



SAFETY BULLETIN 47/24

Standard for Mitigating Oxygen Hazards in the Health Care Environment

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Standard for Mitigating Oxygen Hazards in the Health Care Environment

PREFACE

As part of a program of harmonization of industry standards, the Asia Industrial Gases Association (AIGA) has published SB 46, *Standard for Mitigating Oxygen Hazards in the Health Care Environment*, jointly produced by members of the International Harmonization Council and originally published by Compressed Gas Association Inc.(CGA) as CGA M-24, *Standard for Mitigating Oxygen Hazards in the Health Care Environment*.

This publication is intended as an international harmonized standard for the worldwide use and application of all members of the Asia Industrial Gases Association (AIGA), Compressed Gas Association (CGA), European Industrial Gases Association (EIGA), and Japan Industrial and Medical Gases Association (JIMGA). Each association's technical content is identical, except for regional regulatory requirements and minor changes in formatting and spelling.

Introduction

This publication is intended to give a broad overview of potentially hazardous situations and their mitigation associated with the handling and use of medical oxygen by clinical and nonclinical health care personnel outside of the home care setting.

For many applications in the medical field, gaseous oxygen via cylinders or pipeline and liquid oxygen are used or administered in equipment such as liquid oxygen base and portable units, ventilators, oxygen tents, incubators, and hyperbaric chambers. To avoid incidents involving oxygen, oxygen-rich gases, and oxygen-enriched atmospheres, it is important to understand the associated risks.

1 Scope

This publication provides general requirements for clinical and nonclinical health care personnel handling and using medical oxygen and oxygen-rich gases and associated equipment in a health care environment.

This publication does not provide in-depth discussion of the hazards and handling of oxygen-rich gases and oxygen-enriched atmospheres. The reader is directed to Section 7 for additional references that should be consulted for this information.

This publication does not address general requirements for handling and using medical oxygen in a home care environment.

2 Definitions

For the purpose of this publication, the following definitions apply.

2.1 Publication terminology

2.1.1 Shall

Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

2.1.2 Should

Indicates that a procedure is recommended.

2.1.3 May

Indicates that the procedure is optional.

2.1.4 Will

Is used only to indicate the future, not a degree of requirement.

2.1.5 Can

Indicates a possibility or ability.

2.2 Technical definitions

2.2.1 Oxygen-enriched atmosphere

An atmosphere in which the concentration of oxygen is greater than 23.5% by volume.

2.2.2 Oxygen-rich gases

Gas mixtures having an oxygen content that exceeds 23.5% by volume at sea level or gas mixtures when the partial pressure of oxygen exceeds 175 torr (mm Hg).

NOTE—See AIGA 005, *Fire Hazards of Oxygen and Oxygen-Enriched Atmospheres*, for additional information [1].¹

3 General properties and hazards

Oxygen is not flammable in itself but supports and accelerates combustion. Materials that normally do not burn in air, such as the metal in oxygen regulators, plastic tubing used to supply oxygen, or fire-resistant drapes and gowns, can burn violently in an oxygen-enriched atmosphere.

Materials that can be ignited in air are more easily ignited in the presence of an oxygen-rich gas or oxygen-enriched atmosphere. Many of these materials can be ignited by different sources of ignition such as static electricity, electrical spark, heaters, or rapid introduction of high pressure oxygen into a low pressure system (e.g., rapidly opening a cylinder valve connected to a regulator). Operating and outpatient surgery rooms contain many possible sources of ignition such as electrosurgical units and lasers. *In case of hot work such as welding, flame cutting, soldering, or grinding being carried out close to oxygen sources, the level of oxygen shall be checked and confirmed as safe in accordance with AIGA 005 [1].*

For equipment containing or using liquid oxygen there needs to be an additional awareness of its low temperature and expansion properties. Even a small leak of liquid oxygen can result in a significant displacement of air due to it changing from a liquid to a gas. To avoid accidents involving frostbite and cold burns, always use extreme caution and appropriate personal protective equipment (PPE) when transferring liquid oxygen between oxygen containers and follow the equipment manufacturers' instructions. See CGA P-2.6, *Standard for Transfilling of Liquid Oxygen Used for Respiration* for additional guidance [2].

4 General handling and use requirements

General requirements for equipment and personnel when using medical oxygen and oxygen-rich gases include the following. Guidelines for the safe storage, handling, and use of oxygen can be found in CGA G-4, *Oxygen* [3].

¹ References are shown by bracketed numbers and are listed in order of appearance in the reference section.

4.1 Equipment

All equipment coming into contact with oxygen or oxygen-rich gases shall be specially cleaned for oxygen service. Either the supplier shall provide properly cleaned equipment for such use or the health care facility shall follow cleaning guidelines provided by the manufacturers of such equipment and be performed by qualified, properly trained personnel in accordance with AIGA 012, *Cleaning of Equipment for Oxygen Service* [4].

Medical equipment including valves, regulators, gauges, or fittings shall not come in contact or be contaminated with:

- oils including skin oils,
- hand lotions (including alcohol-based hand cleansers),
- make-up,
- greases or lubricants,
- organic materials (e.g., chemicals, drugs, human products, insects, and animal products),
- dirt and dust,
- rubber, latex, any combustible substance, or
- any other equipment not cleaned for oxygen service.

NOTE—The previous list is not all inclusive.

Equipment shall be checked prior to use and routinely for proper function. Off-duty equipment shall be protected from contamination. This can be accomplished through the use of clean plugs, caps, and plastic bags. Send for cleaning or repair any contaminated, broken, malfunctioning, or leaking equipment. Use of cleaning agents shall be appropriate for oxygen service.

4.2 Health care personnel

Personnel using medical oxygen and oxygen-rich gases shall be adequately trained and knowledgeable in oxygen safety and familiar with the warnings, cautions, and precautions to be taken as specified on the medical oxygen and medical oxygen mixtures container labels and labeling, including any provided safety data sheets (SDS).

Personnel using medical oxygen equipment shall be adequately trained in its operation and have knowledge of the manufacturer's instructions, limitations, cautions, and warnings for using such equipment.

Personnel shall not allow smoking, flames, sparks or other sources of ignition in the vicinity of oxygen use and shall inform conscious patients of the hazards and "do's and don'ts" of oxygen use.

Personnel shall open cylinder valves on medical oxygen and oxygen-rich gases slowly and completely to lessen the heat produced and to achieve the desired flow conditions within the equipment.

Personnel shall check for leaks and releases of gaseous or liquid oxygen from the container connections, associated piping, and utilization equipment during its use. In the event of a leak or release, personnel should take appropriate safety precautions to prevent exposure of both personnel and patients to an oxygen enriched atmosphere or to liquid oxygen, see referenced publications in Section 4.

5 References

Unless otherwise specified, the latest edition shall apply.

[1] AIGA 005, *Fire Hazards of Oxygen and Oxygen-Enriched Atmospheres*, Asia Industrial Gases Association, www.asiaiga.org

[2] CGA P-2.6, *Standard for Transfilling of Liquid Oxygen for Respiration*, Compressed Gas Association, Inc. www.cganet.com

[3] CGA G-4, *Oxygen*, Compressed Gas Association, Inc. www.cganet.com

[4] AIGA 012, *Cleaning of Equipment for Oxygen Service*, Asia Industrial Gases Association, www.asiaiga.org

6 Additional references

For more detailed discussion on the hazards and handling of oxygen-rich gases and atmospheres, see the following publications:

NFPA 53, *Recommended Practice on Materials, Equipment, and Systems Used in Oxygen-Enriched Atmospheres*, National Fire Protection Association. www.nfpa.org

CGA P-2, *Guideline for Characteristics and Safe Handling of Medical Gases*, Compressed Gas Association, Inc. www.cganet.com

CGA P-2.5, *Standard for Transfilling of High Pressure Gaseous Oxygen Used for Respiration*, Compressed Gas Association, Inc. www.cganet.com

CGA P-2.7, *Guideline for the Safe Storage, Handling, and Use of Small Portable Liquid Oxygen Systems in Health Care Facilities*, Compressed Gas Association, Inc. www.cganet.com

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