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An American National Standard

Recommended Practices for the Brazing of Copper Tubing and Fittings for Medical Gas Systems

American Welding Society

Approved American National Standard
ANSI

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Recommended Practices for the Brazing of Copper Tubing and Fittings for Medical Gas Systems

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Prepared by
AWS D10 Committee on Piping and Tubing

Under the Direction of
AWS Technical Activities Committee

Approved by
AWS Board of Directors

Abstract

This document provides the minimum requirements for brazing of copper tubing for use in medical gas distribution systems and also contains criteria for cleanliness, fabrication, and installation and various inspection and testing options.

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Foreword

(This Foreword is not a part of AWS D10.13/D10.13M:2001*, Recommended Practices for the Brazing of Copper Tubing and Fittings for Medical Gas Systems*, but is included for information purposes only.)

These recommended practices have been developed to address the fabrication of gas and vacuum distribution systems in health care facilities. Included in this document are standards for the preparation and cleanliness of materials and equipment, joint heating and filler metal application techniques, and testing and inspection options.

This document provides guidance for implementation of the requirements of NFPA 99C, *Gas and Vacuum Systems*. NFPA 99C specifies the materials used in these systems and requires that brazing procedures and brazers be qualified in accordance with either AWS B2.2-91, *Standard for Brazing Procedure and Performance Qualification*, or the ASME *Boiler and Pressure Vessel Code*, Section IX, *Welding and Brazing Qualifications*, as modified by NFPA 99C. Requirements of NFPA 99C are stated using mandatory language (i.e., "shall"). The recommendations of the D10A Subcommittee on Brazing of Piping and Tubing are stated using non-mandatory language (i.e., "should").

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS D10 Committee on Piping and Tubing, American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

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Recommended Practices for the Brazing of Copper Tubing and Fittings for Medical Gas Systems

1. Scope

This document presents a recommended practice for fabrication and installation of copper tubing used in the distribution of medical gas and vacuum lines in health care facilities. It provides guidance for implementation of the requirements of NFPA 99C, *Gas and Vacuum Systems*. Brazing procedures and brazers should be qualified in accordance with the latest edition of AWS B2.2, *Standard for Brazing Procedure and Performance Qualification* or the *ASME Boiler and Pressure Vessel Code*, Section IX, *Welding and Brazing Qualifications* modified as required by NFPA 99C.

This standard makes use of both U.S. Customary Units and the International System of Units (SI). The measurements are not exact equivalents; therefore, each system must be used independently of the other without combining values in any way. The standard with the designation D10.13:2001 uses U.S. Customary Units. The standard with the designation D10.13M:2001 uses SI Units. The latter are shown in appropriate column in table and figures, and within brackets [ ] when used in the text.

2. Reference Documents

Reference should be made to the latest edition of the following documents:

(1) NFPA 99C, *Gas and Vacuum Systems*[1]

(2) AWS C3.4, *Specification for Torch Brazing*[2]

(3) AWS C3.8, *Recommended Practices for Ultrasonic Inspection of Brazed Joints*

(4) AWS A5.8, *Specification for Filler Metals for Brazing and Braze Welding*

(5) AWS A5.31, *Specification for Fluxes for Brazing and Braze Welding*

(6) AWS A3.0, *Standard Welding Terms and Definitions*

(7) AWS B2.2, *Standard for Brazing Procedure and Performance Qualification*

(8) ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*[2]

(9) ASTM E 94, *Guide to Radiographic Inspection*

3. Brazed Joint Classification

Brazed joints used in medical gas systems should be fabricated according to the requirements of NFPA 99C, *Gas and Vacuum Systems*. Tubing and socket-type fittings used in these systems shall conform to the requirements of the latest edition of NFPA 99C. Joint fit-up tolerances such as joint clearance and overlap should be in accordance with the contractor's qualified brazing procedure (see Figure 1).

In normal operations, these systems run in a stable manner. However, substantial pressure loads may occur due to malfunctions. It is essential that these systems maintain their integrity through extreme conditions. A Class B joint is defined as a joint which will be subjected to low or moderate cyclic service stresses, the failure of which could result in significant risk to persons or property, or could result in a significant operational failure. The Class B joint definition has been obtained from 2.3 of AWS C3.4, *Specification for Torch Brazing*.

4. Process Equipment and Consumables

All equipment used in fabrication and assembly or which comes in contact with the system should be used exclusively for brazing of copper tubing and fittings for medical gas systems. Special procedures provided in this document should be taken to prevent internal contamination of the system.

1. National Fire Protection Association is located at P.O. Box 9101, Batterymarch Park, Quincy, MA 02269-9101.

2. For ordering AWS and ANSI Z49.1 information, contact Global Engineering Documents, 15 Inverness Way East, Englewood, Colorado 80112-5776. Telephones: (800) 854-7179, (303) 397-7956; FAX (303) 397-2740; Internet: www.global.ihs.com.