CGA G-8.1—2013

STANDARD FOR NITROUS OXIDE SYSTEMS AT CUSTOMER SITES

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 web site, 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 12-020
Medical Gases Committee

NOTE—Technical changes from the previous edition are underlined.

FIFTH EDITION: 2013
FOURTH EDITION: 2007
THIRD EDITION: 1990
SECOND EDITION:

Contents **Page**

Tables

Figures

1 Introduction

At atmospheric pressure and temperature, nitrous oxide is a colorless, practically odorless, tasteless, and non-toxic gas about 50% heavier than air. It is quite soluble in water, vegetable oils, and other liquids. Its main use is as an anesthetic. It is also used as a propellant in pressure package containers, in analytical instruments, as a leak detector, and in other specialized applications.

Nitrous oxide is available in the compressed, liquefied form either in high pressure containers or low pressure insulated containers conforming to the specifications of the U.S. Department of Transportation (DOT), Transport Canada (TC) or in relatively low pressure bulk containers maintained at reduced temperatures. Below the critical point of 97.7 °F (36.5 °C) liquid nitrous oxide is in equilibrium with its vapor at a pressure dependent upon the temperature. For specific data see the *Handbook of Compressed Gases* [1].[1] Under normal conditions of storage and use, nitrous oxide is stable in both gas and liquid phases, and is noncorrosive. It does not form an acid in water.

As with oxygen, ignition of combustible materials can occur more readily in a nitrous oxide-enriched atmosphere than in air with combustion proceeding at a faster rate. Nitrous oxide also decomposes exothermally under conditions of high temperature and pressure. If sufficient heat is added, the decomposition can be self-sustaining and with the appropriate high temperature and pressure, the nitrous oxide can explode. Refer to CGA G-8.3, *Safe Practices for the Storage and Handling of Nitrous Oxide* [2]. Therefore, this standard provides primarily for protection of the nitrous oxide system from fire from sources apart from the system itself. It is important to locate nitrous oxide systems in well-ventilated locations since nitrous oxide-enriched atmospheres can collect temporarily in confined areas in the event of the functioning of a pressure relief device (PRD) or leakage from the system.

The properties of nitrous oxide are shown in Tables 1 and 2.

2 Scope

This standard covers the general principles recommended for the installation of nitrous oxide systems on medical or industrial customer premises.

Such systems consist of a central supply, which can be either cylinders connected to a common manifold or bulk liquid containers and the associated equipment and piping required for connecting the central supply to the line supplying the nitrous oxide to the point of use.

The authority having jurisdiction (AHJ) may authorize the continued use of an existing nitrous oxide system, which is not in strict compliance with the provisions of this standard, where such continued use will not constitute a hazard to life or adjacent property.

This standard does not apply to nitrous oxide manufacturing plants and normally does not apply to distributor bulk stations. However, where distributor bulk stations interface closely with business or facilities unrelated to the handling of nitrous oxide, or where the general public can be exposed to such bulk facilities, the applicable safety provisions of this standard shall be followed.

Additional requirements for nitrous oxide systems are contained in NFPA 99, *Health Care Facilities Code,* NFPA 55, *Compressed Gases and Cryogenic Fluids Code,* and CSA Z305.1, *Nonflammable Medical Gas Piping Systems* [3, 4, 5].

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