CGA P-2.6—2011

TRANSFILLING OF LIQUID OXYGEN USED FOR RESPIRATION

FIFTH EDITION

PLEASE NOTE:

The information contained in this document was obtained from sources believed to be reliable and is based on technical information and experience currently available from members of the Compressed Gas Association, Inc. and others. However, the Association or its members, jointly or severally, make no guarantee of the results and assume no liability or responsibility in connection with the information or suggestions herein contained. Moreover, it should not be assumed that every acceptable commodity grade, test or safety procedure or method, precaution, equipment or device is contained within, or that abnormal or unusual circumstances may not warrant or suggest further requirements or additional procedure.

This document is subject to periodic review, and users are cautioned to obtain the latest edition. The Association invites comments and suggestions for consideration. In connection with such review, any such comments or suggestions will be fully reviewed by the Association after giving the party, upon request, a reasonable opportunity to be heard. Proposed changes may be submitted via the Internet at our website, www.cganet.com.

This document should not be confused with federal, state, provincial, or municipal specifications or regulations; insurance requirements; or national safety codes. While the Association recommends reference to or use of this document by government agencies and others, this document is purely voluntary and not binding unless adopted by reference in regulations.

A listing of all publications, audiovisual programs, safety and technical bulletins, and safety posters is available via the Internet at our website at www.cganet.com. For more information contact CGA at Phone: 703-788-2700, ext. 799. E-mail: customerservice@cganet.com.

Work Item 12-054
Medical Gases and Equipment Committee

NOTE—Technical changes from the previous edition are underlined.

FIFTH EDITION: 2011
FOURTH EDITION: 2008
THIRD EDITION: 2005
SECOND EDITION: 1995

Contents **Page**

1 Introduction 1

2 Scope 1

3 Hazards of liquid oxygen 1
3.1 Oxidation hazards 1
3.2 Cryogenic hazards 2
3.3 Expansion or vaporization hazards 2

4 Regulations 2
4.1 United States regulations 3
4.2 Canadian regulations 5
4.3 State, provincial, territorial, and local ordinances 5

5 Transfilling system and equipment 5
5.1 General 5
5.2 Compatibility of materials used in transfilling systems 7
5.3 Cryogenic containers 7
5.4 Cryogenic container valves, pressure control, and pressure relief devices 10
5.5 Source of liquid oxygen supply 10
5.6 Empty cryogenic containers 10

6 Liquid oxygen transfilling operation 10

7 Container maintenance and storage 11

8 References 11

This page is intentionally blank.

1 Introduction

The process of transferring liquid oxygen from one cryogenic container to another is commonly known as transfilling. Only properly trained and qualified personnel using appropriate equipment and working under carefully controlled conditions shall perform the transfilling process. Individuals that manufacture, distribute, or engage in the transfilling of liquid oxygen shall be familiar with the potential hazards associated with cryogenic liquid oxygen and shall comply with all applicable regulations and safety practices.

2 Scope

This publication describes the primary hazards, the minimum performance requirements for equipment, and some of the applicable regulations for the transfilling of pressurized liquid oxygen. It is a guide for manufacturers and distributors of equipment used to transfill liquid oxygen for respiration as well as for individuals or organizations that perform transfilling activities.

This publication applies to specially designed cryogenic containers including portable containers, vehicle-mounted containers, storage tanks, portable tanks, and trailers. It does not apply to small patient-transportable units used in homecare applications.

NOTE—The operation and safety instructions for homecare units are provided as part of user/patient instructions for these systems and should address the hazards and the precautions necessary in the home environment.

3 Hazards of liquid oxygen

Transfilling liquid oxygen from one container to another exposes personnel to the hazards associated with the strong oxidizing properties of oxygen (supports combustion), the extremely cold (cryogenic) temperature of the liquid and vapor, and the pressure producing potential of the vaporization and/or liquid expansion processes.

3.1 Oxidation hazards

Although oxygen in gaseous or liquid form is stable and nonflammable, it is classified as an oxidizer. Materials that burn in air burn much more vigorously and reach a higher combustion temperature in oxygen or in oxygen-enriched atmospheres. Materials used for oxygen containers and piping shall be carefully selected. Various steels are acceptable for many applications but some service conditions may call for other materials (usually copper or copper alloys) because of their greater resistance to ignition and lower rate of combustion.

A hazardous condition is created when oxygen equipment is contaminated with hydrocarbons like oil or grease or with other combustible materials like paper or cotton fibers. Additional sources of contamination can include oil from the equipment operator's hands or contaminated tools. Keep oil, grease, and combustibles away from liquid oxygen systems. Explosive ruptures and the subsequent burning of system components can occur because of exposure to these types of contamination. See NFPA 410, *Standard on Aircraft Maintenance,* Chapter 5*, "*Aircraft Breathing Oxygen Systems*"*, for additional information [1].[1]

Keep ignition sources away from liquid oxygen. Ignition temperatures are lower in oxygen or oxygen-enriched atmospheres causing some materials that do not burn in air to burn readily and vigorously. If ignited, combustibles such as oil burn with explosive violence.

Absorbent materials such as clothing or bedding can become saturated with oxygen when exposed to oxygen or oxygen-enriched atmospheres and easily can ignite. This ignition hazard can persist even after the absorbent material is removed from the oxygen source. Personnel recently exposed to potential oxygen-enriched atmospheres shall avoid contact with ignition sources.

Stepping on or rolling equipment across a liquid oxygen spill can result in the explosive ignition of combustibles.

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