

American Society of Sanitary Engineering

Professional Qualifications Standard for

Medical Gas Systems Personnel

- **Medical Gas Systems Specialists**
- **Medical Gas Systems Installers**
- **Bulk Medical Gas Systems Installers**
- **Medical Gas Systems Inspectors**
- **Medical Gas Systems Verifiers**
- **Medical Gas Systems Maintenance Personnel**
- **Medical Gas Systems Instructors**
- **Bulk Medical Gas Systems Instructors**

An American National Standard

This is a preview of "ASSE/IAPMO/ANSI Seri...". [Click here to purchase the full version from the ANSI store.](#)

TABLE OF CONTENTS

Professional Qualifications Standards for Medical Gas Systems Personnel

General Information	v	10-2.4 System and System Component Testing Knowledge.....	8
Foreword	vii	10-2.5 Documenting and Recording	8
ASSE Professional Qualifications Standards Committee (2005-06)	viii	10-3.1 Terminology	9
Series 6000 Working Group	ix	10-3.2 Certification of Medical Gas Installers	9
Standard #6001	1	Standard #6015	11
<i>Listed Standards and Terminology in ASSE Series 6000 Professional Qualifications Standards</i>		<i>Bulk Medical Gas Systems Installers</i>	
1-1.1 Reference and Industry Standards	1	15-1.1 Scope	11
1-1.2 Terminology	2	15-1.2 Purpose	11
Standard #6005	5	15-1.3 Limitations for a Bulk System Installer.....	11
<i>Medical Gas Systems General Information</i>		15-1.4 Reference and Industry Standards	11
5-1.1 Scope	5	15-2.1 General Knowledge.....	11
5-1.2 Purpose	5	15-2.2 Product Performance Knowledge	12
5-1.3 Limitations	5	15-2.3 Product Installation Knowledge.....	12
5-1.4 Reference and Industry Standards	5	15-2.4 System and System Component Testing Knowledge.....	12
5-2.1 General Knowledge.....	5	15-2.5 Documenting and Recording	12
5-2.2 Product Performance Knowledge	5	15-3.1 Terminology	13
5-2.3 Product Installation Knowledge	6	15-3.2 Qualification of Bulk System Installers	13
5-2.4 System and System Component Testing Knowledge.....	6	Standard #6020	15
5-2.5 Documenting and Recording of Inspections and Tests Knowledge.....	6	<i>Medical Gas Systems Inspectors</i>	
5-3.1 Terminology	6	20-1.1 Scope	15
5-4.1 Certification	6	20-1.2 Purpose	15
Standard #6010	7	20-1.3 Limitations for a Medical Gas Systems Inspector... 15	
<i>Medical Gas Systems Installers</i>		20-1.4 Reference and Industry Standards	15
10-1.1 Scope	7	20-2.1 General Knowledge.....	15
10-1.2 Purpose	7	20-2.2 Product Performance Knowledge	15
10-1.3 Limitations For a Medical Gas Systems Installer..... 7		20-2.3 Product Installation Knowledge	16
10-1.4 Reference and Industry Standards	7	20-2.4 System and System Component Testing Knowledge.....	16
10-2.1 General Knowledge.....	7	20-2.5 Documenting and Recording of Inspections and Tests Knowledge.....	16
10-2.2 Product Performance Knowledge	7	20-3.1 Terminology	16
10-2.3 Product Installation Knowledge	8	20-4.1 Certification of Medical Gas Inspectors.....	16
		Standard #6030	17
		<i>Medical Gas Systems Verifiers</i>	
		30-1.1 Scope	17
		30-1.2 Purpose	17

C.12	Verification of Piping Purity.....	46	J.2	Before Shutdown Date	69
C.13	Verification of Final Tie-ins to Existing Systems....	46	J.3	During Shutdown and System Backfeeding	70
C.14	Verification of System Operational Pressure and Vacuum.....	47	J.4	After Shutdown and Backfeed.....	71
C.15	Verification of Medical Gas Concentration	47	J.5	Recommended Equipment List.....	71
Table 1	Required Concentrations of Medical Gases.....	48	J.6	Suggested Shutdown Notification Form	72
C.16	Verification of Medical Air Compressor Source Systems	48	Annex K	73	<i>Organizations Responsible for the Reference and Industry Standards in ASSE Standard 6001</i>
C.17	Labeling of System Components.....	49	Annex L	75	<i>Sample Shutdown Notification Form</i>
C.18	Verification of Medical Compressed Air Purity	49	Annex M	77	<i>Sample Installer Performance Testing Record Forms</i>
C.19	Verification of Medical Gas Manifold Sources.....	50	Annex N	81	<i>Guidelines for Third Party Certification Agencies</i>
C.20	Verification of Bulk Gas Supply Systems	51	N.1	Third Party Certification Agency	81
C.21	Verification of Medical Vacuum Source Equipment	51			
Annex D	53				
	<i>Maintenance Procedures for Personnel Qualified under ASSE Standard 6040</i>				
D.1	Scope	53			
D.2	Background.....	53			
D.3	Minimum Maintenance Schedule	53			
D.4	General Work Requirements.....	54			
D.5	Test Procedures.....	54			
D.6	Labeling.....	55			
D.7	Base Performance.....	55			
D.8	Tools	56			
D.9	Spare Parts List	56			
Annex E	59				
	<i>Medical Gas Training Outline for Instructors Qualified under ASSE Standard 6050</i>				
E.1	Forty (40) Hour Medical Gas Systems Instructors' Training Outline.....	59			
Annex F	61				
	<i>Medical Air Compressor Inspection Check List</i>				
F.1	Medical Air Compressor Inspection Check List.....	61			
Annex G	63				
	<i>Vacuum Pump Inspection Check List</i>				
G.1	Vacuum Pump Inspection Check List.....	63			
Annex H	65				
	<i>Manifold Inspection Check List</i>				
H.1	Manifold Inspection Check List.....	65			
Annex I	67				
	<i>Bulk Supply Inspection Check List</i>				
I.1	Bulk Supply Inspection Check List.....	67			
Annex J	69				
	<i>Recommended Guidelines for Conducting Planned Medical Gas Systems Shutdown and Temporary Backfeed</i>				
J.1	Scope	69			

GENERAL INFORMATION

Professional Qualifications Standards for Medical Gas Systems Personnel

Neither this standard, nor any portion thereof, may be reproduced without the written consent of the American Society of Sanitary Engineering.

ASSE Professional Qualifications Standards incorporate requirements for education, training and general knowledge. No person may be certified to an ASSE Professional Standard unless they have met all of the requirements contained within the applicable standard, and is certified by a recognized third party certification agency.

Organizations wishing to adopt or list any ASSE Professional Qualifications Standard should print the ASSE standard number on the cover page first and in equal or larger type to that of the adopting or listing organization.

American Society of Sanitary Engineering
Westlake, Ohio
Copyright © 2006, 2004, 2001, 1997
All rights reserved.

FOREWORD

Professional Qualifications Standards for Medical Gas Systems Personnel

This foreword shall not be considered a part of the standard; however, it is offered to provide background information.

The American Society of Sanitary Engineering for Plumbing and Sanitary Research is dedicated to the preservation of public health and safety through "Prevention Rather Than Cure."

The ASSE Standards Program systematically evaluates new technologies through formal requests and addresses the development and promulgation of performance and qualification standards designed to safeguard public health and safety.

It is now a fundamental truth that the plumbing industry must know and understand medical gas and vacuum system requirements since the referencing of NFPA 99 and specific requirements for installation have been added to the model plumbing codes.

In reviewing those requirements it became apparent that there was a need to develop the Series 6000 Standards to address minimum requirements for medical gas and vacuum system installers, inspectors, verifiers, maintenance personnel and instructors. During the 2005 revision of the series, requirements for three new specialties were added – medical gas specialists, bulk system installers and bulk system instructors. While NFPA 99-2005 covers the general field of medical gas and vacuum systems, it does not specifically address requirements in these seven areas that would allow an individual to be certified as a qualified Medical Gas Systems Specialist, Medical Gas Systems Installer, Medical Gas Systems Inspector, Medical Gas Systems Verifier, Medical Gas Systems Maintenance Personnel, Medical Gas Systems Instructor, Bulk System Installer or Bulk System Instructor.

The ASSE Series 6000 Qualification Standards for Medical Gas and Vacuum System Specialists, Installers, Inspectors, Verifiers, Maintenance Personnel, and Instructors, and for Bulk System Installers and Instructors, are based on the requirements of NFPA Standard 99 - *Health*

Care Facilities, 2005 Edition, for Level 1 systems. Level 1 Medical Gas and Vacuum Systems have the highest level of requirements for health care and fire safety, and are typically found in hospitals, ambulatory care centers, and clinics. However, depending on the type of health care provided, they may also be required in medical and dental offices, nursing homes, and limited care facilities.

NFPA 99-2005 also has requirements for Level 2, and Level 3, which have less stringent requirements than those for Level 1 systems. Under certain conditions, these lower level systems are permitted in medical and dental offices, nursing homes, and limited care facilities. Users must refer to NFPA 99-2005 for these requirements. It is important, however, that individuals qualified under the ASSE Series 6000 Standards are qualified for all levels of piped medical gas and vacuum systems covered in NFPA 99-2005.

These ASSE Series 6000 Standards allow regulatory officials and states to have uniform minimum requirements for qualified Medical Gas Systems Installers, Medical Gas Systems Inspectors, Medical Gas Systems Verifiers, Medical Gas Systems Maintenance Personnel, Medical Gas Systems Instructors, Bulk System Installers and Medical Gas Systems Instructors. In addition, these standards give uniform requirements for third-party certifiers so that individuals can be qualified to install, inspect, verify, maintain or teach classes on medical gas and vacuum systems, and can be qualified to install bulk systems or be instructors on the installation of bulk systems.

The ASSE Series 6000 Standards will continue to change through revision, not only because the NFPA 99 Standards change every three years, but because the industry will respond to the experience gained in the field through the use of these standards.

This standard series was promulgated in accordance with procedures developed by the American National Standards Institute (ANSI).

STANDARDS COMMITTEE (2005-06)

Professional Qualifications Standards for Medical Gas Systems Personnel

Joseph Fugelo

*Standards Committee Chairman
The Labor Company
Philadelphia, Pennsylvania*

Rand Ackroyd

*Rand Engineering
Newburyport, Massachusetts*

Sean Cleary

*U.A. Local #524
Scranton, Pennsylvania*

Laurence T. Coleman

*Pipefitters Local Union #597 Training Fund
Chicago, Illinois*

Michael Collins

*Collins Backflow Specialists, Inc.
Palatine, Illinois*

Shannon M. Corcoran

*Standards Coordinator
American Society of Sanitary Engineering
Westlake, Ohio*

Steven Hazzard

*ASSE Staff Engineer
American Society of Sanitary Engineering
Westlake, Ohio*

Leslie Kendall

*U.A. Canada
Hamilton, Ontario, Canada*

Edward Lyczko

*Cleveland Clinic
Cleveland, Ohio*

Jerry McManus

*National ITC
Metairie, Louisiana*

Anthony Rini, III, P.E.

*Mottola-Rini Engineers, PC
New York, New York*

Carl Schroeder

*Plumbing Industry Training Center
Detroit, Michigan*

Carl R. Triphahn

*P.I.P.E. Arizona
Tempe, Arizona*

Joseph C. Zaffuto, P.E.

*ASSE Staff Engineer
American Society of Sanitary Engineering
Westlake, Ohio*

SERIES 6000 WORKING GROUP

Professional Qualifications Standards for Medical Gas Systems Personnel

Edward Lyczko

*Working Group Chairman
The Cleveland Clinic
Cleveland, Ohio*

Mark Allen

*Beacon Medaes
Charlotte, North Carolina*

Grant Anderson

*BR&A Engineers
Boston, Massachusetts*

Laurence T. Coleman - Alternate

*Pipefitters Local Union #597
Chicago, Illinois*

Shannon M. Corcoran

*American Society of Sanitary Engineering
Westlake, Ohio*

Keith Ferrari - Alternate

*Praxair
Raleigh, North Carolina*

Leroy Givens

*Florida Pipe Trades
West Palm Beach, Florida*

Steven Hazzard

*American Society of Sanitary Engineering
Westlake, Ohio*

Leslie Kendall

*U.A. Canada
Hamilton, Ontario, Canada*

Fritz Koppenberger

*Environmental Testing Services, Inc.
Houston, Texas*

Mike Massey

*National ITC
Los Angeles, California*

Gregory J. Maus

*Pipefitters Local Union #597
Chicago, Illinois*

Curtis Mezzic - Alternate

*National ITC
Metairie, Louisiana*

Daniel Miller - Alternate

*Medical Gas Technology, Inc
Charlotte, North Carolina*

Richard Miller

*Medical Gas Technology, Inc
Charlotte, North Carolina*

David Mohile

*Medical Engineering Service, Inc.
Leesburg, Virginia*

Thomas J. Mraulak

*Metropolitan Plumbing Industry Training Center
Troy, Michigan*

Gerald Phariss

*United Association Gulf Coast Regional Training Center
Pearl, Mississippi*

George Scott

*Scott Associates, LLC
South Salem, New York*

Thomas Spremo

*Medical Gas Solutions
Franklin, Wisconsin*

Robert Sutter

*B&R Compliance Associates, LLC
Lehigh Valley, Pennsylvania*

Jerry VanNorman

*Van Norman & Company
Austin, Texas*

J. Richard Wagner

*Poole & Kent Corporation
Baltimore, Maryland*

SERIES 6000 • STANDARD #6001

Listed Standards and Terminology in ASSE Series 6000 Professional Qualification Standards

1-1.1 Reference and Industry Standards

The following list of reference and industry standards is part of the requirements of ASSE Standard 6005, ASSE Standard 6010, ASSE Standard 6015, ASSE Standard 6020, ASSE Standard 6030, ASSE Standard 6040, ASSE Standard 6050, and ASSE Standard 6055. Refer to Annex K for information to contact the various standards organizations.

- | | | | |
|----------|---|----------|---|
| 1-1.1.1 | ASME Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualification, current edition. | 1-1.1.13 | AWS B2.2 Standard for Brazing Procedure and Performance Qualification, current edition. |
| 1-1.1.2 | ASSE 6005 Medical Gas Systems General Knowledge, current edition. | 1-1.1.14 | CGA C-9 Standard Color Marking of Compressed Gas Containers Intended for Medical Use, current edition. |
| 1-1.1.3 | ASSE 6010 Medical Gas Systems Installer Professional Qualifications Standard, current edition. | 1-1.1.15 | CGA E-10 Maintenance of Medical Gas and Vacuum Systems in Health Care Facilities, current edition. |
| 1-1.1.4 | ASSE 6015 Bulk System Installer Professional Qualifications Standard, current edition. | 1-1.1.16 | CGA G-4.1 Cleaning Equipment for Oxygen Service, current edition. |
| 1-1.1.5 | ASSE 6020 Medical Gas Systems Inspector Professional Qualifications Standard, current edition. | 1-1.1.17 | CGA G-10.1 Commodity Specification for Nitrogen, current edition. |
| 1-1.1.6 | ASSE 6030 Medical Gas Systems Verifier Professional Qualifications Standard, current edition. | 1-1.1.18 | CGA M-1, Guide For Medical Gas Supply Systems At Consumer Sites, current edition. |
| 1-1.1.7 | ASSE 6040 Medical Gas Systems Maintenance Personnel Professional Qualifications Standard, current edition. | 1-1.1.19 | CGA P-2 Characteristics and Safe Handling of Medical Gases, current edition. |
| 1-1.1.8 | ASSE 6050 Medical Gas Systems Instructor Professional Qualifications Standard, current edition. | 1-1.1.20 | CGA V-1 Compressed Gas Cylinder Valve Outlet and Inlet Connections, current edition. |
| 1-1.1.9 | ASSE 6055 Bulk System Instructor Professional Qualifications Standard, current edition. | 1-1.1.21 | CSA Z305.1 Nonflammable Medical Gas Piping Systems, current edition. |
| 1-1.1.10 | ASTM B32 Standard Specification for Solder Metal, current edition. | 1-1.1.22 | CSA Z305.2 Low Pressure Connecting Assemblies for Medical Gas Systems, current edition. |
| 1-1.1.11 | ASTM B819 Standard Specification for Seamless Copper Tube for Medical Gas Systems, current edition. | 1-1.1.23 | CSA Z305.3 Pressure Regulators, Gauges, and Flow Metering Devices for Medical Gas Systems, current edition. |
| 1-1.1.12 | ASTM B828 Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings, current edition. | 1-1.1.24 | CSA Z305.4 Qualification Requirements for Agencies Testing Non-Flammable Medical Gas Piping Systems, current edition. |
| | | 1-1.1.25 | CSA Z305.5 Medical Gas Terminal Units, current edition. |
| | | 1-1.1.26 | Copper Development Association Copper Tube Handbook, current edition. |
| | | 1-1.1.27 | NFPA 50 Standard for Bulk Oxygen Systems at Consumer Sites, current edition. |

1-1.1.28	NFPA 55 Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks, current edition.	1-1.2.19	Health care facility requirements
1-1.1.29	NFPA 70 National Electrical Code, current edition.	1-1.2.20	Helium, USP
1-1.1.30	NFPA 99 Standard for Health Care Facilities, 2005 edition.	1-1.2.21	In-Building Emergency Reserve
1-1.1.31	NFPA 99B Standard for Hypobaric Facilities, current edition.	1-1.2.22	Instrument air
1-1.1.32	NFPA 101 Life Safety Code, current edition.	1-1.2.23	Labeled
1-1.1.33	US Food & Drug Administration Current Good Manufacturing Practices, Title 21 of the CFR Parts 210 and 211.	1-1.2.24	Level 1 medical gas and Level 1 medical/surgical vacuum system
NOTE:	All questions related to applicability shall be directed to the Authority Having Jurisdiction (AHJ).	1-1.2.25	Level 2 medical gas and Level 2 medical/surgical vacuum system
		1-1.2.26	Level 3 medical gas and Level 3 vacuum system
		1-1.2.27	Level 3 gas powered devices supply system
		1-1.2.28	Limited care facility requirements
		1-1.2.29	Listed
		1-1.2.30	Local jurisdiction
		1-1.2.31	Manifold
		1-1.2.32	Manufactured assemblies
		1-1.2.33	Medical air, USP (cylinders)
		1-1.2.34	Medical air, USP (compressed)
		1-1.2.35	Medical gas and vacuum systems
		1-1.2.36	Medical Gas Systems Installer
		1-1.2.37	Medical Gas Bulk System Installer
		1-1.2.38	Medical Gas Systems Inspector
		1-1.2.39	Medical Gas Systems Verifier
		1-1.2.40	Medical Gas Systems Maintenance Personnel
		1-1.2.41	Medical Gas Systems Instructor
		1-1.2.42	Medical Gas Bulk System Instructor
		1-1.2.43	Medical support gases
		1-1.2.44	Nitrogen, (NF)
		1-1.2.45	Nitrogen Purge Gas Source Alarm
		1-1.2.46	Nitrous oxide, USP
		1-1.2.47	Nonflammable
		1-1.2.48	Nursing home requirements
		1-1.2.49	Other health care facility requirements
		1-1.2.50	Oxygen, USP
		1-1.2.51	Particulate contaminants
		1-1.2.52	Patient medical gases

1-1.2 Terminology

The following list of terms is part of the requirements of ASSE Standard 6005, ASSE Standard 6010, ASSE Standard 6015, ASSE Standard 6020, ASSE Standard 6030, ASSE Standard 6040, ASSE Standard 6050, and ASSE Standard 6055.

1-1.2.1	Acceptable joints
1-1.2.2	Alarms - area, local, master
1-1.2.3	Anesthetizing location
1-1.2.4	Authority Having Jurisdiction
1-1.2.5	Brazed joints
1-1.2.6	Bulk systems
1-1.2.7	Carbon dioxide, USP
1-1.2.8	Blowdown
1-1.2.9	Code
1-1.2.10	Critical care and life support area
1-1.2.11	Cross-connection
1-1.2.12	Dew point
1-1.2.13	Emergency oxygen supply connection
1-1.2.14	Fire stopping
1-1.2.15	Flowmeter
1-1.2.16	Gas contamination
1-1.2.17	Gas-specific demand check fittings
1-1.2.18	Gas tungsten arc welding (GTAW) autogenous orbital welded joints

- 1-1.2.53 Prohibited joints
- 1-1.2.54 Purge
- 1-1.2.55 SCFM, ACFM, CFM, CFH, LPM
- 1-1.2.56 Special fittings
- 1-1.2.57 Standard
- 1-1.2.58 Surface mounted medical gas rails
- 1-1.2.59 Third-party certification agency (See Annex N)
- 1-1.2.60 Use point
- 1-1.2.61 Waste Anesthetic Gas Disposal (WAGD) Systems

SERIES 6000 • STANDARD #6005

Medical Gas Systems General Information

5-1.1 Scope

This standard provides general knowledge of medical gas and vacuum systems for the purpose of providing continuing education. Eligible individuals include any person with an interest in medical gas and vacuum systems and equipment.

This standard does not apply to those who work with medical gas systems as a Medical Gas Systems Installer per ASSE Standard 6010, Bulk System Installer per ASSE Standard 6015, Inspector per ASSE Standard 6020, Verifier per ASSE Standard 6030, Maintenance Personnel per ASSE Standard 6040, Medical Gas Systems Instructor per ASSE Standard 6050, or Bulk Systems Instructor per ASSE Standard 6055.

Medical gas systems and equipment covered in this standard include health care facilities within the scope of NFPA 99 Standard for Health Care Facilities. Medical gas systems include vacuum piping.

5-1.2 Purpose

The purpose of this standard is to provide minimum criteria, identified by an industry consensus, for Medical Gas Systems, to assure compliance with the referenced standards in Section 5-1.4.

5-1.3 Limitations

Compliance with this standard in itself shall not constitute compliance with the requirements for a Medical Gas Installer per ASSE Standard 6010, a Bulk System Installer per ASSE 6015, a Medical Gas Systems Inspector per ASSE Standard 6020, a Medical Gas Verifier per ASSE Standard 6030, a Medical Gas Maintenance Person per ASSE Standard 6040, a Medical Gas Instructor per ASSE Standard 6050, or a Bulk System Instructor per ASSE Standard 6055.

5-1.4 Reference and Industry Standards

The Reference and Industry Standards listed in ASSE Standard 6001 are a part of this standard.

5-2.1 General Knowledge

5-2.1.1 The individual shall be able to identify and show knowledge of the applicable laws, codes, rules, listing agencies and regulations from the federal, state, and local levels pertaining to medical gas and vacuum systems.

5-2.1.2 The individual shall be able to identify and describe the basic concepts pertaining to:

- a. Absolute pressure;
- b. Alarm panel locations;
- c. Alarm settings;
- d. Atmospheric pressure;
- e. Gage pressure;
- f. Manual valves, including source valves, main valves, riser valves, service valves, in-line shut-off valves, zone valves and valves for future connections;
- g. Medical support gases;
- h. Medical-surgical vacuum;
- i. Oxygen deficient atmosphere;
- j. Oxygen enriched atmosphere;
- k. Patient medical gases;
- l. Pressure and vacuum sensors;
- m. Vacuum measurement; and
- n. Zone valve location.

5-2.2 Product Performance Knowledge

5-2.2.1 The individual shall be able to list the parts and identify the major components of medical gas and vacuum systems and equipment.

5-2.2.2 The individual shall be able to describe the proper application of medical gas systems and their limitations with respect to: