procedures shall be developed for control of emergencies that could occur in the laboratory, including detailed plans for control operations by an emergency control group within the organization or a public fire department."
10-2.1.3.2 (new 11.2.1.3.3)
10-2.1.3.3* (new 11.2.1.3.4*)
10-2.1.4 (new 11.2.1.4)
10-2.1.4.1 (new 11.2.1.4.1)
10-2.1.4.2 (new 11.2.1.4.2)
10-2.1.4.3* (new 11.2.1.4.3*)
Add new paragraph 11.2.1.4.4 to read as follows:: "Fire exit drills shall be so arranged that each person shall be included at least annually."
10-3 (new 11.3)
10-3.1* (new 11.3.1*)
10-3.1.1* (new 11.3.1.1*) "Construction of… additional requirements."
Add a new paragraph which incorporates Exception No. 1 as follows:
11.3.1.1.1 Health care laboratories that are not protected by an automatic extinguishing system and that are classified by the authority having jurisdiction as a severe hazard shall be separated from surrounding health care areas and from exit access (CP#603) corridors by fire-resistive construction with a minimum rating of 1 hour, and all openings protected by 3/4 hour-rated assemblies."
Add a new paragraph which was Exception No. 2 as follows:
11.3.1.1.2 Openings in a laboratory corridor barrier shall be permitted to be held open by an automatic release device complying with the applicable requirements in NFPA 101, Life Safety Code.
10-3.1.2 (new 11.3.1.2)
10-3.2 (new 11.3.2)
10-3.2.1* (new 11.3.2.1*) "Any room… 92.9 m^2 (1000 ft^2)… egress."
Add a paragraph number to the distinctive existing paragraph.
11.3.2.2 "A second… chemicals."
10-3.2.2 (new 11.3.2.3) "Travel… 22.9 m (75 ft)."
10-3.2.3 (new 11.3.2.4)
10-3.2.4 (new 11.3.2.5) "Laboratory corridors… code."
Add a new paragraph for the second sentence of the paragraph above.
11.3.2.6 "Corridors shall… all times."
10-3.2.5 (new 11.3.2.7) "Laboratory corridors,… 243.8 cm (96 in.)… width."
10-3.3 (new 11.3.3) "Exhaust… Section 5-3 (new 6.3)."
10-3.4* (new 11.3.4) "Ventilation… with 5-4.2 (new 6.4.2) and… chemicals."
10-3.5 (new 11.3.5) "Fume… to 5-4.3 (new 6.4.3) and 5-6.2 (new 6.6.2)."
10-4 (new 11.4)
10-4.1 (new 11.4.1)
10-4.2 (new 11.4.2)
10-4.2.1 (new 11.4.2.1) "Tissue processors… at least 1.52 m (5 ft) from… construction."
10-4.2.1.1 (new 11.4.2.1.1) All new tissue processors and similar automatic equipment that release ignitable vapors shall be

provided with the following safeguards and interlocks as part of a monitored audible and visual alarm:
(1) Low liquid level
(2) High vapor (#CP610)
10-4.2.1.2 (new 11.4.2.1.2) The safeguards above shall be connected to an audible alarm in a constantly attended location. (#CP610).
10-4.2.2* (new 11.4.2.2*)
10-5* (new 11.5*)
10-5.1* (new 11.5.1*)
10-5.2 (new 11.5.2)
10-5.3 (new 11.5.3) "Portable… Extinguishers."
Add a new paragraph for the second sentence above.
11.5.4 Clinical laboratories that typically employ quantities of flammable, combustible, or hazardous materials less than that which would ~~considered~~ classified by the authority having jurisdiction severe shall be ~~classified~~ defined (#CP604) as ordinary hazard per NFPA 10 for purposes of extinguisher placement.
Restructure and paragraph 10-6* as follows:
10-6* (new 11.6*) "Where… use."
Add a paragraph number to the second sentence:
11.6.1 "Fixed… pressure."
Rewrite the third sentence as follows:
11.6.2 If shutoff valves or stops are installed in the branch line to safety drenching equipment, the valves shall be:
(1) OS&Y (outside stem and yoke)
(2) Labeled for identification
(3) Sealed in the open position
11.6.3 The installation of wall-mounted portable eye-wash stations shall not preclude the adherence to the provisions of this section.
10-7 (new 11.7)
10-7.1 (new 11.7.1)
10-7.2* (new 11.7.2*)
Restructure paragraph 10-7.2.1* as follows:
10-7.2.1* (new 11.7.2.1*) Flammable… chemicals."
11.7.2.2 "Storage… code."
Rewrite and reparagraph 10-7.2.2* incorporating the existing exception as follows:
10-7.2.2* (new 11.7.2.3*) In laboratories not classified by the authority having jurisdiction as very small work areas, established laboratory practice shall limit working supplies of flammable or combustible liquids.
11.7.2.3.1 The total volume of Class I, II, and IIIA liquids outside of approved storage cabinets and safety cans shall not exceed 3.78 L (1 gal) per 9.23 m^2 (100 ft^2.)
11.7.2.3.2 The total volume of Class I, II, and IIIA liquids, including those contained in approved storage cabinets and safety cans, shall not exceed 7.57 L (2 gal) per 9.23 m^2 (100 ft^2.)
11.7.2.3.3 No flammable or combustible liquid shall be stored or transferred from one vessel to another in any exit access (#CP605) corridor or passageway leading to an exit.
11.7.2.3.4 Approved flammable or combustible inside liquid storage area(s) designed, constructed and operated in accordance with NFPA 30 shall be available within any health care facility regularly maintaining a reserve storage capacity in excess of 1135.5 L (300 gal) (#CP606).
11.7.2.3.5 Quantities of flammable and combustible liquids for disposal shall be included in the total inventory.
Restructure paragraph 10-7.2.3 as follows:
10-7.2.3 (new 11.7.2.4) "Venting… permitted."
11.7.2.4.1 "Storage… system.
11.7.2.4.2 "Construction… cabinet."
Rewrite paragraph 10-7.2.4 (#CP607) as follows:
10-7.2.4 (new 11.7.2.5) Flammable or combustible liquids shall not be positioned:
(1) Near Bunsen burners
(2) Near ovens
(3) Neat hot pipes and valves
(4) Near other sources of heat
(5) In corridors
Restructure paragraph 10-7.2.5 as follows:
10-7.2.5* (new 11.7.2.6) "Class I flammable… coolers."
11.7.2.6.1 "If Class I flammable… Group C locations in accordance with NFPA 70."
11.7.2.6.2 If the refrigerator is not listed for the purpose, the warning shall be worded to prohibit all storage of flammable liquids.
10-7.3 (new 11.7.3) "Transfer… of at least 30.5 m (100 ft) per minute."
10-7.4 (new 11.7.4)
10-7.4.1 (new 11.7.4.1) Flammable liquids and combustible liquids with flash points lower than 93.3°C (200°F) shall be heated in hoods or with special local exhaust ventilation if the quantities exceed 10 ml, or if the liquid is heated to within 16.6°C (30°F) of the flash point of the liquid.
Restructure paragraph 10-7.4.2 as follows:
10-7.4.2 (new 11.7.4.2) "Flammable… boiling points."
11.7.4.3 Open flames shall not be employed.
10-7.5* (new 11.7.5*)
10-8* (new 11.8*)
10-8.1 (new 11.8.1*)
10-8.1.1 Informational – move to Annex A.11.8.1.
Rewrite and restructure paragraph 10-8.1.2* as follows:
10-8.1.2* (new 11.8.1.1*) "A safety officer… laboratory."
11.8.1.2.1 Responsibilities of the safety officer shall include ensuring that the equipment and preparation for fire fighting are appropriate for the special fire hazards present.
11.8.1.2.2 These responsibilities shall be in addition to surveillance of hazards attendant to:
(1) Caustics
(2) Corrosives
(3) Compressed gases
(4) Electrical installations
(5) Other hazards indigenous to laboratories in health care facilities.
11.8.1.2.3 The safety officer shall also supervise the periodic education of laboratory personnel including:
(1) New employee orientation
(2) The nature of combustible and flammable liquids and gases
(3) First aid
(4) Fire fighting
(5) The use of protective equipment
(6) Unsafe conditions observed or reported
11.8.1.2.4 The laboratory safety officer shall prepare and supervise the proper completion of a safety checklist that can be preserved for record. (last sentence of 10-8.1.3)
10-8.1.3 (new 11.8.1.3) Operations and equipment related to safe operations and practices, including such items as:
(1) Ventilating provisions
(2) Fire protection apparatus
(3) Periodic flushing of sinks, emergency showers, and eye wash units
(4) Shelf stocks and storage of flammable and combustible materials and caustic and corrosive liquids shall be reviewed at appropriate, regular intervals.
11.8.1.3.1 A system of prompt reporting of defective equipment and its prompt repair shall be instituted.
11.8.1.3.2 Periodic inspections shall be made of all electrical and gas equipment.
10-8.1.4 (new 11.8.1.4)
10-8.1.5* (new 11.8.1.5*) A written procedure for disposing of hazardous chemicals and combustible trash in accordance with good safety practices and environmental standards shall be established and regularly maintained. (#CP609)
10-8.2 (new 11.8.2)
Rewrite and restructure paragraph 10-8.2.1* as follows:
10-8.2.1* (new 11.8.2.1*) "All doors… the area."
11.8.2.2 "For signage… following:
~~(a)~~ (1) Hazardous… 4.4 L (1 gal)… larger
~~(b)~~ (2) Compressed… than 12.7 cm (5 in.)… 48 cm (15 in.) in length.
~~(c)~~ (3) Dry… of ~~2.2.7 kg~~ 2.27 kg (5 lb)
~~(d)~~ (4) Aggregate… 91 kg (200 lb), or… 44.4 L (10 gal)."
10-8.2.2* (new 11.8.2.3)
10-8.2.3 (new 11.8.2.4)
10-8.2.4 (new 11.8.2.5)
10-9 (new 11.9)
10-9.1 (new 11.9.1) "Transfer… 8-6.2.5.1(b)." (check new paragraph number)
10-9.2 (new 11.9.2)
10-9.3 (new 11.9.3) "Transfer… 8-6.2.5.2." (check new paragraph number)
10-10 (new 11.10)
10-10.1 (new 11.10.1) "Requirement… 4-3.1.1.1." (check new paragraph number)
10-10.2 (new 11.10.2)
10-10.2.1 (new 11.10.2.1) "Storage… 4-3.1.1.1." (check new paragraph number)
Rewrite, reparagraph and incorporate the exception of paragraph 10-10.2.2 as follows:
10-10.2.2 (new 11.10.2.2) Flammable gas cylinder storage for a laboratory, if inside any health care facility shall be in a separate room or enclosure:
(1) Reserved exclusively for that purpose
(2) Having a fire-resistance classification of at least 2 hours.
(3) Ventilated in accordance with 2-6.5 of Annex 2.

11.10.2.2.1 When a laboratory is intended to be routinely and frequently operated with flammable gases supplied from a manifold compressed system, storage shall comply with 4-7.1.1.1. (check new paragraph number)

11.10.2.2.2 Cylinders in storage shall be kept in racks or secured in position.

Reparagraph 10-10.2.3 as follows:

10-10.2.3 (new 11.10.2.3) "Rooms… ventilated."

11.10.2.4 "Electrical… locations."

Reparagraph 10-10.3 as follows:

10-10.3 (new 11.10.3) "The total quantity… chemicals."

11.10.4 "The number… supply."

SUBSTANTIATION: To editorially conform to NFPA Manual of Style (MOS) as rewritten, deleting exceptions and incorporating them as requirements, and separating multiple requirements.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 2 Nickasch, Simmons

(Log #CP603)
Committee: HEA-LAB

99- 331 - (10-3.1.1): Accept
SUBMITTER: Technical Committee on Laboratories
RECOMMENDATION: In the second sentence insert the word access between "exit" and "corridors." Text will now read as follows:

"Health care laboratories shall be separated from surrounding health care areas and from exit access corridors by fire resistive construction with a minimum rating of 1 hour, and all openings protected by 3/4 hour rated assemblies."
SUBSTANTIATION: Clarifies the committee's intent to have the requirement include exit access corridors rather than limit the requirement to exit corridors as defined by NFPA.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 2 Nickasch, Simmons

(Log #CP612)
Committee: HEA-LAB

99- 332 - (10-3.1.1, 10-7.2.2, 10-10.2.2): Accept
SUBMITTER: Technical Committee on Laboratories
RECOMMENDATION: Delete exceptions by incorporating them into new or existing paragraphs as requirements.
SUBSTANTIATION: See Committee Proposal 99-330 (Log #CP602).
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 2 Nickasch, Simmons

(Log #CP610)
Committee: HEA-LAB

99- 333 - (10-4.2): Accept
SUBMITTER: Technical Committee on Laboratories
RECOMMENDATION: Add the following new paragraphs after paragraph 10-4.2.1:

10-4.2.1.1 All new tissue processors and similar automatic equipment that release ignitable vapors shall be provided with the following safeguards and interlocks as part of a monitored audible and visual alarm:

(1) Low liquid level

(2) High vapor

10-4.2.1.2 The safeguards above shall be connected to an audible alarm in a constantly attended location.
SUBSTANTIATION: Unattended tissue processors are common ignition sources of laboratory fires.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 2 Nickasch, Simmons

(Log #CP604)
Committee: HEA-LAB

99- 334 - (10-5.3): Accept
SUBMITTER: Technical Committee on Laboratories
RECOMMENDATION: Reword existing paragraph as follows:

"Clinical laboratories that typically employ quantities of flammable, combustible, or hazardous materials less than that which would be ~~considered~~ classified by the authority having jurisdiction as severe shall be ~~classified~~ defined as ordinary hazard per NFPA 10 for purposes of extinguisher placement."
SUBSTANTIATION: To be consistent with the rest of the chapter.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 2 Nickasch, Simmons
COMMENT ON AFFIRMATIVE:
LINDNER: My vote is to Accept in Principle.

Substantiation: This sentence needs to be clarified. As I read it, it's confusing. However, the principle is good and acceptable.

(Log #30)
Committee: HEA-LAB

99- 335 - (10-7.1.1 (New)): Reject
SUBMITTER: Northcentral Regional Fire Code Dev. Committee
RECOMMENDATION: Add a new Section 10-7.1.1 to read as follows:

10-7.1.1 Class I liquids shall not be permitted in basement areas. Class II and Class IIIA liquids shall be permitted to be stored in basements provided that automatic sprinkler protection and other fire protection facilities are provided in accordance with Section 4-8 of NFPA 30.
SUBSTANTIATION: This language brings NFPA 99 in compliance with NFPA 30, Section 4-4.3.5, which prohibits Class I liquids in basements. NFPA 99 references NFPA 30 for storage and handling of flammable and combustible liquids. This section should be brought up right in the beginning of the document to bring this to the attention of the user.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: NFPA 30 addresses bulk inside liquid storage areas and not the typical amounts of flammable and combustible liquids that would be found in a laboratory work environment. See Committee Proposal 99-337 (Log #CP606) concerning inside storage areas.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 2 Nickasch, Simmons

(Log #CP605)
Committee: HEA-LAB

99- 336 - (10-7.2.2): Accept
SUBMITTER: Technical Committee on Laboratories
RECOMMENDATION: In the fourth sentence insert the word access between "exit" and "corridor". Text will now read as follows:

"No flammable or combustible liquid shall be stored or transferred from one vessel to another in any exit access corridor or passageway leading to an exit."
SUBSTANTIATION: See Committee Proposal 99-331 (Log #CP603).
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 6
NEGATIVE: 1
NOT RETURNED: 2 Nickasch, Simmons
EXPLANATION OF NEGATIVE:
LINDNER: My vote is to Reject

Substantiation: The wording "...in any exit access corridor or passageway leading to an exit." would flatly forbid the use of flammables and combustible liquids, either stored or transferred of any quantity, in an "open lab" space configuration.

Modern state of the art laboratories are mainly "open labs" where the passageway leading to the exit is an integral part of the laboratory. Persons not in the design business would be making decisions on what is or is not acceptable. All walking areas or passageways in such an open lab essentially lead to an exit.

Recommendation: Bring this up for re-discussion with design professionals present and reword the sentence.

(Log #CP606)
Committee: HEA-LAB

99- 337 - (10-7.2.2): Accept
SUBMITTER: Technical Committee on Laboratories
RECOMMENDATION: Rewrite the fifth sentence as follows:
"~~At least one~~ Approved flammable or combustible inside liquid storage ~~room~~ area(s) designed, constructed and operated in accordance with NFPA 30 shall be available within any health care facility regularly maintaining a reserve capacity in excess of ~~300 gal~~ 1135.5 L (300 gal) ~~1135.5 L.~~" (see new paragraph 11.7.2.3.4)
SUBSTANTIATION: The committee wants to refer authorities having jurisdiction, designers, and users to the appropriate requirements when a storage area(s) is required.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 2 Nickasch, Simmons

(Log #CP607)
Committee: HEA-LAB

99- 338 - (10-7.2.4): Accept
SUBMITTER: Technical Committee on Laboratories
RECOMMENDATION: Delete "or within exhaust canopies." Text will now read as follows:
"Flammable or combustible liquids shall not be positioned near Bunsen burners, ovens, hot pipes and valves, or other sources of heat, or in corridors. ~~, or within exhaust canopies.~~"
SUBSTANTIATION: The committee believes that flammable or combustible liquids within an exhaust canopy do not present a hazard.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 6
NEGATIVE: 1
NOT RETURNED: 2 Nickasch, Simmons
EXPLANATION OF NEGATIVE:
LINDNER: My vote is to Reject
Substantiation: The entire sentence is vague. Does that mean it is OK to position flammables and combustibles near Bunsen Burners, ovens, etc. in the lab?
If we support the basic idea of no flammables and combustibles near heat or flame (etc. etc.), we should say so and not confine this to "corridors".

(Log #CP608)
Committee: HEA-LAB

99- 339 - (10-7.2.5): Accept
SUBMITTER: Technical Committee on Laboratories
RECOMMENDATION: Rewrite the second sentence as follows:
"If Class I flammable liquids are stored under refrigeration (e.g., for analytical purposes), the storage devices shall be listed flammable materials storage refrigerators or refrigerators listed for Class I, Division I, Group C locations in accordance with NFPA 70, National Electrical Code." (see new paragraph 11.7.2.6.1)
SUBSTANTIATION: Refers the document user to the appropriate code for that definition.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 2 Nickasch, Simmons

(Log #CP609)
Committee: HEA-LAB

99- 340 - (10-8.1.5):
TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee. The proposed new wording needs to provide concise, specific, and enforceable language.
SUBMITTER: Technical Committee on Laboratories
RECOMMENDATION: Rewrite paragraph 10-8.1.5 as follows:
"A ~~system~~ written procedure for disposing of hazardous chemicals and combustible trash in accordance with good safety practices and environmental standards shall be established and regularly maintained. ~~Disposal of chemical wastes shall be in accordance with good safety practices and environmental standards.~~"
SUBSTANTIATION: Clarification and editorial.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 2 Nickasch, Simmons

(Log #CP401)
Committee: HEA-HCE

99- 341 - (Chapter 11): Accept
SUBMITTER: Technical Committee on Health Care Emergency Preparedness and Disaster Planning
RECOMMENDATION: Replace the term "disaster" in the locations identified with the proposed wording:
11-2 "...responsibility for ~~disaster~~ emergency management planning...".
11-5.1 "...disaster exists, the ~~disaster~~ emergency management plan shall...".
A-11-1 "...model of ~~a disaster~~ an emergency management plan is feasible..."
A-11-4.1 "...All ~~disaster~~ emergency management plans written by..."
"...Further, an authority...particiapting in a community ~~disaster~~ emergency management plan."
A-11-4.3 "...A policy group...decisions not in the ~~disaster~~ emergency management plan."
C-11-3.2 "...to activate the Health Care ~~Disaster~~ Emergency Management Plan in advance of...".
C-11-3.9 "Radioactive Contamination. ~~Disaster~~ Emergency Management planning must consider...".
SUBSTANTIATION: Provide continuity with current terminology concerning emergency planning and ICS.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 4 Kitchin, McPeck, Sinsigalli, Woodfin

(Log #208)
Committee: HEA-HCE

99- 342 - (Chapter 11, Appendix A): Accept in Principle
SUBMITTER: Steve Ennis, The Reciprocal Group
RECOMMENDATION: Remove "preparedness" in all terms as "facility emergency ~~preparedness~~ management," "emergency ~~preparedness~~ management plan."
SUBSTANTIATION: This would match terms being used by federal agencies and the new JCAHO Emergency Management Standard.
COMMITTEE ACTION: Accept in Principle.
2-2 Emergency ~~Preparedness~~ Management.
Chapter 11 Health Care Emergency ~~Preparedness~~ Management.
11-1* Scope. This chapter...facility emergency ~~preparedness~~ management in the...effective disaster preparedness, mitigation, response, and recovery.
11-2 Purpose. The purpose.....disasters. This chapter...for having an emergency ~~preparedness~~ management plan.
11-4.2 Senior Management. It...emergency. Senior...an emergency ~~preparedness~~ management committee, as...evaluating the emergency ~~preparedness~~ management plan.
11-4.3* Emergency ~~Preparedness~~ Management Committee. The emergency ~~preparedness~~ management committee shall...and emergency ~~preparedness~~ management within the...leadership.
The emergency ~~preparedness~~ management committee shall model the emergency ~~preparedness~~ management plan on the...agencies.
11-5.2* The decision to activate the emergency ~~preparedness~~ management plan...involved.
11-5.3 The emergency ~~preparedness~~ management plan, as a minimum, shall include the following:
11-5.3.1* Identification of Emergency Response Personnel. All personnel...emergency ~~preparedness~~ management plan of the health care...hard hats.
11-5.3.2* Continuity of Essential Building Systems. When...emergency ~~preparedness~~ management management...
11-5.3.8 Staff Education. Each health...emergency ~~preparedness~~ management plan...position.
General overview...Emegency ~~Preparedness~~ Management Plan and...thereafter.
11-5.3.9* Drills. Each...emergency ~~preparedness~~ management plan...or both.
A-11-4.3 Emergency ~~Preparedness~~ Planning Committee. The... aid requests.
A-11-5.2 Planning. By basing...emergency ~~preparedness~~ management on realistic...those plans.
A-11-5.3.5 Knowing the location...of emergency ~~preparedness~~ supplies...the facility.
C-11.3.4 High Profile. Admission...Emergency ~~Preparedness~~ Management Plan. These problems are as follows:
C-11.3.8 Bomb Threats. The disaster...Emergency ~~Preparedness~~ Management Plan. Experience...of the facility.
COMMITTEE STATEMENT: For consistency there were several changes needed to be made that were outside the wording of the recommendation.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 4 Kitchin, McPeck, Sinsigalli, Woodfin

(Log #CP406)
Committee: HEA-HCE

99- 343 - (11-1):
TCC NOTE: It was the action of the Technical Correlating Committee to correct a typographical error. In the last line, insert "mitigation" between "...preparedness," and "recovery."
SUBMITTER: Technical Committee on Health Care Emergency Preparedness and Disaster Planning
RECOMMENDATION: Revise paragraph as follows:
11.1* ~~Scope. This~~ Chapter 12 Health Care Emergency Management establishes minimum criteria for health care facility emergency ~~preparedness~~ management in the development of a program for effective disaster preparedness, response and recovery.
SUBSTANTIATION: See Committee Proposal 99-5 (Log #CP400) and 99-342 (Log #208).
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 4 Kitchin, McPeck, Sinsigalli, Woodfin

(Log #CP405)
Committee: HEA-HCE

99- 344 - (11-2 and 11-3): Accept
SUBMITTER: Technical Committee on Hyperbaric and Hypobaric Facilities
RECOMMENDATION: Revise paragraphs as follows:
~~11-3*~~ 11.1* Applicability.
11.1.1 This chapter is applicable to any health care facility that is intended to provide medical care during an emergency or maintain services for patients during a disaster. (Log #207)
~~11-2 Purpose. The purpose of~~ 11.1.2 This chapter ~~is to~~ provides those with the responsibility for ~~disaster~~ emergency management planning in health care facilities with a framework to assess, mitigate, prepare for, respond to, and recover from disasters. This chapter is intended to aid in meeting requirements for having an emergency ~~preparedness~~ management plan.
SUBSTANTIATION: See Committee Proposal 99-5 (Log #CP400), 99-341 (Log #CP401), 99-345 (Log #207), and 99-342 (Log #208).
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 4 Kitchin, McPeck, Sinsigalli, Woodfin

(Log #207)
Committee: HEA-HCE

99- 345 - (11-3): Accept in Principle
SUBMITTER: Steve Ennis, The Reciprocal Group
RECOMMENDATION: Add text as follows:
"This chapter is applicable to any health care facility that is intended to provide medical treatment to the victims of disaster or maintain services for patients during a disaster."
SUBSTANTIATION: As is, and as noted in Appendix A, this includes convalescent and nursing homes. These facilities normally do not receive victims of disasters, but do need to continue services for patients during emergencies such as utility failures or weather emergencies.
COMMITTEE ACTION: Accept in Principle.
Revise text to read as follows:
"This chapter is applicable to any health care facility that is intended to provide medical care during an emergency ~~treatment to the victims of disaster.~~ or maintain services for patients during a disaster."
COMMITTEE STATEMENT: The committee believes the modification provides consistency with the chapter while addressing the concerns of the submitter.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 4 Kitchin, McPeck, Sinsigalli, Woodfin

(Log #206)
Committee: HEA-HCE

99- 346 - (11-5.3.3): Accept
SUBMITTER: Steve Ennis, The Reciprocal Group
RECOMMENDATION: Delete text as follows:
(3) Critical incident ~~staff~~ stress ~~debriefing~~ management.
SUBSTANTIATION: This section/paragraph notes that it is in reference to staff management. The term "staff" in line (3) is not needed. Deleting debriefing and adding management suggests a more complete process.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 4 Kitchin, McPeck, Sinsigalli, Woodfin

(Log #CP403)
Committee: HEA-HCE

99- 347 - (11-5.3.6): Accept
SUBMITTER: Technical Committee on Hyperbaric and Hypobaric Facilities
RECOMMENDATION: Revise to read as follows:
11-5.3.6* Security. Security plans shall be developed to meet the needs of the facility. ~~that address facility access, crowd control, security staff needs, and traffic control.~~
SUBSTANTIATION: See Committee Proposal 99-5 (Log #CP400). The deleted information is appendix information.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 4 Kitchin, McPeck, Sinsigalli, Woodfin

(Log #126)
Committee: HEA-PIP

99- 348 - (12-3.4): Accept in Principle
TCC NOTE: The Technical Correlating Committee refers this proposal to the Technical Committee on Laboratories for review, comment and correlation with the Technical Committee on Piping Systems.
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Rewrite this section as follows:
12.3.4 Gas and Vacuum System Requirements.
12.3.4.1 General. Where medical gas, instrument air, vacuum, and WAGD systems are installed they shall conform to the requirements for the appropriate level. Systems conforming to different levels within the same building are permitted. The appropriate level shall be determined as follows:
(a) All systems shall comply to Level 1 if any part of the systems are Level 1, unless:
1. The system(s) is (are) entirely separate from the Level 1 system(s) (i.e., are stand alone) and are not connected to Level 1 sources or distribution pipelines and
2. The occupancy to be served and the function of that occupancy is distinct from other occupancies in the building.
(b) Medical gas and vacuum systems shall be permitted to be Level 2 systems only where:
1. 12.3.4.1(a)1 and 2 are true and
2. Patients served by the system(s) are not dependent on mechanical ventilation or assisted mechanical ventilation at any time, including during administration of anesthesia.
(c) Medical gas and vacuum systems shall be permitted to be Level 3 systems only where:
1. 12.3.4.1(a)1 and 2 and 12.3.4.1(b)1 are true and
2. The patient population, during or subsequent to treatment, are not dependent for life on the gases or vacuum system(s), and the treatment(s) which the facility will perform can be completed without detrimental effect on patient outcomes in the event of sudden loss of the gas or vacuum system(s) and
3. The total of all gases in cylinders or containers, except nitrogen, connected and in storage at one time does not exceed 3,000 ft^3 (85 m^3) at standard temperature and pressure (STP), except that 5,000 ft^3 (143 m^3) at standard temperature and pressure (STP), shall be permitted if oxygen is stored in a DOT Specification 4L (cryogenic liquid) cylinder and
4. The system(s) supply not more than two adjoining single treatment facilities
(d) Gas and vacuum systems shall be permitted to be Level 4 systems only where:
1. 12.3.4.1(a)1 and 2, 12.3.4.1(b)2, and 12.3.4.1(c)2 are true and
2. The pipeline system serves only laboratories, except that instrument air systems used for medical support may also serve laboratories (ref. 4-3.1.1.10).
SUBSTANTIATION: The intent of these paragraphs has not been met by the wording. It is presently unusable because it is incomplete and many terms are not clear. The proposal suggests:
1. Assembling all the requirements in a single place.
2. Defining a logical decision tree.
In the proposal, underscore indicates a new requirement. All others are presently elsewhere in the standard.
COMMITTEE ACTION: Accept in Principle.
Delete all of recommendation (d).
COMMITTEE STATEMENT: Deletion of (d) is due to Committee Proposal 99-308 (Log #CP707) which reads as follows:
Move all of 4-6 to Chapter 10 except 4-6.2.2 which would become 4-3.2.2.1(b).
Existing 4-3.2.2.1 would become 4-3.2.2.1(a).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #110)
Committee: HEA-PIP

99- 349 - (12-3.4.5): Accept
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Revise 12-3.4.5 to read:
"Where nitrous oxide or halogenated agents are intended to be administered, a patient WAGD shall be installed and conform to Level 1 WAGD systems in Chapter 4."
SUBSTANTIATION: To correlate with 4-3.3.2.3 requirement in Chapter 4.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #325)
Committee: HEA-PIP

99- 350 - (13-2 (New)):
TCC NOTE: The Technical Correlating Committee directs that this proposal be returned to Committee; the action and accomplishment are not clear.
SUBMITTER: F. David Wyrick, Sr., Cambiare Ltd.
RECOMMENDATION: I have provided a table of explanation which was omitted in the 1999 Edition. It should have been within Chapter 15 as 15-3.4. Since Chapter 15 was changed and now (Reserved) the table should have been put in Chapter 13.
SUBSTANTIATION: This table was to feature each level and how and what products could be used and in what level.
COMMITTEE ACTION: Accept in Principle.

Table 15-3.4 Gas and Vacuum System Requirements

Sources	Level 1	Level 2	Level 3	Level 4
Medical gas 50 psig	Large facilities Life support	Reserved	Small systems w/task mounted regs.	—
Lab gas include flammable	—	—	—	Lab
Compressed air	Large medical air	Small, (max 50 psi)	0-60 psi for dynamic devices	Lab
Nitrogen system	0-300 psi dynamic devices, (med-surg only)	Reserved	0-160 psi dynamic devices	—
Vacuum	Medical surgical Life support	—	Small, non-life-support	Lab
WAGD (gas or vac)	Hospital	—	Small, i.e., dental vacuum	—
Non-flammable gas	Inhalation anesthesia	—	General anesthesia and conscious sedation	—
Med. Air cylinders (life support)	Yes	—	No	—

COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-20 (Log #CP710) which reads as follows:

Add definitions as follows:

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 [gauge pressure <160 psi(1100kPa)] to power devices (e.g., hand pieces, syringes, cleaning devices) as a power source.

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

Level 1 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS would place patients in imminent danger of morbidity or mortality.

Level 2 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS system would place patients at manageable risk of morbidity or mortality.

Level 3 Piped Gas Systems. Systems serving occupancies where interruption of the PGS would terminate procedures but would not place patients at risk of morbidity or mortality.

Level 3 Vacuum System. A Level 3 vacuum distribution system that can be either a wet system, designed to remove liquids, air/gas or solids from the treated area, or a dry system designed to trap liquids and solids before the service inlet and to accommodate air-gas only through the service inlet.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #211)
Committee: HEA-ELS

99- 351 - (13-3.3.1): Accept

SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Revise 13-3.3.1 to read as follows:

13-3.3.1 Electrical Distribution System. For ambulatory health care centers, the electrical distribution system for patient care areas shall conform to the requirements in Chapter 3, "Electrical Systems."

These requirements apply to new construction. Existing installations need not be modified, provided that they meet the operational safety requirements in 3-3.3.2 and 3-3.3.3."

SUBSTANTIATION: Proposal 99-322 in the ROP for the 1998 Fall Meeting recommended the above change to then Chapter 13, Ambulatory Health Care Center Requirements (AHCC). That proposal was accepted. However, it was superseded by a proposal that completely revised Chapters 13, 14, and 15.

This new proposal only reintroduces Proposal 99-322 for acceptance again, with an editorial to have wording in concert with Proposal 99-322 and applicable just to AHCC.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 17
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 3 Crawford, Longhitano, Swisher

(Log #127)
Committee: HEA-PIP

99- 352 - (13-3.4): Accept in Principle

TCC NOTE: The Technical Correlating Committee refers this proposal to the Technical Committee on Laboratories for review, comment and correlation with the Technical Committee on Piping Systems.

SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Rewrite this section as follows:

13.3.4 Gas and Vacuum System Requirements.

13.3.4.1 General. Where medical gas, instrument air, vacuum, and WAGD systems are installed they shall conform to the requirements for the appropriate level. Systems conforming to different levels within the same building are permitted. The appropriate level shall be determined as follows:

(a) All systems shall comply to Level 1 if any part of the systems are Level 1, unless:

1. The system(s) is (are) entirely separate from the Level 1 system(s) (i.e., are stand alone) and are not connected to Level 1 sources or distribution pipelines and

2. The occupancy to be served and the function of that occupancy is distinct from other occupancies in the building.

(b) Medical gas and vacuum systems shall be permitted to be Level 2 systems only where:

1. 13.3.4.1(a)1 and 2 are true and

2. Patients served by the system(s) are not dependent on mechanical ventilation or assisted mechanical ventilation at any time, including during administration of anesthesia.

(c) Medical gas and vacuum systems shall be permitted to be Level 3 systems only where:

1. 13.3.4.1(a)1 and 2 and 13.3.4.1(b)1 are true and

2. The patient population, during or subsequent to treatment, are not dependent for life on the gases or vacuum system(s), and the treatment(s) which the facility will perform can be completed without detrimental effect on patient outcomes in the event of sudden loss of the gas or vacuum system(s) and

3. The total of all gases in cylinders or containers, except nitrogen, connected and in storage at one time does not exceed 3,000 ft^3 (85 m^3) at standard temperature and pressure (STP), except that 5,000 ft^3 (143 m^3) at standard temperature and pressure (STP), shall be permitted if oxygen is stored in a DOT Specification 4L (cryogenic liquid) cylinder and

4. The system(s) supply not more than two adjoining single treatment facilities

(d) Gas and vacuum systems shall be permitted to be Level 4 systems only where:

1. 13.3.4.1(a)1 and 2, 13.3.4.1(b)2, and 13.3.4.1(c)2 are true and

2. The pipeline system serves only laboratories, except that instrument air systems used for medical support may also serve laboratories (ref. 4-3.1.1.10).

SUBSTANTIATION: The intent of these paragraphs has not been met by the wording. It is presently unusable because it is incomplete and many terms are not clear. The proposal suggests:

1. Assembling all the requirements in a single place.
2. Defining a logical decision tree.

In the proposal, underscore indicates a new requirement. All others are presently elsewhere in the standard.

COMMITTEE ACTION: Accept in Principle.

Delete all of recommendation (d).

COMMITTEE STATEMENT: (d) was deleted in Committee Proposal 99-308 (Log #CP707).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #125)
Committee: HEA-PIP

99- 353 - (13-3.4.1, 16-3.4.1): Accept

SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Delete the second paragraph.

Submitter's Note: See related proposals on 12/13/16/17, 3-4.1.

SUBSTANTIATION: The exception to the Level 1 rule is found in Level 2, which follows in Paragraphs 13-3.4.2/16-3.4.2 respectively.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #200)
Committee: HEA-PIP

99- 354 - (13-3.4.2): Reject

TCC NOTE: The Technical Correlating Committee directs the Committee to review the Committee Statement. The Committee Statement does not address the submitter's recommendation.

SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Revise text as follows:

"If installed where patients, due to medical, surgical, or diagnostic intervention, are not dependent on the piped gas system, the patient gas system shall conform to Level 2 piped gas systems of Chapter 4."

SUBSTANTIATION: If the patients are dependent on the piped gas systems to keep them alive the systems should conform to Level 1 where everything is multiplexed. If the patients are not dependent on the piped gas systems to live the systems could conform to Level 2.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Proposal 99-20 (Log #CP710) which reads as follows:
Add definitions as follows:
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 [gauge pressure <160 psi(1100kPa)] to power devices (e.g., hand pieces, syringes, cleaning devices) as a power source.
Gas Powered System. A Level 3 gas distribution system comprised of component parts, including, but not limited to, cylinders, manifolds, air compressor, motor, receiver, controls, filters, dryers, valves, and piping, that delivers compressed air [gauge pressure <160 psi(1100kPa)] to power devices (e.g., hand pieces, syringes, cleaning devices) as a power source.
Level 1 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS would place patients in imminent danger of morbidity or mortality.
Level 2 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS system would place patients at manageable risk of morbidity or mortality.
Level 3 Piped Gas Systems. Systems serving occupancies where interruption of the PGS would terminate procedures but would not place patients at risk of morbidity or mortality.
Level 3 Vacuum System. A Level 3 vacuum distribution system that can be either a wet system, designed to remove liquids, air/gas or solids from the treated area, or a dry system designed to trap liquids and solids before the service inlet and to accommodate air-gas only through the service inlet.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #111)
Committee: HEA-PIP

99- 355 - (13-3.4.7): Reject
TCC NOTE: The Technical Correlating Committee directs the Committee to review the Committee Statement as the Committee Statement does not address the submitter's substantiation.
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Revise 13-3.4.7 to read:
"Where nitrous oxide or halogenated agents are intended to be administered, a patient WAGD shall be installed and conform to Level 1 WAGD systems in Chapter 4."
SUBSTANTIATION: To correlate with 4-3.3.2.3 requirement in Chapter 4.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Proposal 99-20 (Log #CP710) which reads as follows:
Add definitions as follows:
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 [gauge pressure <160 psi(1100kPa)] to power devices (e.g., hand pieces, syringes, cleaning devices) as a power source.
Gas Powered System. A Level 3 gas distribution system comprised of component parts, including, but not limited to, cylinders, manifolds, air compressor, motor, receiver, controls, filters, dryers, valves, and piping, that delivers compressed air [gauge pressure <160 psi(1100kPa)] to power devices (e.g., hand pieces, syringes, cleaning devices) as a power source.
Level 1 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS would place patients in imminent danger of morbidity or mortality.
Level 2 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS system would place patients at manageable risk of morbidity or mortality.
Level 3 Piped Gas Systems. Systems serving occupancies where interruption of the PGS would terminate procedures but would not place patients at risk of morbidity or mortality.
Level 3 Vacuum System. A Level 3 vacuum distribution system that can be either a wet system, designed to remove liquids, air/gas or solids from the treated area, or a dry system designed to trap liquids and solids before the service inlet and to accommodate air-gas only through the service inlet.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #112)
Committee: HEA-GAS

99- 356 - (13-4 (New)): Accept in Principle
TCC NOTE: It was the action of the Technical Correlating Committee to accept the Technical Committee's action and further propose that the Technical Committee consider that 13-2.1 be revised to read: "~~Laboratories.~~ Responsibilities. The governing boards ..."
Substantiation: Paragraph 13-2.1 concerns responsibilities and is not limited to laboratories. Of all of the occupancies within Chapter 13, laboratories are a special area that need to be addressed.
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Add the following section in Chapter 13:
13-4 Specific Area Requirements.
NOTE: This is in addition to any applicable requirements in Section 13-3.
13-4.1 Anesthetizing Locations. Anesthetizing locations covered in this chapter shall comply with the requirements in 12-4.1.
13-4.2 Laboratories. Laboratories covered in this chapter shall comply with requirements in Chapter 10 as applicable and the requirements of NFPA 45, Standard for Fire Protection for Laboratories Using Chemicals, as applicable.
SUBSTANTIATION: 1. This section was omitted in the 1999 edition of NFPA 99. This section is necessary in order to complete the requirements for anesthetizing locations in facilities other than hospitals. This information was included in the 1996 edition of NFPA 99 for ambulatory health care centers, but appears to have been inadvertently left out of the 1999 edition as a result of the complete revision of Chapters 13, 14, and 15 in the 1996 edition of NFPA 99.
2. Requirements for anesthetizing locations other than in hospitals have over the years been modified to the point that in the 1996 edition of NFPA 99, requirements for anesthetizing locations in ambulatory health care centers referenced requirements in Chapter 12 for hospital anesthetizing locations. This proposal would require all anesthetizing locations designated as "anesthetizing locations" to meet the same criteria as those for hospitals.
3. The Technical Committee may want to apply this new Section 13-3.4.1 just to "ambulatory health care centers." If so, it will then have to address those anesthetizing locations being constructed in other health care facilities (i.e., so called "office O/Rs").
COMMITTEE ACTION: Accept in Principle.
Delete Note. Revise 13-4.1 to read:
"If anesthetizing locations are present, they shall comply with the requirements of 12-4.1."
COMMITTEE STATEMENT: Clarification.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 8
NOT RETURNED: 3 Bancroft, Mills, Swope

(Log #112a)
Committee: HEA-LAB

99- 357 - (13-4 (New)):
TCC NOTE: It was the action of the Technical Correlating Committee that the submitter's substantiation was technically correct. Paragraph 13-4.2 is appropriate. See Technical Committee on Gas Delivery Equipment Proposal 99-356 (Log #112).
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Add the following section in Chapter 13:
13-4 Specific Area Requirements.
NOTE: This is in addition to any applicable requirements in Section 13-3.
13-4.1 Anesthetizing Locations. Anesthetizing locations covered in this chapter shall comply with the requirements in 12-4.1.
13-4.2 Laboratories. Laboratories covered in this chapter shall comply with requirements in Chapter 10 as applicable and the requirements of NFPA 45, Standard for Fire Protection for Laboratories Using Chemicals, as applicable.

SUBSTANTIATION: 1. This section was omitted in the 1999 edition of NFPA 99. This section is necessary in order to complete the requirements for anesthetizing locations in facilities other than hospitals. This information was included in the 1996 edition of NFPA 99 for ambulatory health care centers, but appears to have been inadvertently left out of the 1999 edition as a result of the complete revision of Chapters 13, 14, and 15 in the 1996 edition of NFPA 99.

2. Requirements for anesthetizing locations other than in hospitals have over the years been modified to the point that in the 1996 edition of NFPA 99, requirements for anesthetizing locations in ambulatory health care centers referenced requirements in Chapter 12 for hospital anesthetizing locations. This proposal would require all anesthetizing locations designated as "anesthetizing locations" to meet the same criteria as those for hospitals.

3. The Technical Committee may want to apply this new Section 13-3.4.1 just to "ambulatory health care centers." If so, it will then have to address those anesthetizing locations being constructed in other health care facilities (i.e., so called "office O/Rs").

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: No substantiation provided for 13-4.2. Referred to Technical Correlating Committee.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 7

NOT RETURNED: 2 Nickasch, Simmons

(Log #3)
Committee: HEA-PIP

99- 358 - (15-3.4.8 and 15-3.4.9): Reject

TCC NOTE: The Technical Correlating Committee refers this proposal to the Technical Committee on Laboratories for review, comment and correlation with the Technical Committee on Piping Systems.

SUBMITTER: Joseph Klapp, Collins & Assoc. Technical Services, Inc.

RECOMMENDATION: Revise text:

"...laboratory gas systems shall conform to Level 4 ~~Type 4~~ vacuum systems of Chapter 4."

SUBSTANTIATION: Chapter 4 has levels, not types.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: See Committee Proposal 99-308 (Log #CP707).

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #128)
Committee: HEA-PIP

99- 359 - (16-3.4): Accept in Principle

TCC NOTE: The Technical Correlating Committee refers this proposal to the Technical Committee on Laboratories for review, comment and correlation with the Technical Committee on Piping Systems.

SUBMITTER: Mark Allen, Beacon Medical Products

RECOMMENDATION: Rewrite this section as follows:

16.3.4 Gas and Vacuum System Requirements.

16.3.4.1 General. Where medical gas, instrument air, vacuum, and WAGD systems are installed they shall conform to the requirements for the appropriate level. Systems conforming to different levels within the same building are permitted. The appropriate level shall be determined as follows:

(a) All systems shall comply to Level 1 if any part of the systems are Level 1, unless:

1. The system(s) is (are) entirely separate from the Level 1 system(s) (i.e., are stand alone) and are not connected to Level 1 sources or distribution pipelines and

2. The occupancy to be served and the function of that occupancy is distinct from other occupancies in the building.

(b) Medical gas and vacuum systems shall be permitted to be Level 2 systems only where:

1. 16.3.4.1(a)1 and 2 are true and

2. Patients served by the system(s) are not dependent on mechanical ventilation or assisted mechanical ventilation at any time, including during administration of anesthesia.

(c) Medical gas and vacuum systems shall be permitted to be Level 3 systems only where:

1. 16.3.4.1(a)1 and 2 and 16.3.4.1(b)1 are true and

2. The patient population, during or subsequent to treatment, are not dependent for life on the gases or vacuum system(s), and the treatment(s) which the facility will perform can be completed without detrimental effect on patient outcomes in the event of sudden loss of the gas or vacuum system(s) and

3. The total of all gases in cylinders or containers, except nitrogen, connected and in storage at one time does not exceed 3,000 ft^3 (85 m^3) at standard temperature and pressure (STP), except that 5,000 ft^3 (143 m^3) at standard temperature and pressure (STP), shall be permitted if oxygen is stored in a DOT Specification 4L (cryogenic liquid) cylinder and

4. The system(s) supply not more than two adjoining single treatment facilities

(d) Gas and vacuum systems shall be permitted to be Level 4 systems only where:

1. 16.3.4.1(a)1 and 2, 16.3.4.1(b)2, and 16.3.4.1(c)2 are true and

2. The pipeline system serves only laboratories, except that instrument air systems used for medical support may also serve laboratories (ref. 4-3.1.1.10).

SUBSTANTIATION: The intent of these paragraphs has not been met by the wording. It is presently unusable because it is incomplete and many terms are not clear. The proposal suggests:

1. Assembling all the requirements in a single place.
2. Defining a logical decision tree.

In the proposal, underscore indicates a new requirement. All others are presently elsewhere in the standard.

COMMITTEE ACTION: Accept in Principle.

Delete all of recommendation (d).

COMMITTEE STATEMENT: See Committee Proposal 99-308 (Log #CP707) as this item was deleted which reads as follows:

Move all of 4-6 to Chapter 10 except 4-6.2.2 which would become 4-3.2.2.1(b).

Existing 4-3.2.2.1 would become 4-3.2.2.1(a).

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #201)
Committee: HEA-PIP

99- 360 - (16-3.4.2): Reject

TCC NOTE: The Technical Correlating Committee directs the Committee to review the Committee Statement. The Committee Statement does not address the submitter's substantiation.

SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering

RECOMMENDATION: Revise text as follows:

"If installed where patients, due to medical, surgical, or diagnostic intervention, are not dependent on the piped gas system, the patient gas system shall conform to Level 2 piped gas systems of Chapter 4."

SUBSTANTIATION: If the patients are dependent on the piped gas systems to keep them alive the systems should conform to Level 1 where everything is multiplexed. If the patients are not dependent on the piped gas systems to live the systems could conform to Level 2.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: See Committee Proposal 99-20 (Log #CP710) which reads as follows:

Add definitions as follows:

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 [gauge pressure <160 psi(1100kPa)] to power devices (e.g., hand pieces, syringes, cleaning devices) as a power source.

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

Level 1 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS would place patients in imminent danger of morbidity or mortality.

Level 2 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS system would place patients at manageable risk of morbidity or mortality.

Level 3 Piped Gas Systems. Systems serving occupancies where interruption of the PGS would terminate procedures but would not place patients at risk of morbidity or mortality.

Level 3 Vacuum System. A Level 3 vacuum distribution system that can be either a wet system, designed to remove liquids, air/gas or solids from the treated area, or a dry system designed to trap liquids and solids before the service inlet and to accommodate air-gas only through the service inlet.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #129)
Committee: HEA-PIP

99- 361 - (17-3.4): Accept in Principle

TCC NOTE: The Technical Correlating Committee refers this proposal to the Technical Committee on Laboratories for review, comment and correlation with the Technical Committee on Piping Systems.

SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Rewrite this section as follows:

17.3.4 Gas and Vacuum System Requirements.

17.3.4.1 General. Where medical gas, instrument air, vacuum, and WAGD systems are installed they shall conform to the requirements for the appropriate level. Systems conforming to different levels within the same building are permitted. The appropriate level shall be determined as follows:

(a) All systems shall comply to Level 1 if any part of the systems are Level 1, unless:

1. The system(s) is (are) entirely separate from the Level 1 system(s) (i.e., are stand alone) and are not connected to Level 1 sources or distribution pipelines and

2. The occupancy to be served and the function of that occupancy is distinct from other occupancies in the building.

(b) Medical gas and vacuum systems shall be permitted to be Level 2 systems only where:

1. 17.3.4.1(a)1 and 2 are true and

2. Patients served by the system(s) are not dependent on mechanical ventilation or assisted mechanical ventilation at any time, including during administration of anesthesia.

(c) Medical gas and vacuum systems shall be permitted to be Level 3 systems only where:

1. 17.3.4.1(a)1 and 2 and 17.3.4.1(b)1 are true and

2. The patient population, during or subsequent to treatment, are not dependent for life on the gases or vacuum system(s), and the treatment(s) which the facility will perform can be completed without detrimental effect on patient outcomes in the event of sudden loss of the gas or vacuum system(s) and

3. The total of all gases in cylinders or containers, except nitrogen, connected and in storage at one time does not exceed 3,000 ft^3 (85 m^3) at standard temperature and pressure (STP), except that 5,000 ft^3 (143 m^3) at standard temperature and pressure (STP), shall be permitted if oxygen is stored in a DOT Specification 4L (cryogenic liquid) cylinder and

4. The system(s) supply not more than two adjoining single treatment facilities

(d) Gas and vacuum systems shall be permitted to be Level 4 systems only where:

1. 17.3.4.1(a)1 and 2, 17.3.4.1(b)2, and 17.3.4.1(c)2 are true and

2. The pipeline system serves only laboratories, except that instrument air systems used for medical support may also serve laboratories (ref. 4-3.1.1.10).

SUBSTANTIATION: The intent of these paragraphs has not been met by the wording. It is presently unusable because it is incomplete and many terms are not clear. The proposal suggests:

1. Assembling all the requirements in a single place.
2. Defining a logical decision tree.

In the proposal, underscore indicates a new requirement. All others are presently elsewhere in the standard.

COMMITTEE ACTION: Accept in Principle.
Delete recommendation (d).

COMMITTEE STATEMENT: See Committee Proposal 99-308 (Log #CP707) which reads as follows:

Move all of 4-6 to Chapter 10 except 4-6.2.2 which would become 4-3.2.2.1(b).

Existing 4-3.2.2.1 would become 4-3.2.2.1(a).

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #202)
Committee: HEA-PIP

99- 362 - (17-3.4.2): Reject

TCC NOTE: The Technical Correlating Committee directs the Committee to review the Committee Statement. The Committee Statement does not address the submitter's substantiation.

SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering
RECOMMENDATION: Revise text as follows:

"If installed where patients, due to medical, surgical, or diagnostic intervention, are not dependent on the piped gas system, the patient gas system shall conform to Level 2 piped gas systems of Chapter 4."

SUBSTANTIATION: If the patients are dependent on the piped gas systems to keep them alive the systems should conform to Level 1 where everything is multiplexed. If the patients are not dependent on the piped gas systems to live the systems could conform to Level 2.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: See Committee Proposal 99-20 (Log #CP710) which reads as follows:

Add definitions as follows:

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 [gauge pressure <160 psi(1100kPa)] to power devices (e.g., hand pieces, syringes, cleaning devices) as a power source.

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

Level 1 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS would place patients in imminent danger of morbidity or mortality.

Level 2 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS system would place patients at manageable risk of morbidity or mortality.

Level 3 Piped Gas Systems. Systems serving occupancies where interruption of the PGS would terminate procedures but would not place patients at risk of morbidity or mortality.

Level 3 Vacuum System. A Level 3 vacuum distribution system that can be either a wet system, designed to remove liquids, air/gas or solids from the treated area, or a dry system designed to trap liquids and solids before the service inlet and to accommodate air-gas only through the service inlet.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #CP501)
Committee: HEA-HYP

99- 363 - (Chapter 19):

TCC NOTE: It was the action of the Technical Correlating Committee that a portion of this proposal (19-2.5.5) be returned to committee to clarify their intentions. The strike through and underscore in 19-2.5.5 should have been more explicit, making it consistent with the reorientation of the paragraph.

SUBMITTER: Technical Committee on Hyperbaric and Hypobaric Facilities
RECOMMENDATION: Split the existing paragraph into separate paragraphs – one paragraph for each sentence. Revise text as follows:

19-1.3 Application of this Chapter. This chapter shall apply to new facilities. This chapter shall also apply to ~~Only~~ the altered, renovated, or modernized portion of an existing system or individual component. ~~shall be required to meet the requirements of this chapter. It shall not require the alteration or replacement of existing construction or equipment~~ Existing construction or equipment shall be permitted to be continued in use when such use does not constitute a distinct hazard to life.

(each sentence is a new paragraph under 19-1.3)
19-2.1.1.2 (create two paragraphs under 19-2.1.1)
19-2.2.1* (create three paragraphs under 19-2.2)
19-2.4.2.2 (make 2nd sentence a new paragraph under 19-2.4.2.2)
19-2.4.2.3 (make 2nd sentence a new paragraph under 19-2.4.2.3)
19-2.4.2.4 (create two paragraphs under 19-2.4.2)
19-2.5.2.1 (make 2nd sentence a new paragraph under 19-2.5.2.1)
19-2.5.3.2 (make 2nd sentence a new paragraph under 19-2.5.3.2)
19-2.5.3.4 (make 2nd sentence a new paragraph under 19-2.5.3.4)
19-2.5.4.1 (make 2nd sentence a new paragraph under 19-2.5.4.1)
19-2.5.5 Testing Requirements. The deluge and handline systems shall be functionally tested at least semiannually per 19-2.5.2.3 for deluge systems and 19-2.5.3.4 for handline systems. (new paragraph under 19-2.5.5) If a bypass system is used, it shall not remain in the test mode after completion of the test. (new paragraph under 19-2.5.5) During initial construction, or whenever changes are made to the ~~installed~~ deluge system which will affect the spray pattern, testing of spray coverage ~~per~~ to demonstrate conformance to the requirements of 19-2.5.2.3 shall be performed at surface pressure, and at maximum operating pressure. ~~The requirements of 19-2.5.2.3 shall be satisfied under both conditions.~~ (new paragraph under 19-2.5.5) A detailed record of the test results shall be supplied to the authority having jurisdiction and the hyperbaric facility safety director.
19-2.7.2.1 All hyperbaric facilities intended for human occupancy shall contain an electrical service that is supplied from two independent sources of electric power. (new paragraph under 19-2.7.2.1) For hyperbaric facilities located in a hospital, one power source shall be a prime-mover-driven generator set located on the premises of the facility. (new paragraph under 19-2.7.2.1) ~~This service~~ The prime-mover-driven generator set shall be designated as the Emergency System and shall meet the requirements of Chapter 3, "Electrical Systems," of this standard for hyperbaric systems based in health care facilities. (new paragraph under 19-2.7.2.1) Article 700, Emergency Systems, of NFPA 70, National Electrical Code, shall apply to hyperbaric systems located in facilities other than health care facilities.
19-2.7.2.2 …of interruption of normal power. Such equipment shall include, but is not ~~necessarily be~~ limited to…
(a) Electrical power outlets located within the chamber
(b) Chamber emergency lighting, whether internally or externally mounted
(c) Chamber intercommunications
(d) Alarm systems, including fire detectors
(e) Chamber fire suppression system equipment and controls.
(new paragraph under 19-2.7.2.2) Booster pumps ~~(if installed)~~ in the chamber fire suppression system shall be on separate branch circuits serving no other loads.
(f) Other electrical controls used for chamber pressurization and ventilation control
(g) A number of chamber room lights (either overhead or local) to ensure continued safe operation of the facility during a normal power outage
19-2.7.3.6 (make 2nd sentence a new paragraph under 19-2.7.3.6)
19-2.7.4.1 (make 2nd sentence a new paragraph under 19-2.7.4.1)
19-2.8.1.1 (create two paragraphs under 19-2.8.1)
19-2.8.4.1 (make 2nd sentence a new paragraph under 19-2.8.4.1)
19-2.8.5.2 (make 2nd sentence a new paragraph under 19-2.8.5.2)
19-2.9.3 (make 2nd sentence a new paragraph under 19-2.9.3)
19-3.1.5.6* The use of flammable…
(new paragraph under 19-3.1.5.6) Whenever possible, patients shall be stripped…
(new paragraph under 19-3.1.5.6) All cosmetics, lotions, and …
19-3.3.5 (make 2nd and 3rd sentences new paragraphs under 19-3.3.5)
19-3.4.1.5 (make 2nd sentence a new paragraph under 19-3.4.1.5)
19-3.4.2.1 Installation, repairs, and modifications of equipment, ~~and so forth,~~ related to a chamber shall be evaluated by engineering personnel, tested under pressure, and approved by the safety director. (new paragraph under 19-3.4.2.1) Logs of ~~the various~~ all tests shall be maintained.
19-3.4.2.2 Operating equipment logs shall be maintained by engineering personnel. (new paragraph under 19-3.4.2.2) ~~They~~ Operating equipment logs shall be signed before chamber operation by the person in charge (see A-19-3.1.3.2).

SUBSTANTIATION: Editorial restructuring is required to meet the April 2000 Manual of Style format. Multiple requirements were split into separate paragraphs.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #CP502)
Committee: HEA-HYP

99- 364 - (Chapter 19): Accept
SUBMITTER: Technical Committee on Hyperbaric and Hypobaric Facilities
RECOMMENDATION: Add text to introduce a list of items. Revise text as follows:
19-1.4.2* Occupancy. Hyperbaric chambers shall be classified according to the following criteria:
(a) Class A — Human, multiple occupancy
(b) Class B — Human, single occupancy
(c) Class C — Animal, no human occupancy
19-2.7.3.12.2 Cord-Connected Devices. Cord-connected devices shall meet the following requirements:
(a) All portable, cord-connected equipment shall have an on-off power switch.
(b) The equipment electrical rating shall not exceed 120 V and 2 A unless the electrical portions of the equipment are inert-gas purged.
~~Exception: Cord-connected devices not meeting the requirements of (b) shall be permitted if the electrical portions of the equipment are inert-gas purged.~~
(c) The plug of cord-connected devices shall not be used to interrupt power to the device.

SUBSTANTIATION: Editorial restructuring is required to comply with the April 2000 Manual of Style requirements. Introductory sentences were added to lists.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #CP503)
Committee: HEA-HYP

99- 365 - (Chapter 19): Accept
SUBMITTER: Technical Committee on Hyperbaric and Hypobaric Facilities
RECOMMENDATION: Revise text as follows:
(move entire 19-1.5 to annex as modified)
19-1.5* Nature of Hazards.
~~19-1.5.1~~ A-19-1.5 Potential hazards involved in the design, construction, operation, and maintenance of hyperbaric facilities are formidable. This chapter for the use of hyperbaric facilities is intended to provide protection against fire, explosion, and other hazards without unduly limiting the activities of professional personnel involved in patient ~~(in the case of hospitals) or other~~ care. This principle, without minimizing the hazards, recognizes that professional personnel shall be guided by all of the hazards to life that are inherent in and around hyperbaric treatment procedures.
~~19-1.5.2* Potential hazards involved in the design, construction, operation, and maintenance of hyperbaric facilities are formidable. For a discussion of these hazards, see the information in C-19.~~
19-3.1.2 Recognition of Hazards. (move the following sentence to annex):
A-19-3.1.2 The hazards involved in the use of hyperbaric facilities can be mitigated successfully only when all of the areas of hazard are fully recognized by all personnel and when the physical protection provided is complete and is augmented by attention to detail by all personnel of administration and maintenance having any responsibility for the functioning of the hyperbaric facility. (leave next sentence as text of 19-3.1.2) The nature and ~~degree~~ recognition of ~~these~~ hyperbaric hazards are outlined in ~~Appendix C-19~~ the annex of this document and shall be reviewed by the safety director. (move next sentence to annex) ~~Since~~ Section 19-3 is expected to be used as a text by those responsible for the mitigation of hazards of hyperbaric facilities, the requirements set forth ~~herein~~ are frequently accompanied by explanatory text.
19-3.1.3.3* ~~The ultimate responsibility~~ The governing board shall be responsible for the care and safety of patients ~~(in the case of a hospital)~~ and personnel ~~(in any institution) is that of the governing board~~. (move the following sentence to annex)

A-19-3.1.3.3 ~~Hence~~ It is incumbent upon ~~that~~ the governing body to insist that ~~adequate~~ rules and regulations with respect to practices and conduct in hyperbaric facilities, including qualifications and training of hyperbaric personnel, be adopted by the medical or administrative staff of the institution, and that ~~adequate~~ regulations for inspection and maintenance are in use by the administrative, maintenance, and ancillary (and in the case of a hospital, nursing and other professional) personnel.

19-3.1.3.5* (move the following three sentences to annex with annex text from 19-3.1.3.3) In meeting its responsibilities for safe practices in hyperbaric facilities, the administration of the facility ~~shall~~ should adopt or correlate regulations and standard operating procedures to ensure that both the physical qualities and the operating maintenance methods pertaining to hyperbaric facilities meet the standards set in this chapter. The controls adopted ~~shall~~ should cover the conduct of personnel in and around hyperbaric facilities and the apparel and footwear allowed. They ~~shall~~ should cover periodic inspection of static-dissipating materials and of all electrical equipment, including testing of ground contact indicators. (leave next sentence as text of 19-3.1.3.5) The safety director shall ensure that electrical, monitoring, life support, protection, and ventilating arrangements in the hyperbaric chamber ~~shall be~~ are inspected and tested ~~regularly~~ as part of the routine maintenance program of the facility.

19-3.1.4.5 (move to annex and make text annex to 19-3.1.4.6)

19-3.1.5.3 Personnel.

~~(a)~~ (move the following sentence to annex) The number of occupants of the chamber shall should be kept to the minimum number necessary to carry out the procedure.

~~(b)~~ (new paragraph under 19-3.1.5.3) Antistatic procedures as directed by the safety director shall be employed whenever atmospheres containing more than 23.5 percent oxygen by volume are used.

~~(c)~~ (new paragraph under 19-3.1.5.3) In Class A and Class B chambers with atmospheres containing more than 23.5 percent oxygen by volume, electrical grounding of the patient shall be ensured by the provision of a high-impedance conductive pathway in contact with the patient's skin.

~~(d) Because of the possibility of percussion sparks,~~ (new paragraph under 19-3.1.5.3) Shoes having ferrous nails that make contact with the floor shall not be permitted to be worn in Class A chambers.

(create new sentence as annex text)

A-19-3.1.5.3 There is a possibility of percussion sparks from shoes with ferrous nails.

19-3.2.5 (move the following sentence to annex) Radiation equipment, whether infrared or roentgen ray, can make hyperbaric chambers even more hazardous. (leave next sentence as text of 19-3.2.5) In the event that ~~such~~ radiation equipment is introduced into a hyperbaric chamber, hydrocarbon detectors shall be installed. (new paragraph under 19-3.2.5) In the event that flammable gases are detected in excess of 1000 parts per million, ~~such~~ radiation equipment shall not be operated until the chamber atmosphere is cleared.

19-3.6.1.1 (move to annex for 19-3.6)

19-3.6.2.3 Conductive Accessories. Conductive accessories~~, such as belting, rubber accessories, plastics, covers, and sheeting used inside the chamber,~~ shall meet the conductivity and antistatic requirements of 2-6.3.8, Reduction in Electrostatic Hazard in Annex 2.

(create new sentence and add to annex) Conductive accessories can include belting, rubber accessories, plastics, covers, and sheeting.

SUBSTANTIATION: Editorial restructuring is required to comply with the April 2000 Manual of Style requirements. Nonmandatory language was moved to the annex or revised to make it mandatory.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #CP504)
Committee: HEA-HYP

99- 366 - (Chapter 19):

TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be editorially corrected. In the existing paragraph 19-2.1.1, Exception No. 2, the term "2-hour fire resistive-rated" precedes perimeter, barrier, and construction. Replace "resistive" with "resistant " for continuity with NFPA 101. In the existing paragraph 19-2.7.3.1, Exception No. 1, replace "classified as flame resistant" with "classified as flame retardant."
SUBMITTER: Technical Committee on Hyperbaric and Hypobaric Facilities
RECOMMENDATION: Revise to eliminate exceptions as follows:

19-2.1.1 …shall be protected by 2-hour fire-resistive-rated construction.

~~Exception No. 1:~~ (new paragraph under 19-2.1.1) *Free-standing, dedicated buildings containing only a Class A chamber(s) and ancillary service equipment shall not be required to be protected by 2-hour fire-resistive-rated construction.

~~Exception No. 2:~~ (new paragraph under 19.2.1.1) ~~Chambers not contiguous to a health care facility, and either located in a mobile, vehicle-mounted facility or not permanently affixed to a foundation.~~ Trailer or vehicle-mounted facilities shall be permitted without a 2-hour fire-resistive-rated perimeter.

(new paragraph under 19.2.1.1)When trailer or vehicle-mounted facilities are located contiguous to a health care facility, or another structure, a 2-hour fire-resistive-rated barrier shall be placed between the facility and the contiguous structure.

(new paragraph under 19.2.1.1) Where building exterior walls form part of the facility boundary, that portion of the facility boundary shall not require 2-hour fire-resistive-rated construction.

19-2.1.2 …housing a Class A chamber and in any ancillary equipment rooms.

~~Exception:~~ (new paragraph under 19-2.1.2) Class A chambers not contiguous to a health care facility, and ~~either~~ located in a mobile, vehicle-mounted facility ~~or not permanently affixed to a foundation.~~ shall not be required to be protected as specified in 19-2.1.2.

(new paragraph under 19.2.1.2) Class A chambers not contiguous to a health care facility, and located in a mobile, vehicle mounted facility.

19-2.1.3 The room or rooms housing Class B and C chambers shall be afforded sprinkler protection in accordance with 19-2.1.2.

~~Exception:~~ (new paragraph under 19-2.1.3) Chambers not contiguous to a health care facility, and ~~either~~ located in a mobile, vehicle-mounted facility ~~or not permanently affixed to a foundation~~ shall not be required to have sprinkler protection as specified in 19-2.1.2.

19-2.7.3.1 Conductor Insulation. … as defined in Chapter 2.

~~Exception No. 1:~~ (new paragraph under 19-2.7.3.1) Insulation classified as flame resistant shall not be required on conductors that form an integral part of electrical equipment approved for use inside the chamber, including patient leads; ~~, need not meet the flame resistance classification.~~

~~Exception No. 2:~~ (new paragraph under 19-2.7.3.1) Insulation shall not be required on ~~G~~ground conductors inside of a conduit ~~need not be insulated~~.

19-3.2.3 Equipment used inside the chamber requiring lubrication shall be lubricated with oxygen-compatible flame-resistant material.

~~Exception:~~ (new paragraph under 19-3.2.3) Factory-sealed antifriction bearings…

SUBSTANTIATION: Editorial restructuring is required to comply with the April 2000 Manual of Style requirements. The exceptions were written as requirements.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #CP505)
Committee: HEA-HYP

99- 367 - (Chapter 19):

TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee. The paragraph is difficult to read, should not be in a list format and delete "its" in paragraph 19-3.1.4.3(a). Between paragraphs 19-3.2.2 and 19-3.5.1.1 there is a directive to relocate text; the meaning is unclear whether it pertains to the paragraph above or below. The intent of "See also A-19.3.2.2" is unclear.

SUBMITTER: Technical Committee on Hyperbaric and Hypobaric Facilities

RECOMMENDATION: Create a list for a series of items as follows:

19-2.2.3 The interior of Class A chambers shall be unfinished or treated with a finish that is one of the following:

(a) inorganic-zinc-based ~~or~~

(b) high-quality epoxy or equivalent~~, or that is~~

(c) flame resistant

19-2.7.1.4* For the fixed electrical installation, none of the following shall be permitted inside the chamber.

(a) ~~no~~ circuit breakers

(b) line fuses

(c) motor controllers

(d) relays

(e) transformers

(f) ballasts

(g) lighting panels~~, or~~

(h) power panels ~~shall be located inside of the chamber.~~

{new paragraph under 19-2.7.1.4} If motors are to be located in the chamber, they shall meet the requirements of 19-2.7.3.9.

19-2.7.3.9 Motors shall meet ~~the requirements of~~ one of the following requirements:

(a) NFPA 70, National Electrical Code, Article 501-8(a)(1) for the chamber pressure and oxygen concentration~~, or shall~~

(b) be of the totally enclosed types meeting NFPA 70, Article 501-8(a)(2) or (3).

19-2.7.5.1.1 All associated conduits shall meet the following requirements:

(a) be waterproof ~~and shall~~

(b) meet the requirements of NFPA 70, National Electrical Code ~~Such conduits shall~~

(c) be equipped with approved drains

19-2.8.1.2 The following equipment shall be installed outside the chamber or shall meet the requirements of 19-2.7.3.11.

(a) control equipment

(b) power amplifiers

(c) output transformers~~, and~~

(d) monitors associated with communications and monitoring equipment ~~shall be installed outside the chamber or shall otherwise meet the requirements of 19-2.7.3.11.~~

19-2.8.2.1* An intercommunication system shall connect all personnel compartments (locks)~~, main compartments (locks),~~ and the chamber operator's control console.

19-3.1.4.3 All personnel, including those involved in maintenance and repair of the hyperbaric facility, shall ~~become familiar with~~ be trained on emergency equipment with respect to the following:

(a) ~~its~~ purposes

(b) applications

(c) operation~~, and~~

(d) limitations

19-3.2.1 All equipment used in the hyperbaric chamber shall comply with Section 19-2, including the following: ~~This includes~~

(a) all electrical and mechanical equipment necessary for the operation and maintenance of the hyperbaric facility~~, as well as~~

(b) any medical devices and instruments used in the facility

{new paragraph under 19-3.2.1} Use of unapproved equipment shall be prohibited. [See 19-3.1.5.4(c).]

19-3.2.2* The following shall be all metal to the extent possible:

(a) oxygen containers

(b) valves

(c) fittings~~, and~~

(d) interconnecting equipment ~~shall be all metal to the extent possible.~~

(add new paragraph 19-3.2.3 and renumber) The following shall be compatible with oxygen under service conditions:

(a) valve seats

(b) gaskets

(c) hoses~~, and~~

(d) lubricants ~~shall be selected carefully for oxygen compatibility under service conditions.~~

19-3.2.4* Equipment made of the following shall be prohibited from the chamber interior:

(a) cerium

(b) magnesium

(c) magnesium alloys~~, and~~

~~(d) similar manufacture shall be prohibited from the chamber interior.~~

Relocate the following text to Annex for 19-3.2.4 - "(See also A-19-3.2.2.)"

19-3.5.1.1 All electrical circuits shall be tested before chamber pressurization. {new paragraph under 19-3.5.1.1} ~~This~~ Electrical circuit test shall include the following:

(a) a ground fault check to verify that no conductors are grounded to the chamber~~, as well as~~

(b) a test of normal functioning (see 19-2.7.2.3).

SUBSTANTIATION: Editorial restructuring is required to comply with the April 2000 Manual of Style requirements. The paragraphs were restructured to include lists.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 15

NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

COMMENT ON AFFIRMATIVE:

GURNEE: Suggest: "None of the following shall be permitted inside the chamber pressure envelope".

Reason: Some electrical components can be physically inside the chamber but are in their own pressure housing vented to the surface and thus not a risk.

HAMILTON: Section 19-3.2 is not clear. The second sentence says "facility" where it probably means "chamber".

(Log #CP506)
Committee: HEA-HYP

99- 368 - (Chapter 19): Accept

SUBMITTER: Technical Committee on Hyperbaric and Hypobaric Facilities

RECOMMENDATION: Reverse the order of the units of measure such that the metric unit is first, and the alternate unit of measure is in parentheses immediately after the metric unit. Apply this recommendation to text in the following paragraphs.

19-2.4.1 …Exception

19-2.4.1.1

19-2.5.3.4

19-2.9.2

Recommendation: Alter paragraph text as follows. New text has been underlined.

19-1.2.1* …and experimental procedures at ~~pressures from 0 psig to 100 psig (14.7 psia to 114.7 psia) (0 to 690 kPa gauge).~~ gauge pressures from 0 to 690 kPa (0 to 100 psi).

19-1.2.2* …in which the chamber atmosphere contains an oxygen partial pressure greater than ~~0.21 atmosphere absolute (3.09 psia).~~ an absolute pressure of 21.3 kPa (3.09 psi) (0.21 atmospheres).

19-2.5.2.3* …at floor level shall be not less than ~~2 gpm/ft2 (81.5 L/min/m2)~~ 81.5 L/min/m2 (2 gpm/ft2) with no floor area larger than 1 m^2 (10.76 ft2) receiving less than ~~1 gpm/ft2 (40.75 L/min/m2)~~ 40.75 L/min/m2 (1 gpm/ft2).

19.2.5.3.1 Handlines shall have a ~~1/2 in.~~ 1.27 cm (0.5 in.) minimum internal…

19-2.7.3.2 Wiring Methods. …with an NPT standard conduit cutting die that provides ~~3/4 in. taper per ft (1.9 cm per every 0.3 m)~~ a taper of 1.9 cm per 0.3 m (0.75 in. per ft.). Such conduit…

SUBSTANTIATION: Editorial restructuring is required to comply with the April 2000 Manual of Style requirments. SI units were modified.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 15

NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #CP507)
Committee: HEA-HYP

99- 369 - (Chapter 19):

TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be editorially corrected. In new paragraph 19-2.4.1.3.3 delete the word "A", beginning the sentence with "Breathing."

SUBMITTER: Technical Committee on Hyperbaric and Hypobaric Facilities

RECOMMENDATION: Revise text as follows:

19-2.1.1.3 The supporting foundation for any chamber shall be ~~sufficiently strong~~ designed to support the chamber. ~~Consideration shall be given to any added floor stresses that will be created during any on-site hydrostatic testing.~~

(add new paragraph under 19-2.1.1.3) If on-site hydrostatic testing will be performed, the chamber supporting foundation shall be designed to support the additional water weight.

19-2.1.2.1* Chamber room sprinkler heads shall be an approved type equipped with fusible elements. (new paragraph under 19-2.1.2) The element temperature ratings shall be as low as possible, consistent with the requirements against false operation in NFPA 13.

19-2.2.2 ~~Class A chambers shall be equipped with a floor that is structurally capable of supporting~~ The floor of a Class A chamber shall be designed to support equipment and personnel necessary for the operation of the chamber according to its expected purpose.

19-2.2.2.3 If a bilge is installed, access to the bilge shall be provided for cleaning purposes~~. The floor overlaying the bilge shall be removable or, as an alternative, there shall be other suitable access for cleaning the bilge.~~

19-2.2.4* ~~A sufficient number of~~ Viewing ports~~,~~ ~~and~~ access ports for piping and wiring or monitoring and related leads shall be installed during initial fabrication of the chamber.

19-2.4.2* Sources of air for chamber atmospheres shall be such that toxic or flammable gases are not introduced. (new paragraph under 19-2.4.2) Compressor intakes shall be located ~~so as to avoid~~ away from air contaminated by exhaust from activities of vehicles, internal combustion engines, stationary engines, or building exhaust outlets.

19-2.4.2.1 ~~Positive efforts shall be undertaken to ensure that air for chamber atmosphere is not fouled by handling. This air supply~~ Air supply for chamber atmosphere shall be monitored as required in 19-2.8.7.

19-2.5.1.4* A fire alarm signaling device shall be provided at the chamber operator's control console for signaling ~~the telephone operator or a suitable authority to activate~~ the emergency fire/rescue network of the institution containing the hyperbaric facility.

19-2.5.2.3* ~~The number and positioning of sprinkler heads shall be sufficient to provide reasonably uniform spray coverage with vertical and horizontal (or near horizontal) jets.~~ Average spray density at floor level shall be not less than [(81.5 L/min/m^2 (2 gpm/ft^2)] with no floor area larger than 1 m^2 receiving less than [40.75 L/min/m^2 (1 gpm/ft^2).]

19-2.5.3.3 Handlines shall be equipped with override valves ~~placed in easily accessible locations~~ that are accessible to personnel outside the chamber.

19-2.5.4.2* The number of detectors employed and their location shall be ~~dependent on the sensitivity of each detector and the configuration of the spaces to be protected~~ selected to cover the chamber interior.

19-2.5.4.5 The system shall include self-monitoring functions for fault detection and ~~appropriate~~ fault alarms and indications.

19-2.7.1.1 The requirements of NFPA 70, National Electrical Code, or local electrical codes shall apply to electrical wiring and equipment in hyperbaric facilities within the scope of this chapter, except as such rules are modified in this section. ~~Where unusual conditions exist in a specific facility, the authority having jurisdiction shall judge with respect to the application of specific rules.~~

19-2.7.1.6 In the event of activation of the room sprinkler system, electrical equipment shall be protected from sprinkler water ~~to the maximal extent possible~~, but need not remain functional ~~so long as~~ if manual means ~~sufficient to safely~~ to control and decompress the chamber are provided.

19-2.8.2.2 Oxygen mask microphones shall be ~~approved~~ intrinsically safe at the maximum proposed pressure and 95 ± 5 percent oxygen.

19-2.8.5.1 Oxygen levels shall be continuously monitored in any chamber in which nitrogen or other diluent gas is added to the chamber to reduce the volumetric concentration of oxygen in the atmosphere ~~(saturation operations)~~. ~~Audible and visual alarms shall indicate unsafe low oxygen partial pressure in the chamber.~~

(new paragraph under 19-2.8.5) Oxygen monitors shall be equipped with audible and visual alarms.

19-2.8.6 Carbon Dioxide Monitoring. The chamber atmosphere shall be monitored for carbon dioxide levels during saturation operations whenever ventilation is not used ~~(see 19-2.4.1.1, Exception) to ensure that carbon dioxide levels do not exceed safe levels.~~

19-3.1.3.1 … installations are employed, shall establish and enforce ~~appropriate~~ programs to fulfill the provisions of this chapter.

19-3.1.3.4 By virtue of its responsibility for the professional conduct of members of the medical staff of the health care facility, the organized medical staff shall adopt ~~adequate~~ and enforce regulations with respect to the use of hyperbaric facilities located in health care facilities ~~(see C-19.2 and C-19.3) and through its formal organization shall ascertain that these regulations are regularly adhered to~~. (new paragraph under 19-3.1.3.4) The safety director shall ~~be included~~ participate in the ~~planning phase~~ development of these regulations.

19-3.1.4.1* General. The administrative, technical, and professional staffs shall jointly ~~consider and agree upon necessary rules and regulations~~ develop policies for the control of personnel concerned with the use of hyperbaric facilities. (new paragraph under 19-3.1.4.1) Upon adoption, ~~rules and regulations~~ policies shall be ~~prominently~~ posted in ~~and around the hyperbaric chamber~~ the facility. (move the following two sentences to annex) Positive measures are necessary to acquaint all personnel with the rules and regulations established and to assume enforcement. Training and discipline are ~~mandatory~~ necessary.

19-3.1.5.5 (move the following paragraph to annex) A-19-3.1.5.4 It is recommended that all chamber personnel ~~shall~~ wear garments of the overall or jumpsuit type, completely covering all skin areas possible, and as tightfitting as possible.

19-3.1.5.7 All other fabrics used in the chamber such as sheets, drapes, and blankets shall be of ~~inherently~~ flame-resistant materials.

19-3.2.1.3 (move next sentence to annex) The use of paper ~~shall~~ should be kept to an absolute minimum in hyperbaric chambers~~,~~ ~~and any~~. (leave following as text of 19-3.2.1.3) Paper brought into the chamber shall be stored in a closed metal container. (new paragraph under 19-3.2.1.3) Containers used for paper storage shall be emptied after each chamber operation.

19-3.3.1 The institution's administrative personnel shall ~~ensure that rules and regulations are provided to ensure the~~ develop policies for safe handling of gases in the hyperbaric facility (see 19-3.1.5.2 and C-19-1.1.3.2).

19-3.4.1.1 The hyperbaric safety director shall ~~be ultimately responsible for ensuring~~ ensure that all valves, regulators, meters, and similar equipment used in the hyperbaric chamber are ~~properly~~ compensated for ~~safe~~ use under hyperbaric conditions and tested ~~periodically~~ as part of the routine maintenance program of the facility. (new paragraph under 19-3.4.1.1) Pressure relief valves shall be tested and calibrated ~~periodically~~ as part of the routine maintenance program of the facility.

19-3.4.1.2 The hyperbaric safety director shall ~~also be ultimately responsible for ensuring~~ ensure that all gas outlets in the chambers are ~~properly~~ labeled or stenciled in accordance with CGA C-4, Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained.

19-3.4.1.3 Before piping systems …the outlet label and that ~~proper~~ connecting fittings are checked…

19-3.5.1.2 In the event of fire, all nonessential electrical equipment within the chamber shall be deenergized ~~insofar as possible~~ before extinguishing the fire. (new paragraph under 19-3.5.1.2) Smoldering, burning electrical equipment shall be deenergized before extinguishing a localized fire involving only the equipment (see 19-2.5).

19-3.6.3.1* Materials containing rubber shall be inspected ~~regularly~~ as part of the routine maintenance program of the facility, especially at points of kinking.

SUBSTANTIATION: Editorial restructuring is required to comply with the April 2000 Manual of Style requirments. The sections were modified to eliminate unenforceable, vague or permissive language.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #CP508)
Committee: HEA-HYP

99- 370 - (Chapter 19): Accept
SUBMITTER: Technical Committee on Hyperbaric and Hypobaric Facilities
RECOMMENDATION: Revise text as follows:
19-2.5.1.3 System design…
(b) All ungrounded electrical leads for power and lighting circuits contained inside the chamber shall be disconnected. {new list item under 19-2.5.1.3} Intrinsically safe circuits, including sound-powered communications, ~~are not required to be disconnected~~ shall be permitted to remain connected when either the handline or the deluge system is activated.
Part (c) is to remain unchanged.
19-2.5.4 Automatic Detection System Requirements. Automatic fire detection systems ~~are optional~~ shall not be required. ~~Whether installed and used in an alarm function or in an automatic deluge activation function, they shall meet the requirements set forth below.~~
19-3.2.1.4 ~~No~~ Equipment ~~shall be allowed in the chamber~~ that does not meet the temperature requirements of NFPA 70, National Electrical Code, Article 500-3(a), (b), and (c) shall not be allowed in the chamber.
SUBSTANTIATION: Editorial restructuring is required to comply with the April 2000 Manual of Style requirements. Mandatory language was added or moved to annex.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #CP509)
Committee: HEA-HYP

99- 371 - (Chapter 19): Accept
SUBMITTER: Technical Committee on Hyperbaric and Hypobaric Facilities
RECOMMENDATION: Revise text as follows:
19-2.3.1.2 Gasket material shall be of a type that ~~permits~~ allows the movement of thermal expansion and shall be ~~suitable~~ selected for the temperatures, pressures, and composition of gases involved. (new paragraph under 19-2.3.1.2) Gaskets ~~of~~ or O-rings shall be confined to grooves or enclosures, which will prevent their being blown out or squeezed from the enclosures or compression flanges.
(New) 19-2.4.1 Ventilation of Class A Chambers
19-2.4.1.1 The minimum ventilation rate for a Class A chamber shall be 3 actual cu ft...
(New) 19-2.4.1.1.1 The minimum threshold rate shall be 3 actual cf per min...
~~19-2.4.1.3~~ 19-2.4.1.1.2 Provision shall be made for ventilation during non-pressurization...
(New) 19-2.4.1.2 ~~The ventilation rate requirements of this paragraph are waived~~ Ventilation shall not be required when saturation...
(New) 19-2.4.1.3 Individual breathing apparatus shall be ~~supplied for each occupant of a Class A chamber for use in case air in the chamber~~ available inside a Class A chamber for each occupant for use in the event that the chamber atmosphere is fouled by combustion or otherwise.
(New) 19-2.4.1.3.1 ~~Each breathing apparatus shall be available for immediate use, and~~ The breathing mixture supplied to breathing apparatus shall be independent of the chamber atmosphere.
(New) 19-2.4.1.3.2 The breathing gas supply shall be ~~sufficient~~ designed for simultaneous use...
(New) 19-2.4.1.3.3 ~~Such~~ A breathing apparatus shall function at all pressures....
(New) 19-2.4.1.3.4 In the event of a fire within a chamber provision shall be made to switch...
~~19-2.4.1.5~~ 19-2.4.1.3.5 An alternate source of breathing air shall be available outside a Class A...
(New) 19-2.4.2 Sources of Air for Chamber Atmospheres.
~~19-2.4.2~~ 19-2.4.2.1 Sources of air for chamber atmospheres shall be such that toxic gases are not...
~~19-2.4.2.1~~ 19-2.4.2.2 Positive efforts shall be undertaken to ensure that air for chamber atmospheres...
~~19-2.4.2.2~~ 19-2.4.2.3 The use of conventional oil lubricated compressors....
~~19-2.4.2.3~~ 19-2.4.2.4 Air compressor installations shall consist of two or more individual....
~~19-2.4.2.4~~ 19-2.4.2.5 Air compressor installations that supply medical air to piped gas systems... The second sentence should be separated as a new paragraph.
(New) 19-2.4.3 Temperature and Humidity Control.
~~19-2.4.3~~ 19-2.4.3.1 Warming and cooling of atmosphere within a Class A chamber shall be permitted...
Move exception of current 19-2.4.1 to follow 19-2.4.3.2 as follows:
19-2.4.3.2* Class A chambers that are not used in the capacity of an operating room...
Renumber 19-2.4.1 as follows: ~~19-2.4.1~~ 19-2.4.3.3 Whenever the Class A chamber is used as an operating room, it shall be ~~adequately~~…
Renumber 19-2.4.1.2 as follows: ~~19-2.4.1.2~~ 19-2.4.3.3.1 If inhalation anesthetic agents are being utilized a closed anesthetic...
Renumber 19-2.4.1.2.1 as follows: ~~19-2.4.1.2.1~~ 19-2.4.3.3.2 Flammable inhalation anesthetics (i.e., cyclopropane, ethyl ether...
Rewrite the second sentence of existing 19-2.4.3 as follows: 19-2.4.3.4 Dehumidification shall be permitted through the use of cold coils ~~humidification~~…
Add new 19-2.4.3.5 as follows: 19-2.4.3.5 Humidification shall be permitted by the use of air powered water nebulizer.
Rewrite the last sentence of 19-2.4.3 as follows: 19-2.4.3.6 ~~Suitable~~ Noncombustible packing and nonflammable lubricant shall be employed on the...
Renumber existing 19-2.4.4 as follows: ~~19-2.4.4~~ 19-2.4.4 Ventilation of Class B Chambers.
Rewrite existing 19-2.5.2 as follows: 19-2.5.2 Deluge System Requirements. A fixed water deluge extinguishing system shall be installed in all chamber compartments that are designed for manned operations. (new paragraph under 19-2.5.2) In chambers that consist of more than one chamber compartment (lock), the design of the deluge system shall ~~ensure adequate operation~~ meet the requirements of 19.2.5.2 when the chamber compartments are at different depths (pressures). (new paragraph under 19-2.5.2) ~~The design shall also ensure the independent or simultaneous operation of deluge systems~~ The deluge system in different compartments (locks) shall operate independently or simultaneously.
~~Exception:~~ (new paragraph under 19-2.5.2) Fixed deluge systems shall not be required in chamber compartments that are used strictly as personnel transfer compartments (locks), and for no other purposes~~, are not required to have a fixed deluge system~~.
Rewrite existing 19-2.5.2.4 as follows: 19-2.5.2.4 There shall be ~~sufficient~~ water available in the deluge system to maintain the flow specified in 19-2.5.2.3 simultaneously in each chamber compartment (lock) containing the deluge system for 1 minute. (new paragraph under 19-2.5.2.4) The limit on maximum extinguishment duration shall be governed by the chamber capacity (bilge capacity also, if so equipped) and/or its drainage system.
19-2.5.3 Handline System Requirements. A handline extinguishing system shall be installed in all chamber compartments (locks). (new paragraph under 19-2.5.3) At least two handlines shall be strategically located in treatment compartments (locks). (new paragraph under 19-2.5.3) At least one handline shall be located in each personnel transfer compartment (lock). (new paragraph under 19-2.5.3) If any chamber compartment (lock) is equipped with a bilge access panel, at least one handline shall ~~be of sufficient length to allow use of the handline for fire suppression in~~ reach the bilge area.
Rewrite existing 19-2.7.2.3 as follows: 19-2.7.2.3 **...** as applicable. (new paragraph under 19-2.7.2) ~~Such~~ Electric-motor-driven compressors and auxiliary electrical equipment shall be arranged for delayed-automatic or manual connection to the alternate power source so as to prevent excessive current draw on the system during restarting.
~~Exception:~~ (new paragraph under 19-2.7.2) When reserve air tanks or non-electric compressor(s) ~~of sufficient capacity~~ to maintain pressure and ventilation airflow within the chamber and

supply air for the chamber pressurization are provided, the compressor(s) and auxiliary equipment ~~need not have~~ shall not be required to have an alternate source of power.

Rewrite existing 19-2.7.3 as follows: 19-2.7.3* Wiring and Equipment Inside Class A Chambers. The following general rules shall be satisfied in the use of electrical devices and equipment: [Relocated from 19-2.7.3 (d)] The requirements under this section are intended to protect against the elevated fire risks known to exist in a pressurized air environment and shall not be construed as classifying the chamber interior as a Class I (as defined in NFPA 70, National Electrical Code, Article 500) hazardous location.

~~(a)~~ (new paragraph under 19-2.7.3) ~~No~~ Equipment or equipment component installed in or used in the chamber shall not present an explosion or implosion hazard under the conditions of hyperbaric use. (new paragraph under 19-2.7.3) All equipment shall be rated, or tested and documented, for intended hyperbaric conditions prior to use.

~~(b)~~ Only the ~~minimum amount of~~ electrical equipment necessary for the safe operation of the chamber and for required patient care shall be permitted in the chamber. (new paragraph under 19-2.7.3) ~~Portable equipment shall be permitted in the chamber which is not needed for the patient treatment at hand~~. Only portable equipment necessary for the logistical and operational support shall be permitted in the chamber during manned pressurization.

~~(c)~~ (new paragraph under 19-2.7.3) Signs prohibiting the introduction of flammable liquids, gases, and other articles not permitted by this chapter, into the chamber shall be posted at the chamber entrance(s).

~~Exception:~~ (new paragraph under 19-2.7.3) Where conformance with Class I, Division 1 requirements is specified in the following paragraphs, conformance with Class I, Division 2 requirements shall be permitted to be substituted. (move this sentence to annex) ~~if~~ The limitations on the use in the chamber of alcohol and other agents that emit flammable vapors in the Exception to 19-3.1.5.2 ~~are~~ should be strictly observed and such restrictions should be prominently posted.

A-19-2.7.3 This section contains requirements for the safe use of electrical equipment in the hyperbaric, oxygen-enriched environment (OEA) of the Class A chamber.

19-2.7.3.2 Wiring Methods.

(new paragraph under 19-2.7.3.2) Fixed wiring shall be installed in threaded RMC or IMC conduit utilizing the following waterproof components.

(a) threaded metal joints
(b) fittings
(c) boxes~~, and~~
(d) enclosures

(new paragraph under 19-2.7.3.2) A continuous ground shall be maintained between all conductive surfaces enclosing electrical circuits and the chamber hull using approved grounding means. (new paragraph under 19-2.7.3.2) All threaded conduit shall be threaded with an NPT standard conduit cutting die that provides $^{3}/_{4}$-in. taper per ft (1.9 cm per every 0.3 m). (new paragraph under 19-2.7.3.2) ~~Such~~ All threaded conduit shall be made wrenchtight to prevent sparking when fault current flows through the conduit system.

~~Exception No. 1:~~ (new paragraph under 19-2.7.3.2) Wiring classified as intrinsically safe for any group location and installed in accordance with NFPA 70, National Electrical Code, Article 504, Intrinsically Safe Systems, shall be permitted. ~~using any of the methods suitable for ordinary locations.~~

~~Exception No. 2:~~ (new paragraph under 19-2.7.3.2) Threaded, liquidtight flexible metal conduit installed in accordance with NFPA 70, Article 351, shall be permitted when protected from damage by ~~suitable~~ physical barriers such as equipment panels.

19-2.7.3.4 Flexible Electrical Cords. Flexible cords used to connect portable utilization equipment to the fixed electrical supply circuit shall meet all of the following requirements:

(a) be of a type approved for extra-hard utilization in accordance with NFPA 70, National Electrical Code, Table 70-4~~, shall~~
(b) include a ground conductor~~, and shall otherwise~~
(c) meet the requirements of NFPA 70, Article 501-11.

~~Exception:~~ (new paragraph under 19-2.7.3.4) The normal cord supplied with the device shall be permitted when the portable device is rated at less than 2 A and the cord is ~~securely~~ positioned out of traffic and protected from physical abuse.

19-2.7.3.5* Receptacles Installed Inside the Chamber.

(new paragraph under 19-2.7.3.5) Receptacles ~~installed in the chamber~~ shall be waterproof~~,~~. (new paragraph under 19-2.7.3.5) Receptacles shall be of the type providing for connection to the grounding conductor of the flexible cord~~, and~~. (new paragraph under 19-2.7.3.5) Receptacles shall be supplied from isolated power circuits meeting the requirements of 19-2.7.4.2. (new paragraph under 19-2.7.3.5) The design of the receptacle shall be such that sparks cannot be discharged into the chamber environment when the plug is inserted or withdrawn under electrical load. (new paragraph under 19-2.7.3.5) One of the following shall be satisfied to protect against inadvertent withdrawal of the plug under electrical load:

(a) The receptacle-plug combination shall be of a locking type~~; or~~

(b) The receptacle shall carry a label warning against unplugging under load, and the power cord ~~shall be secured and protected against trip hazards from the movement of personnel in the chamber~~ shall not present a trip hazard for personnel moving in the chamber.

19-2.7.3.8 There shall be no exposed live electrical parts. (new paragraph under 19-2.7.3.8) ~~other than those that are intrinsically safe or~~ Exposed live electrical parts that are intrinsically safe shall be permitted. (new paragraph under 19-2.7.3.8) Exposed live electrical parts that constitute patient monitoring leads which are part of electromedical equipment ~~meeting~~ shall be permitted provided that they meet the requirements of 19-2.7.3.12.

19-2.7.3.10* Lighting. Lighting installed or used inside the chamber shall ~~meet the temperature requirements of this section and~~ be rated for a pressure of $1^{1}/_{2}$ times the chamber working pressure. (new paragraph under 19-2.7.3.10) Permanently installed fixtures shall comply with the following:

(a) be rated and approved for Class I (Division 1 or 2) classified areas~~, shall~~
(b) have lens guards installed~~, and shall~~
(c) be located away from areas where they would experience physical damage from the normal movement of people and equipment. (new paragraph under 19-2.7.3.10) Ballasts and other energy storage components that are part of the lighting circuit shall be installed outside the chamber in accordance with 19-2.7.1.4. (new paragraph under 19-2.7.3.10) Portable fixtures intended for spot illumination shall be shatterproof or ~~otherwise~~ protected from physical damage.

19-2.7.3.11* Low-Voltage, Low-Power Equipment. The requirements of this section shall apply to sensors, signaling, alarm, communication, and remote control equipment installed or used in the chamber for operation of the chamber ~~shall meet the following criteria:~~.

~~(a)~~ (new paragraph under 19-2.7.3.11) Equipment shall be isolated from main power by one of the following means:

(a) design of the power supply circuit~~, by~~
(b) opto-isolation~~, or by~~
(c) other electronic isolation means

~~(b)~~ (new paragraph under 19-2.7.3.11) Circuits such as headset cables, sensor leads, and so forth, not enclosed as required in 19-2.7.3.2, shall ~~be either~~ meet one of the following requirements:

(a) be part of approved intrinsically safe equipment~~, or~~
(b) be limited by circuit design to no more than 28 V and 0.5 A under normal or circuit fault conditions.

~~(c)~~ (new paragraph under 19-2.7.3.11) Chamber speakers shall be of a design in which the electrical circuitry and wiring is completely enclosed. (new paragraph under 19-2.7.3.11) Electrical rating of chamber speakers shall not exceed 28 V rms and 25 W.

~~(d)~~ (new paragraph under 19-2.7.3.11) Battery operated, portable intercom headset units shall meet the requirements of 19-2.7.3.12~~(d)~~.1 for battery operated devices.

19-2.7.3.12* Portable Patient Care Related Electrical Appliances. ~~Portable patient care related electrical appliances used in a chamber shall meet, as a minimum, the following electrical safety requirements:~~

~~(a)~~ (new paragraph under 19-2.7.3.12) The appliance shall be designed and constructed in accordance with Chapter 9, "Manufacturer Requirements."

~~(b)~~ (new paragraph under 19-2.7.3.12) The electrical and mechanical integrity of the appliance shall be verified and

documented through an ongoing maintenance program as required in Chapter 7, "Electrical Equipment."

~~(c)~~ (new paragraph under 19-2.7.3.12) The appliance shall conform to the requirements of 19-2.7.3(a) and 19-2.7.3.7.

~~(d)~~ (new paragraph under 19-2.7.3.12) Appliances that utilize oxygen shall ~~contain provisions to prevent~~ not allow oxygen accumulation in the electrical portions of the equipment under normal and abnormal conditions.

19-2.7.3.12.1 Battery-Operated Devices. Battery-operated devices shall meet the following requirements.

(a) Batteries shall be fully enclosed and secured within the equipment enclosure.

(b) Batteries shall ~~be suitable for the chamber operating pressure, and~~ not be damaged by the maximum chamber pressure they are exposed to. (new list item under 19-2.7.3.12.1) Batteries shall be of a sealed type that does not off-gas during normal use.

(c) Batteries or battery-operated equipment shall not undergo charging while located in the chamber. (new list item under 19-2.7.3.12.1) Batteries shall not be changed on in-chamber equipment ~~located in the chamber~~ while the chamber is in use.

(d) The equipment electrical rating shall not exceed 12 V and 48 W.

19-2.7.4.2 … with a line isolation monitor with ~~appropriate~~ signal lamps and audible alarms. (new paragraph under 19-2.7.4.2) Such circuits shall meet the requirements of NFPA 70, Article 517-160, Isolated Power Systems, and 517-160(b), Line Isolation Monitor. (new paragraph under 19-2.7.4.2) Branch circuits shall not exceed 125 V or 15 A.

19-2.7.6.1 Electrical equipment inside Class B chambers shall be restricted to communication functions and patient physiological monitoring leads. (new paragraph under 19-2.7.6.1) Circuits shall be designed to limit the electrical energy to wire leads into the chamber under normal or fault conditions to no more than 28 V and $^1/_2$ W. (new paragraph under 19-2.7.6.1) Communication wires shall be protected from physical damage and from coming into contact with flammable materials in the chamber by ~~appropriate~~ barriers or conduit. (new paragraph under 19-2.7.6.1) Patient monitoring leads shall be part of approved electromedical apparatus meeting the requirements in 19-2.7.3.12.

19-2.8.7* Chamber Gas Supply Monitoring. The air supply of Class A and Class B chambers shall be sampled ~~periodically~~ for concentrations of carbon monoxide. (move next sentence to annex) The frequency of such monitoring ~~shall~~ should depend on the location of the air intake relative to potential sources of contamination. (new paragraph under 19-2.8.7) Air supplied from oil-lubricated compressors capable of contaminating the compressor output due to wear or failure shall be continuously monitored for volatilized hydrocarbons as well as carbon monoxide at a location downstream from the oil filter when the compressors are running. (new paragraph under 19-2.8.7) As a minimum, the air supplied to Class A and B chambers shall meet the requirements for medical air as defined in Chapter 2.

19-2.9.2 Exhaust from all classes of chambers shall be piped outside of the building~~, the point of exit being clear of all neighboring hazards and clear of possible reentry of exhaust gases into the building, and~~. (new paragraph under 19-2.9.2) The point of exhaust shall not create a hazard. (new paragraph under 19-2.9.2) The point of exhaust shall not allow reentry of exhaust gases into the building. (new paragraph under 19-2.9.2) The point of exhaust shall be one of the following:

(a) located above the building height

(b) protected by a grille or fence of at least 2-ft (0.6-m) radius from the exhaust port. ~~A protective grille or fence is not required when the exhaust is above the building height.~~

19-3.1.3.2* Each hyperbaric facility shall designate a safety director ~~shall be designated~~ to be in charge of all hyperbaric equipment and overall facility safety. (new paragraph under 19-3.1.3.2) The safety director shall ~~work closely~~ participate with facility management personnel and the hyperbaric physician(s) ~~to establish~~ in developing procedures for ~~safe~~ operation and maintenance of the hyperbaric facility. (new paragraph under 19-3.1.3.2) ~~He or she~~ The safety director shall make ~~necessary~~ recommendations for departmental safety policies and procedures. (new paragraph under 19-3.1.3.2) The safety director shall have the authority to restrict or remove any potentially hazardous supply or equipment items from the chamber.

19-3.1.4.2 The medical director of hyperbaric medicine ~~shall work with the safety/technical director to establish~~ and the safety director shall jointly develop the minimum staff qualifications, experience, and compliment based on the following:

(a) the number and type of hyperbaric chambers in use~~, their~~

(b) the maximum treatment capacity~~, and~~

(c) the type of hyperbaric therapy normally provided

19-3.1.4.4 Emergency procedures ~~best suited to the needs of the individual~~ specific to the hyperbaric facility shall be established. (new paragraph under 19-3.1.4.4) All personnel shall ~~become thoroughly familiar with these procedures and the methods of implementing them~~ be trained on emergency procedures. (move next sentence to annex) Individual circumstances dictate whether such familiarization can best be afforded through the medium of a procedure manual. (new paragraph under 19-3.1.4.4) Personnel shall be trained to ~~safely~~ control the chamber and decompress occupants when all powered equipment has been rendered inoperative.

19-3.1.5.1 Open Flames and Hot Objects.

(create new sentence as annex text) Flame detectors can be prematurely activated by certain radiation sources. (leave next sentence as text of 19-3.1.5.1) The following shall be prohibited from inside the chamber and the immediate vicinity outside the chamber:

(a) smoking

(b) open flames

(c) hot objects~~, and~~

(d) ultraviolet sources~~, which would cause premature operation of flame detectors, when installed, shall be prohibited from hyperbaric facilities, both inside and outside, and in the immediate vicinity of the chamber.~~ (move next sentence to annex) The immediate vicinity of the chamber is defined as the ~~general surrounding~~ area around the chamber from which activation of the flame detector can occur.

19-3.1.5.2 Flammable Gases and Liquids.

~~(a)~~ (new paragraph under 19-3.1.5.2) Flammable agents… shall be ~~forbidden~~ prohibited inside the chamber and from the proximity of the compressor intake.

~~Exception:~~ (new paragraph under 19-3.1.5.2) For Class A chambers, flammable… if the following conditions are met:

~~1.~~ (a) Such use is approved by the safety director, or other authority having jurisdiction.

~~2.~~ (b) *The quantities of such agents are limited so that they are incapable of releasing sufficient flammable vapor into the chamber atmosphere to exceed the LEL for the material. (new list item c)) A safety factor shall be included to account for the localized concentrations, stratification, and the absence of ventilation.

~~3.~~ (d) The oxygen monitoring requirement of 19-2.8.5.2 is observed.

~~(b)~~ (new paragraph under 19-3.1.5.2) ~~No~~ Flammable liquids, gases, or vapors shall not be permitted inside any Class B chamber.

19-3.1.5.4 Textiles.

~~(a)~~ (new paragraph under 19-3.1.5.4) Silk, wool, or…

~~(b)~~ (new paragraph under 19-3.1.5.4) Garments fabricated of…

~~(c)~~ (new paragraph under 19-3.1.5.4) The physician or surgeon in charge, with the concurrence of the safety director shall be permitted to use prohibited items in the chamber that are one of the following:

(a) suture material

(b) alloplastic devices

(c) bacterial barriers

(d) surgical dressings~~, and~~

(e) biologic interfaces ~~of otherwise prohibited materials shall be permitted to be used at the discretion of the physician or surgeon in charge with the concurrence of the safety director~~. (new paragraph under 19-3.1.5.4) ~~This permission~~ Physician and safety director approval to use prohibited items shall be stated in writing for all prohibited materials employed (see A-19-3.1.3.2).

~~(d)~~ (new paragraph under 19-3.1.5.4) Where flame resistance is specified, the fabric shall meet the requirements set forth for the small-scale test in NFPA 701, Standard Methods of Fire Tests for Flame-Resistant Textiles and Films, ~~except that the test shall be performed~~ in an atmosphere equivalent to the maximum oxygen concentration and pressure proposed for the chamber.

19-3.2.1.1 The following devices shall not be operated in the hyperbaric chamber unless approved by the safety director for such use:

(a) portable X-ray devices

(b) electrocautery equipment~~, and other~~

(c) ~~similar~~ high-energy devices ~~shall not be operated in the hyperbaric chamber unless approved by the safety director for such use.~~

(new paragraph under 19-3.2.1) Photographic equipment employing the following shall not remain in the chamber when the chamber is pressurized:

(a) photoflash

(b) flood lamps~~, or similar equipment shall not remain in the hyperbaric chamber when the chamber is pressurized.~~ (new paragraph under 19-3.2.1) Lasers shall not be used under any condition.

19-3.6.2.2 Furniture Used in the Chamber.

~~(a)~~ (new paragraph under 19-3.6.2.2) ~~* Periodic inspection shall be made of leg tips, tires, casters, or other conductive devices on furniture and equipment to ensure that they are maintained~~ Conductive devices on furniture and equipment shall be inspected to ensure that they are free of wax, lint, or other extraneous material that could insulate them and defeat the ~~purpose for which they are used~~ conductive properties. (create new sentence and move to annex) Conductive devices include leg tips, tires, and casters. ~~Periodic inspection shall also be made to avoid transporting such materials from other areas to conductive floors.~~ (new paragraph under 19-3.6.2.2) ~~Metals capable of impact sparking shall not be allowed for~~ Casters or furniture leg tips shall not be capable of impact sparking.

~~(b)~~ (new paragraph under 19-3.6.2.2) Casters shall not be lubricated with oils or other flammable materials. (new paragraph under 19-3.6.2.2) Lubricants shall be oxygen compatible and flame resistant.

~~(c)~~ (new paragraph under 19-3.6.2.2) Wheelchairs and gurneys with bearings lubricated and sealed by the manufacturer shall be permitted in Class A chambers where conditions prescribed in 19-2.8.5 are met.

19-3.6.5 Housekeeping. (move next sentence to annex) It is absolutely essential that all areas of, and components associated with, the hyperbaric chamber be kept meticulously free of grease, lint, dirt, and dust. (leave next sentence as text of 19-3.6.5) A ~~regular~~ housekeeping program shall be implemented whether or not the facility is in regular use. (new paragraph under 19-3.6.5) The persons assigned to this task shall be ~~thoroughly indoctrinated~~ trained in the hazards to occupants under normal operation.

SUBSTANTIATION: Editorial restructuring is required to comply with the April 2000 Manual of Style requirements.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood
COMMENT ON AFFIRMATIVE:
GURNEE: My memory of committee action was to place a time of continuous spray on the handline system similar to the deluge system (i.e., where a dedicated handline tank is supplied) so a handline storage capacity could be determined. My notes indicate 1 minute, like deluge was recommended.

(Log #CP510)
Committee: HEA-HYP

99- 372 - (Chapter 19):

TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee for editorial correction. Rewrite existing paragraph 19-1.1.1 to succinctly convey the Technical Committee's intended message
SUBMITTER: Technical Committee on Hyperbaric and Hypobaric Facilities
RECOMMENDATION: Leave 19-1 in chapter 19 as the introduction. Move all of 19-1.2 to chapter 1. Alter text as follows. New text has been underlined.

19-1* Introduction ~~and Scope~~.

~~19-1.1 Purpose.~~

~~19-1.1.1*~~ The purpose of this chapter is to set forth minimum safeguards for the protection of patients or other subjects of, and personnel administering, hyperbaric therapy and experimental procedures. Its purpose is also to offer some guidance for rescue personnel who are not ordinarily involved in hyperbaric chamber operation, but who could become so involved in an emergency.

~~19-1.1.2~~ Requirements cited in this section are minimum ones. Discretion on the part of chamber operators and others might dictate the establishment of more stringent regulations.

19-1.2* Scope. The scope of this chapter shall be as specified in 1.X.X.

Move the following to Chapter 1:

19-1.2.1* This chapter applies to hyperbaric chambers and associated facilities that are used, or intended to be used, for medical applications and experimental procedures at pressures from 0 psig to 100 psig (14.7 psia to 114.7 psia) (0 to 690 kPa gauge).

~~19-1.2.1.1~~ 19-1.2.3 This chapter covers the recognition of and protection against hazards of an electrical, explosive, or implosive nature, as well as fire hazards.

Move to Annex A-19-1.2:

~~19-1.2.1.2~~ 19-1.2.4 Medical complications of hyperbaric procedures are discussed primarily to acquaint rescue personnel with these problems.

19-1.2.2* This chapter applies to both single- and multiple-~~patient~~ 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 0.21 atmosphere absolute (3.09 psia).

SUBSTANTIATION: Editorial restructuring is required to comply with the April 2000 Manual of Style requirements.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #214)
Committee: HEA-HYP

99- 373 - (19-2.1.1 Exception No. 2): Accept in Principle
SUBMITTER: W. T. Workman, Workman Hyperbaric Services, Inc.
RECOMMENDATION: Revise to read as follows:

Exception No. 2: Chambers not contiguous to a health care facility, and ~~either~~ located in a mobile, vehicle-mounted facility ~~or not permanently affixed to a foundation~~.

SUBSTANTIATION: For practical purposes, once a Class A or Class B hyperbaric chamber is installed in a room and connected to the requisite supply and exhaust piping, it becomes "permanent," whether the chamber skids, pedestals or casters are secured to the floor or not. During a fire emergency, no chamber, regardless of its classification is going to be removed to a location not threatened by fire. In today's marketplace, there are small Class A chambers with casters and Class B chambers without casters that are positioned but not affixed to the floor. These chamber designs should be afforded the same level of protection as more traditional chamber designs.
COMMITTEE ACTION: Accept in Principle.

Revise to read as follows:

Exception No. 2: Chambers not contiguous to a health care facility, and ~~either~~ located in a mobile, vehicle-mounted facility ~~or not permanently affixed to a foundation~~

Revise to read:

"Trailer or vehicle-mounted facilites shall be premitted without a 2 hour fire-resistive-rated perimeter. However, when such facilities are located contiguous to a health care facility, or another structure, a 2 hour fire-resistive-rated barrier shall be placed between the facilty and the contiguous structure."

COMMITTEE STATEMENT: Revised to eliminate ambiguity from earlier editions of the standard.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #295)
Committee: HEA-HYP

99- 374 - (19-2.1.1 Exception No. 3 (New)): Reject
SUBMITTER: Steven Reimers, Larry Wischhoefer, Reimers Systems Inc.
RECOMMENDATION: Add a new exception as follows:

Exception No. 3: Chambers limited to 3 ATA working pressure and labeled for use only in applications not requiring saturation decompression.

SUBSTANTIATION: The existing requirement for a two hour fire-resistive-rated wall construction is intended to protect the

chamber and its occupants from a fire elsewhere in the building in circumstances where substantial decompression obligations may exist thus preventing rapid evacuation of the chamber. However, for chambers limited to 3 ATA working pressure and non-saturation exposures, the probable exit times for the chamber occupants in a Class A chamber in the event of a fire in the building are similar to those for occupants in Class B chambers where the two hour fire-resistive-rated construction is not required.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The committee feels that the current requirements are considered adequate.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #215)
Committee: HEA-HYP

99- 375 - (19-2.1.2 Exception): Accept in Principle
SUBMITTER: W. T. Workman, Workman Hyperbaric Services, Inc.
RECOMMENDATION: Revise to read as follows:
Exception: Class A chambers not contiguous to a health care facility, and ~~either~~ located in a mobile, vehicle-mounted facility ~~or not permanently affixed to a foundation~~.
SUBSTANTIATION: For practical purposes, once a Class A or Class B hyperbaric chamber is installed in a room and connected to the requisite supply and exhaust piping, it becomes "permanent," whether the chamber skids, pedestals or casters are secured to the floor or not. During a fire emergency, no chamber, regardless of its classification is going to be removed to a location not threatened by fire. In today's marketplace, there are small Class A chambers with casters and Class B chambers without casters that are positioned but not affixed to the floor. These chamber designs should be afforded the same level of protection as more traditional chamber designs.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Action and Statement on Proposal 99-376 (Log #216) and Committee Proposal 99-366 (Log #CP504).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #216)
Committee: HEA-HYP

99- 376 - (19-2.1.3 Exception): Accept in Principle
SUBMITTER: W. T. Workman, Workman Hyperbaric Services, Inc.
RECOMMENDATION: Revise to read as follows:
Exception: Chambers not contiguous to a health care facility, and ~~either~~ located in a mobile, vehicle-mounted facility ~~or not permanently affixed to a foundation~~.
SUBSTANTIATION: For practical purposes, once a Class A or Class B hyperbaric chamber is installed in a room and connected to the requisite supply and exhaust piping, it becomes "permanent," whether the chamber skids, pedestals or casters are secured to the floor or not. During a fire emergency, no chamber, regardless of its classification is going to be removed to a location not threatened by fire. In today's marketplace, there are small Class A chambers with casters and Class B chambers without casters that are positioned but not affixed to the floor. Class B and C chamber designs should be afforded the same level of protection as Class A chamber designs.
COMMITTEE ACTION: Accept in Principle.
Make the Exception a new requirement as follows:
"Chambers not contiguous to a health care facility, and located in a mobile, vehicle mounted facility shall not be required to have sprinkler protection as specified in 19-2.1.2."
COMMITTEE STATEMENT: Conforms to Manual of Style to eliminate exceptions. See Committee Proposal 99-366 (Log #CP504).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #296)
Committee: HEA-HYP

99- 377 - (19-2.1.4):
TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee for reconsideration. In the Committee Statement, expand upon the reason for rejection; address the submitter's substantiation.
SUBMITTER: Steven Reimers, Larry Wischhoefer, Reimers Systems Inc.
RECOMMENDATION: Renumber Paragraph 19-3.3.5 as 19-2.1.4 and relocate to Section 19-2.1, Housing for Hyperbaric Facilities.
SUBSTANTIATION: This paragraph contains facility construction requirements related to the storage and handling of gases within a hyperbaric facility. However, it is located in Section 19-3, "Administration and Maintenance." Consequently, its provisions are sometimes overlooked until after a facility is built. Relocating this paragraph as proposed will place it where it will be more readily seen by interested parties at the correct times, e.g., during the facility design process.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Committee believes the present location is adequate.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #297)
Committee: HEA-HYP

99- 378 - (19-2.2.1):
TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee for reconsideration. In the Committee Statement, expand upon the reason for rejection; address the submitter's substantiation.
SUBMITTER: Steven Reimers, Larry Wischhoefer, Reimers Systems Inc.
RECOMMENDATION: Revise Paragraph 19-2.2.1 to read as follows:
"Chambers for human occupancy, and their supporting systems, shall be designed and fabricated to meet ANSI/ASME PVHO-1, Safety Standard for Pressure Vessels for Human Occupancy, <u>including any additional requirements for medical systems,</u> by personnel...".
SUBSTANTIATION: PVHO-1 is in the process of being reorganized into a document that includes a main general requirements section followed by application specific sections, much in the same manner as Chapters 1 through 18 of NFPA 99 are organized. The proposed change indicates clearly which of the application specific sections should apply. The proposed wording is also compatible with the current format of PVHO-1 which does not contain application specific sections.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Committee believes current wording is adequate.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #300)
Committee: HEA-HYP

99- 379 - (19-2.4.1 through 19-2.4.3): Accept in Principle
SUBMITTER: Steven Reimers, Larry Wischhoefer, Reimers Systems Inc.
RECOMMENDATION: Restructure Paragraphs 19-2.4.1 to 19-2.4.1.2 as follows and add the labels indicated:
19-2.4 Chamber Ventilation.
19-2.4.1 <u>Ventilation of Class A Chambers.</u>
19-2.4.1.1 <u>Minimum Ventilation Rates.</u> (insert existing 19-2.4.1.1)
19-2.4.1.2 <u>Class A Chambers Used as Operating Rooms.</u>
19-2.4.1.2.1 (insert existing 19-2.4.1)
19-2.4.1.2.2 (insert existing 19-2.4.1.2)
19-2.4.1.2.3 (insert existing 19-2.4.1.2.1)
Add labels to 19-2.4.1.3 through 19-2.4.3 as follows:
19-2.4.1.3 <u>Ventilation During Nonpressurization</u> (insert existing 19-2.4.1.3)
19-2.4.1.4 <u>Individual Breathing Apparatus</u> (insert existing 19-2.4.1.4)

19-2.4.1.5 Alternative Source of Breathing Air (insert existing 19-2.4.1.5)
19-2.4.2 Air Sources and Handling (insert existing 19-2.4.2 through 19-2.4.2.4)
19-2.4.3 Chamber Air Handling Requirements (insert existing 19-2.4.3)
SUBSTANTIATION: The existing numbering scheme makes the current requirements of 19-2.4.1.1 through 19-2.4.1.5 sub-requirements applicable to Class A chambers used as operating rooms, and therefore strictly applicable ONLY to Class A chambers used as hyperbaric operating rooms. The requirements of 19-2.4.1.1, 19-2.4.1.3, 19-2.4.1.4, and 19-2.4.1.5 are considered to be applicable to all Class A chambers and have been widely interpreted in that manner for some time. This proposal corrects the organizational error in the current paragraph structure. The current wording has been used by some manufacturers as an opening to provide chambers with no ventilation whatsoever.
The labels do not affect the technical requirements, but are offered as an attempt to make the requirements easier to read and understand.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Proposal 99-371 (Log #CP509).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #130)
Committee: HEA-HYP

99- 380 - (19-2.4.2.2): Reject
SUBMITTER: Mark Allen, Beacon Medical Products
RECOMMENDATION: Rewrite 19-2.4.2.2 as follows:
19-2.4.2 Medical gas systems serving hyperbaric chambers shall comply with Chapter 4, Level 1, except as specified below:
19.2.4.2.1 Hyperbaric air systems serving only the hyperbaric chamber shall be permitted to be oil lubricated compressors fitted with oil separation, filtration, and adsorption devices such that the air produced meets the definition for Medical Air under all conditions of intake air and the system is monitored according to 19-2.8.7. Air treatment systems shall include automatic safeguards.
19.2.4.2.2 Air compressor installations shall be permitted to comply with Level 2 Medical Air Systems if a reserve manifold of cylinders containing medical air are installed so as to automatically activate in the event of failure of the compressor or air treatment system. The reserve manifold shall contain sufficient cylinders to maintain pressure and ventilation airflow within the chamber and supply air for the chamber pressurization.
SUBSTANTIATION: Installations of medical gases in hyperbaric areas are in every way as important and subject to the exact same hazards as medical gases piped anywhere. The present 19-2.4 is incomplete on the subject of medical gases, which causes users difficulties with certifiers who attempt to enforce Chapter 4 based on the scope of that chapter. In addition, the present 19-2.4 does not account for Levels 1 or 2.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Many of the requirements of Chapter 4 for Level 1 and Level 2 medical air systems are not acceptable for hyperbaric facilities.
Hyperbaric facility requirements are covered by Chapter 19 and its references.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #298)
Committee: HEA-HYP

99- 381 - (19-2.4.4 (New)): Reject
SUBMITTER: Steven Reimers, Larry Wischhoefer, Reimers Systems Inc.
RECOMMENDATION: Add a new paragraph as follows:
19-2.4.4 Atmospheric Uniformity. The atmosphere within all Class A chambers shall be stirred sufficiently so that excessive local concentrations of oxygen or other gases do not occur.
Renumber existing 19-2.4.4 as 19-2.4.5.
SUBSTANTIATION: The administration of hyperbaric oxygen therapy necessitates the handling of large amounts of oxygen inside a chamber. In the event of a major leak, such as from a disconnected hood exhaust hose, large amounts of oxygen can be quickly discharged into the chamber. If the chamber atmosphere is not "stirred" sufficiently, it can take several minutes for the accumulating oxygen to be detected by the chamber oxygen analyzer(s). This can lead to potentially unsafe conditions going undetected. It is possible that such a situation contributed to the multiplace chamber fire in Milan not long ago. Just how much "stirring" of the atmosphere is required has not been quantified as of the date of this proposal. However, experience with atmospheric conditioning systems in diving chambers has shown that the throughput of the atmosphere condition system should be not less than about 1/6 of the chamber volume per minute if good control is to be maintained.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Language is unenforceable.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #299)
Committee: HEA-HYP

99- 382 - (19-2.4.5 (New)):
TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee for reconsideration. The Technical Committee did not substantiate why it is beyond the scope of the committee. The Technical Correlating Committee believes it is part of the Technical Committee's scope, and that the proposal be reconsidered.
SUBMITTER: Steven Reimers, Larry Wischhoefer, Reimers Systems Inc.
RECOMMENDATION: Add a new paragraph as follows:
19-2.4.5 Emergency Depressurization Capability. All chambers shall be provided with an emergency depressurization mechanism capable of depressurizing the chamber from 3 ATA to surface pressure in less than 120 seconds. Operation of this mechanism shall be possible only by direct operator action. A lock-out capability shall be permitted for use when chamber occupants have incurred a decompression obligation.
SUBSTANTIATION: In recent years some chambers have appeared on the market from which the minimum egress time is several minutes due to a very slow depressurization capability. In a clinical setting where prompt evacuation may be required for medical as well as fire safety reasons, the absence of an ability to quickly depressurize a chamber is considered an unnecessary risk.
Most existing Class B chambers already have this capability. This capability is already in place on many multiplace clinical chambers in Germany and some in the United States.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The recommendation is beyond the scope of this committee.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #23)
Committee: HEA-HYP

99- 383 - (19-2.5):
TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee for reconsideration. The Technical Committee stated the procedures are essential. The Technical Correlating Committee directs the Technical Committee to develop the language to implement the procedures.
SUBMITTER: Dave DeAngelis, Naval Facility Engineering Service Center/ ECD
RECOMMENDATION: I would like to suggest a change to the Fire Extinguishing Requirements for Multiplace Chambers. It is requested that we also discuss this at the PVHO Medical Subcommittee meeting being held in Biloxi on 9 February and also at the NFPA Technical Committee meeting in June. I would like

to see if there is support in the Hyperbaric Community and agreement in the committees that this is a worthwhile task.

As a Project Engineer and then Program Manager for US Navy shore-based hyperbaric facilities (multiplaces) for seventeen years, I have a responsibility to meet NFPA 99. There is one area where I do not meet the standard, it is in the fire systems. On a five foot diameter multiplace chamber, I do not put a hand held or a deluge system. We provide the chamber with a pressurized water fire extinguisher. On the US Navy's 6.5 diameter chamber, only a hand held hose system is provided (actually two in inner lock (either end) and one in outer lock). Any chamber larger than 6.5 foot diameter, both a deluge and a hand held system are provided.

After years of designing, talking and reviewing fire systems, the justification I have for this is based on the following:

In US Navy Shore-base Hyperbaric chambers:

1. Patients are only allowed to wear approved clothing that is fire retardant.
2. Patients are not allowed to bring any external items into me chamber, i.e., hand heaters, etc.
3. All items (bunks, benches, tables) inside the chamber are grounded.
4. The chamber is grounded.
5. No items are allowed in the chamber that can offgas or provide a fuel.
6. The chamber atmosphere is continuously monitored for high oxygen concentrations and an alarm sounds if levels are high.
7. Systems are designed to have gas storage and compressors sized large enough that when oxygen levels are high, ventilation can be provided to reduce the high oxygen levels in the chamber.
8. BIBs systems are "dumped" to the exterior and not "dumped" in the chamber.
9. Oxygen systems are grounded and provided with butt welded piping systems.
10. External lighting sources provided.
11. All internal/external wiring in rigid conduit with sealed connectors.
12. Highest voltage source in chamber is 24 volts.

SUBSTANTIATION: Our position is based on the fact we have done all we can to eliminate a source (spark), gaseous fuel, or nongaseous fuel to start a fire. If there is a problem and there is a fire, it should be a local fire that is easily maintainable with the hand held hose system and not a flash fire. The US Navy has chosen 6.5 foot diameter as the maximum size not provided with a deluge system because at this size, with a handheld hose at either end and one in the outer lock, the fire hose is always within a tenders reach. Much larger than 6.5 ft diameter and it is not that easy to get to the hose and usually the number of patients is large enough to warrant a deluge system.

As is the case for all people deciding to purchase a multiplace chamber, I would have extreme problems "selling" a US Navy 6.5 ft diameter chamber if I had to provide a deluge system. The cost of a deluge system would be detrimental to the project cost. I do not feel that I am jeopardizing safety with this approach and feel confident that by providing these systems meeting items 1-12, I have eliminated the risk of a flash fire or a fire that would require a deluge system to extinguish.

I also provide a push button switch to change from oxygen to air at the control console in the event that the hand held hose system is activated.

If this philosophy was adopted by NFPA and in turn PVHO, multiplace chambers would become more attractive to potential customers. I have always had a problem with requiring the smaller multiplace chamber with these enormous fire systems (both hand held and deluge) and yet a monoplace, using 100 percent oxygen as its internal media, having neither a hand held hose or a deluge system.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: The proposal did not contain a specific recommendation. The committee feels that the procedures described, while essential, are not sufficient to warrant deletion of the deluge capability.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 15

NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #278)

Committee: HEA-HYP

99- 384 - (19-2.5.1.1): Accept in Principle

SUBMITTER: William C. Gearhart, University of Pennsylvania, Institute for Environmental Medicine

RECOMMENDATION: Revise text as follows:

"A fire suppression system consisting of an independently supplied and operating handline and ~~deluge system~~ deluge type water spray system shall be installed in all Class A chambers."

SUBSTANTIATION: Encourage consistent and appropriate language associated with fixed fire suppression systems (i.e., NFPA 15; NFPA 25, 1-5 Definitions, 25-12; NFPA Handbook).

NOTE: Supporting material is available for review at NFPA Headquarters.

COMMITTEE ACTION: Accept in Principle.

Add the word "system" following the word "handline." Revise text as follows:

"A fire suppression system consisting of an independently supplied and operating handline system and deluge type water spray system shall be installed in all Class A chambers.

COMMITTEE STATEMENT: Clarify that there are two separate systems.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 15

NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #121)

Committee: HEA-HYP

99- 385 - (19-2.5.1.1, 19-2.5.1.2,19-2.5.3.4):

TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee for reconsideration. For Committee Statement No. 2, address the substantiation made by the submitter.

SUBMITTER: Stephen D. Reimers, Larry Wischhoefer, Reimers Systems, Inc.

RECOMMENDATION: (1) Revise 19-2.5.1.1 to read:

"A fire suppression system consisting of ~~an~~ independently supplied and operating handline and deluge ~~system~~ systems shall be installed in all Class A chambers."

(2) Revise 19-2.5.1.2 to read:

"Design of the fire suppression system shall be such that failure of components or water supply in either the handline system or deluge system will not render the other system inoperative. The handline and deluge systems shall be permitted to be supplied from a common water source only if one or both of them contains a holding tank of sufficient size to meet the requirement of this standard without refilling."

(3) Revise last sentence of 19-2.5.3.4 to read:

"The system shall be capable of supplying a minimum of 5 gpm (18.8 L/min) simultaneously to each of any two of the handlines at the maximum chamber pressure for a period of not less than four minutes."

SUBSTANTIATION: Experience has shown that the current wording has not been effective in achieving the system independence intended by the Code; there have been several system installations where the failure of the water supply will render both the deluge and handlines inoperable. The proposed changes will clarify to the designers and, most importantly, to the enforcement authorities the basic design criteria.

(1) The new wording is intended to clarify the intent.

(2) The water supply is as important as the components in the independence and operation of the handline and deluge systems.

(3) A minimum flow duration is needed to size a water holding tank, if one is used in the design of the handline system.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: 1. Proposed revisions to 19-2.5.1.1 are addressed by the Committee Action in Proposal 99-384 (Log #278).

2. Proposed revisions to 19-2.5.1.2 and 19-2.5.3.4 are not considered necessary.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 15

NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #19)
Committee: HEA-HYP

99- 386 - (19-2.5.1.1, Exception Nos. 1 and 2 (New)): Reject
SUBMITTER: Western Regional Fire Code Dev. Committee
RECOMMENDATION: Revise to read:
19-2.5.1.1 A fire suppression system consisting of an independently supplied and operating handline and deluge system shall be installed in all Class A chambers.
Exception No. 1:* Free-standing, dedicated buildings containing only a Class A chamber(s) and ancillary service equipment.
Exception No. 2: Chambers not contiguous to a health care facility, and either located in a mobile, vehicle-mounted facility or not permanently affixed to a foundation.
SUBSTANTIATION: The additional text provides consistency with 19-2.1.1 which has similar wording. It is almost impossible to provide a trailer with an independent handlines and deluge system. The proposed wording better clarifies the intent of this section.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Section 19-2.5. refers to fire suppression systems inside Class A chambers, not to the fire suppression requirements for the room housing the chamber.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #122)
Committee: HEA-HYP

99- 387 - (19-2.5.1.7 (New)): Accept in Principle in Part
SUBMITTER: Stephen D. Reimers, Larry Wischhoefer, Reimers Systems, Inc.
RECOMMENDATION: Add a new paragraph:
19-2.5.1.7 Water Supply.
(a) The fire suppression system shall be permitted to be supplied from the local potable water service provided it has sufficient pressure and flow capacity.
(b) If the fire suppression system is supplied from the local fire main service, provision shall be made by filtering or other means to prevent fouling of the system controls by dirty water and to prevent the discharge of dirty water into the chamber.
SUBSTANTIATION: We need to provide in the Code explicit permission to use the local potable water service as the water source for the fire suppression system. Systems are also appearing that use the building fire main water at mains pressure for the fire suppression system. Building fire main water is notorious for being very dirty. The wisdom of discharging large quantities of such water onto patients, some of whom may have open wounds, in a confined space needs to be discussed.
COMMITTEE ACTION: Accept in Principle in Part.
Revise to read:
19-2.5.1.7 ~~Water Supply.~~
~~(a)~~ The fire suppression system shall be permitted to be supplied from the local potable water service. ~~provided it has sufficient pressure and flow capacity.~~
~~(b) If the fire suppression system is supplied from the local fire main service, provision shall be made by filtering or other means to prevent fouling of the system controls by dirty water and to prevent the discharge of dirty water into the chamber.~~
COMMITTEE STATEMENT: (1) The pressure and flow capacity is defined elsewhere in Chapter 19.
(2) The connection to local fire main service is defined in NFPA 13.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #276)
Committee: HEA-HYP

99- 388 - (19-2.5.2.2): Accept
SUBMITTER: William C. Gearhart, University of Pennsylvania, Institute for Environmental Medicine
RECOMMENDATION: Revise text as follows:
"Water shall be delivered from the ~~sprinkler heads~~ fixed discharge nozzles as specified in 19-2.5.2.4 within 3 seconds of activation of any affiliated deluge control."
SUBSTANTIATION: Encourage consistent and appropriate language associated with fixed fire suppression systems. (NFPA 15; NFPA 25, 1-5 Definitions, 25-12; NFPA Handbook.)
NOTE: Supporting material is available for review at NFPA Headquarters.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #277)
Committee: HEA-HYP

99- 389 - (19-2.5.2.3): Accept in Principle
SUBMITTER: William C. Gearhart, University of Pennsylvania, Institute for Environmental Medicine
RECOMMENDATION: Revise text as follows:
"The number and positioning of ~~sprinkler heads~~ fixed discharge nozzles shall be sufficient to provide reasonably uniform spray coverage with vertical and horizontal (or near horizontal) jets."
SUBSTANTIATION: Encourage consistent and appropriate language associated with fixed fire suppression systems. (NFPA 15, NFPA Handbook.)
NOTE: Supporting material is available for review at NFPA Headquarters.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Proposal 99-369 (Log #CP507).
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #275)
Committee: HEA-HYP

99- 390 - (19-2.5.2.5):
TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee for reconsideration. The subject is within the scope of the Technical Committee. Cite the other NFPA documents.
SUBMITTER: William C. Gearhart, University of Pennsylvania, Institute for Environmental Medicine
RECOMMENDATION: Add the following text:
"When an inspection, test, or maintenance procedure of the fire suppression system results in the system being placed "OUT OF SERVICE," a protocol should be followed which notifies appropriate personnel and agencies of the planned or emergency IMPAIRMENT. A sign indicating the fire suppression system is "OUT OF SERVICE" should be conspicuously placed on the operating console until the fire suppression system is restored to service."
SUBSTANTIATION: To ensure proper notification and labeling procedures are prepared and implemented with respect to planned and emergency impairments of the fire suppression system.
NOTE: Supporting material is available for review at NFPA Headquarters.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Outside of the scope, and addressed within other NFPA documents
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #280)
Committee: HEA-HYP

99- 391 - (19-2.5.3.4):
TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee for reconsideration. The Committee Statement should qualify their action since they believe that there is no specific substantiation that there is a problem.
SUBMITTER: William C. Gearhart, University of Pennsylvania, Institute for Environmental Medicine
RECOMMENDATION: Revise text as follows:
"The water supply for the handline system shall be designed to ensure a 50 psi (345 kPa) ~~minimum water pressure~~ residual nozzle pressure above the maximum chamber operating design pressure."

SUBSTANTIATION: To create a quantitative benchmark consistent with the fire protection industry's approach to handline nozzle operating pressure requirements.
NOTE: Supporting material is available for review at NFPA Headquarters.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The existing text is acceptable.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #274)
Committee: HEA-HYP

99- 392 - (19-2.5.5): Accept in Principle
SUBMITTER: William C. Gearhart, University of Pennsylvania, Institute for Environmental Medicine
RECOMMENDATION: Revise text as follows:
"The deluge and handline systems shall be functionally tested at least ~~annually~~ quarterly per 19-2.5.2.4 for deluge systems and... Following the test, all valves should be placed in their baseline position."
Appendix A: "The primary focus for the "quarterly" test of a water based extinguishing system is to ensure water flow through the system; i.e., inspector's test. Other vitally important benefits are the activation of water flow devices, alarm appliances, notification and annunciator systems."
SUBSTANTIATION: 1) To be consistent with NFPA 25, Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems schedules.
2) To improve and ensure the reliability of hyperbaric fire suppression systems and their companion alarm devices and appliances.
NOTE: Supporting material is available for review at NFPA Headquarters.
COMMITTEE ACTION: Accept in Principle.
Modify by replacing "quarterly" with "semiannually". Text will read as follows:
"The deluge and handline systems shall be functionally tested at least semiannually per 19-2.5.2.4 for deluge systems and... Following the test, all valves should be placed in their baseline position."
Appendix A: The primary focus for the "quarterly" test of a water based extinguishing system is to ensure water flow through the system; i.e., inspector's test. Other vitally important benefits are the activation of water flow devices, alarm appliances, notification and annunciator systems.
COMMITTEE STATEMENT: Semi-annual testing has been found to be sufficient.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
NOT RETURNED: 4 Dornette, Foreman, Leland, Martin, Wood
EXPLANATION OF NEGATIVE:
MILLS: I do not agree with increasing frequencies without supportive documentation.
SALAMONE: I don't agree with the change to increase frequency due to a lack of data to substantiate this change.

(Log #314)
Committee: HEA-HYP

99- 393 - (19-2.7.3(c)): Accept
SUBMITTER: Kevin I. Posey, International ATMO Inc.
RECOMMENDATION: Move Paragraph 19-2.7.3(c) to two new Paragraphs 19-2.5.1.7 and 19-2.6.1.
SUBSTANTIATION: This paragraph is out of place at its current location and would improve the organization and readability of the document if moved under the above mentioned paragraphs. I believe this concept is more general in nature and therefore belongs under these paragraphs.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #315)
Committee: HEA-HYP

99- 394 - (19-2.7.3.4): Accept
SUBMITTER: Kevin I. Posey, International ATMO Inc.
RECOMMENDATION: Add the following:
"19-2.7.3.4 Flexible Electrical Cords. [BOLD] Flexible ... Article 501-11."
SUBSTANTIATION: From a user's viewpoint, I have often scanned through NFPA 99, Chapter 19, looking for a specific piece of information. Many paragraphs have bold text giving the reader easy identification of the material contained in the paragraph. Other paragraphs are misleading inasmuch as the bold lettering of the paragraph above would lead one to think that the subsequent paragraphs contain information on that subject when it does not. I believe this change would improve readability for the user. The addition of the bold lettering would quickly identify the paragraph.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #316)
Committee: HEA-HYP

99- 395 - (19-2.7.3.8): Accept
SUBMITTER: Kevin I. Posey, International ATMO Inc.
RECOMMENDATION: Move Paragraph 19-2.7.3.8 to Paragraph 19-2.7.3(c).
SUBSTANTIATION: This paragraph is out of place at its current location and would improve the organization and readability of the document if moved under Paragraph 19-2.7.3. I believe this concept is more general in nature and therefore belongs under this paragraph.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #317)
Committee: HEA-HYP

99- 396 - (19-2.7.3.9): Accept
SUBMITTER: Kevin I. Posey, International ATMO Inc.
RECOMMENDATION: Add the following:
"19-2.7.3.9 Motors. [BOLD] Motors ... (3)."
SUBSTANTIATION: From a user's viewpoint, I have often scanned through NFPA 99, Chapter 19, looking for a specific piece of information. Many paragraphs have bold text giving the reader easy identification of the material contained in the paragraph. Other paragraphs are misleading inasmuch as the bold lettering of the paragraph above would lead one to think that the subsequent paragraphs contain information on that subject when it does not. I believe this change would improve readability for the user. The addition of the bold lettering would quickly identify the paragraph.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #318)
Committee: HEA-HYP

99- 397 - (19-2.8.3): Accept
SUBMITTER: Kevin I. Posey, International ATMO Inc.
RECOMMENDATION: Move Paragraph 19-2.8.3 to new Paragraph 19-2.5.4.6 and change as indicated below:
"Automatic fire detection equipment, when used, shall meet the applicable requirements in 19-2.7.3~~.~~ ~~and 19-2.5.4.~~"
SUBSTANTIATION: This paragraph is out of place at its current location and would improve the organization of the document if moved under Paragraph 19-2.5.4.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #217)
Committee: HEA-HYP

99- 398 - (19-3.1.3.2): Accept in Principle
SUBMITTER: W. T. Workman, Workman Hyperbaric Services, Inc.
RECOMMENDATION: Revise to read as follows:
"Each hyperbaric facility ~~A~~ shall designate a safety director ~~shall be designated~~ to be in charge of all hyperbaric equipment and overall facility safety."
SUBSTANTIATION: There are a growing number of contract service providers that have designated a corporate level safety director to oversee a corporate wide safety program failing to designate a local safety director for each hyperbaric program location. The intent is for each individual hperbaric facility to have a designated safety director responsible for a comprehensive hyperbaric facility safety program.
COMMITTEE ACTION: Accept in Principle.
Revise to read:
"Each hyperbaric facility shall designate an onsite hyperbaric safety director to be in charge of all hyperbaric equipment and the operational safety requirements of this chapter."
COMMITTEE STATEMENT: To clarify the intent that each facility should have an onsite hyperbaric safety director.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 13
NEGATIVE: 2
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood
EXPLANATION OF NEGATIVE:
MILLS: I do not agree with the committee action because the original recommendation included language that provided a facility safety officer who is also responsible for safe operation of hyperbaric equipment.
SALAMONE: I don't agree with the committee action because the original recommendation included language that provided a facility safety officer who is also responsible for safe operation of hyperbaric equipment.

(Log #218)
Committee: HEA-HYP

99- 399 - (19-3.1.4.6): Accept
SUBMITTER: W. T. Workman, Workman Hyperbaric Services, Inc.
RECOMMENDATION: Revise to read as follows:
"Emergency procedues and fire training drills shall be ~~carried out at regular intervals~~ conducted at least annually and documented by the safety director."
SUBSTANTIATION: 19-3.1.4.4 requires that hyperbaric personnel become familiar with established emergency procedures but does not specify how. Also, the frequency of "regular intervals" is open to wide interpetation and is difficult to measure. Establishing an annual requirement is measurable and helps focus department personnel on the issue of emergency procedures and fire safety.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #319)
Committee: HEA-HYP

99- 400 - (19-3.1.5.5):
TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee for reconsideration. The Committee Statement should cite specific paragraphs.
SUBMITTER: Kevin I. Posey, International ATMO Inc.
RECOMMENDATION: Move Paragraph 19-3.1.5.5 to Paragraph 19-3.1.5.3(e) and change as follows:
"All chamber personnel in Class A chambers shall wear either garments of the overall or jumpsuit type, completely covering all skin areas possible, and as tightfitting as possible, or hospital scrubs made of an anti-static blend or scrubs approved for use in hospital operating rooms."
SUBSTANTIATION: Moving the paragraph under Paragraph 19-3.1.5.3, Personnel, would improve organization and readability. The use of tightfitting, jumpsuit type garments is not practical in a patient care environment where scrubs are the standard of care.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: There is sufficient wording elsewhere in Chapter 19.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #320)
Committee: HEA-HYP

99- 401 - (19-3.1.5.6): Reject
SUBMITTER: Kevin I. Posey, International ATMO Inc.
RECOMMENDATION: Move Paragraph 19-3.1.5.6 to Paragraph 19-3.1.5.3(f).
SUBSTANTIATION: This paragraph would be better located under Paragraph 19-3.1.5.3, Personnel, as it pertains to items used or worn by tenders and patients [similar to Paragraph 19-3.1.5.3(d)].
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Current location is adequate. Paragraph will be changed to conform to Manual of Style requirements.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #321)
Committee: HEA-HYP

99- 402 - (19-3.2): Reject
SUBMITTER: Kevin I. Posey, International ATMO Inc.
RECOMMENDATION: Incorporate the contents of Paragraph 19-3.2, Equipment, through Paragraph 19-3.2.5 into Paragraph 19-2.7.3, Wiring and Equipment Inside Chambers.
SUBSTANTIATION: These paragraphs have similar material and the same word (Equipment) in each paragraph title. The organization of the document would improve by combining the contents of these sections.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Current paragraph structure is adequate.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #322)
Committee: HEA-HYP

99- 403 - (19-3.6.1.2): Accept
SUBMITTER: Kevin I. Posey, International ATMO Inc.
RECOMMENDATION: Delete the following text:
~~19-3.6.1.2 Textiles. Textiles used or worn in the hyperbaric chamber shall conform to 19-3.1.5.4 through 19-3.1.5.7.~~
SUBSTANTIATION: This paragraph is redundant with the paragraphs it references and therefore should be deleted entirely.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 15
NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #279)
Committee: HEA-HYP

99- 404 - (19-3.6.4):

TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee for reconsideration. The Committee Statement needs to cite specific paragraphs.

SUBMITTER: William C. Gearhart, University of Pennsylvania, Institute for Environmental Medicine

RECOMMENDATION: Revise text as follows:

"Electrical switches, valves, and electrical monitoring equipment associated with fire detection and ~~extinguishment~~ suppression systems shall be ~~visually inspected~~ verified operational before each chamber pressurization. Automatic fire detection equipment shall be tested each week and functionally tested quarterly (by-pass test), including discharge of ~~extinguishing~~ suppression media, conducted annually. Automatic fire detection equipment testing shall include activation of trouble circuits and signals."

SUBSTANTIATION: To replace "weak" wording with strong, direction oriented text.

To encourage consistent and appropriate language associated with fire suppression and fire detection systems.

NOTE: Supporting material is available for review at NFPA Headquarters.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: Operational is a maintenance function already covered elsewhere in chapter 19, and term operational is vague.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 20

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 15

NOT RETURNED: 5 Dornette, Foreman, Leland, Martin, Wood

(Log #203)
Committee: HEA-PIP

99- 405 - (21-1.2.1): Accept

SUBMITTER: Thomas J. Mraulak, American Society of Sanitary Engineering

RECOMMENDATION: Add:

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

SUBSTANTIATION: If one or both of my changes dealing with the 6000 Series Standard are accepted we need to add the reference.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #209)
Committee: HEA-PIP

99- 406 - (21-1.2.6): Accept in Principle

SUBMITTER: Richard E. Hoffman, Compressed Gas Association

RECOMMENDATION: Replace list of CGA publications with the following:

C-4 American National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained, 1990.
C-9 Standard Color Marking of Compressed Gas Containers Intended for Medical Use, 1988.
G-4 Oxygen, 1996
G-4.1 Cleaning Equipment for Oxygen Service, 1996.
G-7.1 Commodity Specification for Air, 1997.
G-8.1 Standard for Nitrous Oxide Systems at Consumer Sites, 1990.
G-10.1 Commodity Specification for Nitrogen, 1997.
P-2 Characteristics and Safe Handling of Medical Gases, 1996.
P-2.5 Transfilling of High Pressure Gaseous Oxygen to be Used for Respiration, 2000.
P-2.6 Transfilling of Liquid Oxygen to be Used for Respiration, 1995.
P-2.7 Guide for the Safe Storage, Handling and Use of Portable Liquid Oxygen Systems in Health Care Facilities (to be published 2000).
P-9 The Inert Gases: Argon, Nitrogen and Helium, 1992.
V-1 American National/Compressed Gas Association Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections, 1994.
V-5 Diameter Index Safety Systems (to be published in 2000).
E-10 Maintenance of Medical Gas and Vacuum Systems in Health-Care Facilities, 1997.

SUBSTANTIATION: List needs to be updated.

COMMITTEE ACTION: Accept in Principle.

Delete C-4 and add a reference to C-7, Guide to the Preparation for Cautionary Labeling and Marking for Compressed Gas Containers, 2000 edition.

Change the reference in section 4-3.1.1.1(b) from C-4 to C-7.

COMMITTEE STATEMENT: C-4 was incorporated into C-7.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NOT RETURNED: 1 Bancroft

(Log #209a)
Committee: HEA-GAS

99- 407 - (21-1.2.6): Accept in Principle

SUBMITTER: Richard E. Hoffman, Compressed Gas Association

RECOMMENDATION: Replace list of CGA publications with the following:

C-4 American National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained, 1990.
C-9 Standard Color Marking of Compressed Gas Containers Intended for Medical Use, 1988.
G-4 Oxygen, 1996
G-4.1 Cleaning Equipment for Oxygen Service, 1996.
G-7.1 Commodity Specification for Air, 1997.
G-8.1 Standard for Nitrous Oxide Systems at Consumer Sites, 1990.
G-10.1 Commodity Specification for Nitrogen, 1997.
P-2 Characteristics and Safe Handling of Medical Gases, 1996.
P-2.5 Transfilling of High Pressure Gaseous Oxygen to be Used for Respiration, 2000.
P-2.6 Transfilling of Liquid Oxygen to be Used for Respiration, 1995.
P-2.7 Guide for the Safe Storage, Handling and Use of Portable Liquid Oxygen Systems in Health Care Facilities (to be published 2000).
P-9 The Inert Gases: Argon, Nitrogen and Helium, 1992.
V-1 American National/Compressed Gas Association Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections, 1994.
V-5 Diameter Index Safety Systems (to be published in 2000).
E-10 Maintenance of Medical Gas and Vacuum Systems in Health-Care Facilities, 1997.

SUBSTANTIATION: List needs to be updated.

COMMITTEE ACTION: Accept in Principle.

Update references as noted and applicable to Chapter 8, changing C-4 to C-7 in the list of publications and in paragraph 8-6.4.1.6.

COMMITTEE STATEMENT: The citation for C-4 has changed since receipt of Log #209a, and not all documents are germane to the scope of this committee.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 11

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 8

NOT RETURNED: 3 Bancroft, Mills, Swope

(Log #CP5)
Committee: HEA-ADM

99- 408 - (A-2-2): Accept

TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee for a more expansive substantiation and definitive action, or update the appendix information.

SUBMITTER: Technical Committee on Administration

RECOMMENDATION: Delete A-2-2 "Governing Body".

SUBSTANTIATION: This material is outdated.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 6

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 4

NEGATIVE: 1

NOT RETURNED: 1 McPeck

EXPLANATION OF NEGATIVE:
BULOW: Removing the term "Governing Body" may be appropriate for the reason given by the committee, however the term "Senior Management" is used in 11-4.2 and has no definition. I propose that the definition found in Section 2-2 of the 1999 edition of NFPA 99, "Governing Body" be titled to "Senior Management" using the existing text as follows:
Senior Management. The person or persons who have the overall legal responsibility for the operation of the health care facility.

(Log #CP611)
Committee: HEA-LAB

99- 409 - (A-10-7.2.5): Accept
SUBMITTER: Technical Committee on Laboratories
RECOMMENDATION: Delete "Do Not Smoke" from "... A warning sign such as the one indicated here should be posted on every box.

DANGER
NOT EXPLOSIONPROOF
NOT VENTILATED
GROUND ALL ELECTRICAL EQUIPMENT
DO NOT STORE DRY ICE
~~DO NOT SMOKE~~"

SUBSTANTIATION: Smoking in working areas in health care facilities is not permitted by other regulatory agencies.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 7
NOT RETURNED: 2 Nickasch, Simmons

(Log #204)
Committee: HEA-HCE

99- 410 - (A-11-4.3): Reject
SUBMITTER: Steve Ennis, The Reciprocal Group
RECOMMENDATION: Revise text as follows and change Figure A-11-4.3:
A policy group may be constituted to provide decisions related to items or incident decisions outside the scope of authority of the facility management team. This group may

SUBSTANTIATION: Changes needed to reflect the widely used "unified command concept."
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Existing wording reflects current practices and principles.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 4 Kitchin, McPeck, Sinsigalli, Woodfin

(Log #205)
Committee: HEA-HCE

99- 411 - (A-11-5.3.2):
TCC NOTE: It was the action of the Technical Correlating Committee that this proposal be returned to committee for an insufficient committee statement. Identify the other regulatory agencies or standards.
SUBMITTER: Steve Ennis, The Reciprocal Group
RECOMMENDATION: Add after "attachment of portable emergency utility modules": Also, the installation and maintenance of redundant and backup systems will be critical. (Note, many of these are required.)
SUBSTANTIATION: Currently, no mention is made to redundant or backup systems in the standard.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The material suggested by the proposal has been covered by other regulatory agencies or standards.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 4 Kitchin, McPeck, Sinsigalli, Woodfin

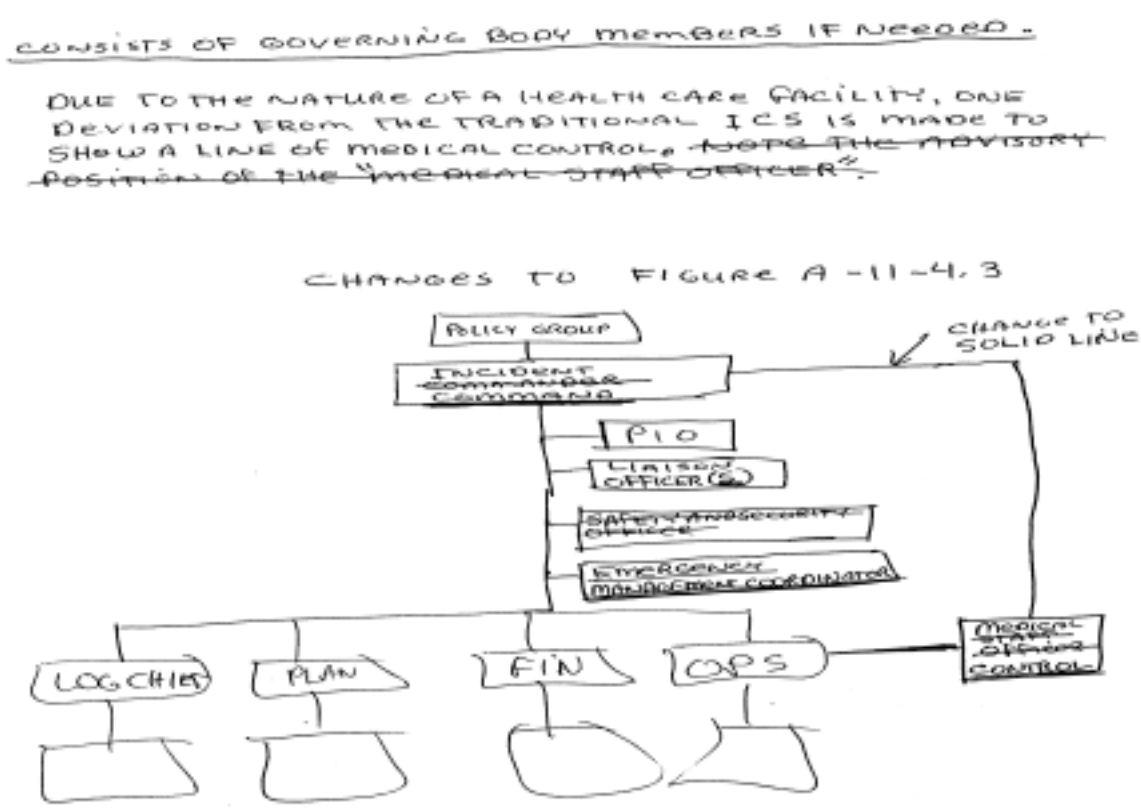


Figure A-11-4.3

(Log #CP404)
Committee: HEA-HCE

99- 412 - (A-11-5.3.6(d) (New)): Accept
SUBMITTER: Technical Committee on Health Care Emergency Preparedness and Disaster Planning
RECOMMENDATION: Create a new paragraph (d) to reflect the information deleted from 11-5.3.6, and incorporate other elements essential to a security management plan. Text will read as follows:
A-11-5.3.6(d) Other Consideration.
(1) Notification protocols
(2) Response criteria
(3) Maintaining sensitive areas security
(4) Safeguarding property/equipment
(5) Backup communication
(6) Monitoring critical security systems
(7) Alternate site security
(8) Security to/from evacuated/alternate sites
(9) Security at evacuated facilities.
SUBSTANTIATION: The considerations are consistent with the primary elements solicited in the development of a JCAHO security management plan (EC1.4) and security's role and responsibilities in a health care related emergency or disaster.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 4 Kitchin, McPeck, Sinsigalli, Woodfin

(Log #CP712)
Committee: HEA-PIP

99- 413 - (C-4 through C-4.8): Accept
SUBMITTER: Technical Committee on Piping Systems
RECOMMENDATION: Remove all of C-4 through C-4.8 including all the tables and charts.
SUBSTANTIATION: This information is over 20 years old and contains many inaccuracies. Some of the information is over 36 years old. As an instance , the lead and lag vacuum settings are too low for today's machinery. There are many technical documents used by professional designers that hav much more up to date information and are relied upon.
Although a notation at the beginning of this section indicates that is not been updated since it's initial publication in 1980, it is still used in many cases. We need to take this information out of NFPA 99.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #CP711)
Committee: HEA-PIP

99- 414 - (C-4-3): Accept
SUBMITTER: Technical Committee on Piping Systems
RECOMMENDATION: Delete entire C-4.3.
SUBSTANTIATION: This information is over 20 years old and contains many inaccuracies. Some of the information is over 36 years old. As an instance , the lead and lag vacuum settings are too low for today's machinery. There are many technical documents used by professional designers that hav much more up to date information and are relied upon.
Although a notation at the beginning of this section indicates that is not been updated since it's initial publication in 1980, it is still used in many cases. We need to take this information out of NFPA 99.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #6)
Committee: HEA-PIP

99- 415 - (C-4-3.3 Example 3): Accept
SUBMITTER: Craig B. Williams, Hill-Rom
RECOMMENDATION: Revise text:

	Start	Stop
Lead Switch	16 in. Hg Vac	19 in. Hg Vac
Lag Switch	15 in. Hg Vac	18 in. Hg Vac

SUBSTANTIATION: Obvious misprint in handbook.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #123)
Committee: HEA-PIP

99- 416 - (Table C-4-3.4 and C-4-8): Reject
TCC NOTE: The Technical Correlating Committee directs the Committee to review the Committee Statement as the Committee Statement does not address the submitter's substantiation.
SUBMITTER: Burton R. Klein, Burton Klein Associates
RECOMMENDATION: Retain Table C-4.3.4, but under "Minimum Number of Station Inlets" add "See Table C-4.8." Delete recommended number of inlets in column.
SUBSTANTIATION: Table C-4.8 lists the recommended number of vacuum inlets at various locations. Document should have only one set of recommended values.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: See Committee Proposal 99-20 (Log #CP710) which reads as follows:
Add definitions as follows:
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 [gauge pressure <160 psi(1100kPa)] to power devices (e.g., hand pieces, syringes, cleaning devices) as a power source.
Gas Powered System. A Level 3 gas distribution system comprised of component parts, including, but not limited to, cylinders, manifolds, air compressor, motor, receiver, controls, filters, dryers, valves, and piping, that delivers compressed air [gauge pressure <160 psi(1100kPa)] to power devices (e.g., hand pieces, syringes, cleaning devices) as a power source.
Level 1 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS would place patients in imminent danger of morbidity or mortality.
Level 2 Medical Piped Gas and Vacuum Systems. Systems serving occupancies where interruption of the MPGVS system would place patients at manageable risk of morbidity or mortality.
Level 3 Piped Gas Systems. Systems serving occupancies where interruption of the PGS would terminate procedures but would not place patients at risk of morbidity or mortality.
Level 3 Vacuum System. A Level 3 vacuum distribution system that can be either a wet system, designed to remove liquids, air/gas or solids from the treated area, or a dry system designed to trap liquids and solids before the service inlet and to accommodate air-gas only through the service inlet.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 23
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NOT RETURNED: 1 Bancroft

(Log #CP402)
Committee: HEA-HCE

99- 417 - (C-11-1): Accept
SUBMITTER: Technical Committee on Health Care Emergency Preparedness and Disaster Planning
RECOMMENDATION: Replace "disaster control center" at the end of the first sentence with "Emergency Operations Center (EOC)". Text will read:
"...for example, operation of the ~~disaster control center.~~ Emergency Operations Center (EOC)."
SUBSTANTIATION: To be consistent with ICS terminology.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 18
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 14
NOT RETURNED: 4 Kitchin, McPeck, Sinsigalli, Woodfin
