

AWS C3.7M/C3.7:2011
An American National Standard



Specification for Aluminum Brazing



American Welding Society®



**AWS C3.7M/C3.7:2011
An American National Standard**

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American National Standards Institute
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Specification for Aluminum Brazing

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Prepared by the
American Welding Society (AWS) C3 Committee on Brazing and Soldering

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This specification presents the minimum fabrication, equipment, material, process procedure, and inspection requirements for the brazing of aluminum by all of the processes commonly used—atmosphere furnace, vacuum furnace, and flux processes. Its purpose is to standardize aluminum brazing requirements for all applications in which brazed aluminum joints of assured quality are required. It provides criteria for classifying aluminum brazed joints based on loading and the consequences of failure and quality assurance criteria defining the limits of acceptability of each class.



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This standard is subject to revision at any time by the AWS C3 Committee on Brazing and Soldering. It must be reviewed every five years, and if not revised, it must be either reaffirmed or withdrawn. Comments (recommendations, additions, or deletions) and any pertinent data that may be of use in improving this standard are required and should be addressed to AWS Headquarters. Such comments will receive careful consideration by the AWS C3 Committee on Brazing and Soldering and the author of the comments will be informed of the Committee's response to the comments. Guests are invited to attend all meetings of the AWS C3 Committee on Brazing and Soldering to express their comments verbally. Procedures for appeal of an adverse decision concerning all such comments are provided in the Rules of Operation of the Technical Activities Committee. A copy of these Rules can be obtained from the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

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Foreword

This foreword is not part of AWS C3.7M/C3.7:2011, *Specification for Aluminum Brazing*, but is included for informational purposes only.

This specification is one of a series prepared at the request of the Aerospace Materials Division (AMD) of SAE International and a number of other organizations to replace the military specification MIL-B-7883, *Brazing of Steels, Copper, Copper Alloys, Nickel Alloys, Aluminum, and Aluminum Alloys*, which addressed all brazing processes. It became both obsolete and very cumbersome as brazing technology proliferated and became more complex.

Addressing all of the diverse brazing processes in one concise, easily understood document was found to be impractical; therefore, a series of six independent specifications on brazing have been written, all in the same format. These are AWS C3.4M/C3.4, *Specification for Torch Brazing*; AWS C3.5M/C3.5, *Specification for Induction Brazing*; AWS C3.6M/C3.6, *Specification for Furnace Brazing*; the present document AWS C3.7M/C3.7, *Specification for Aluminum Brazing*; AWS C3.8M/C3.8, *Specification for the Ultrasonic Pulse-Echo Examination of Brazed Joints*; and AWS C3.9M/C3.9, *Specification for Resistance Brazing*.

After the completion of the fourth brazing specification, it was determined that a document providing specific criteria and requirements for the application of ultrasonic testing to brazed joints was needed. Therefore, AWS C3.8M/C3.8, *Specification for the Ultrasonic Pulse-Echo Examination of Brazed Joints*, was written to complement this series.

The decision to subdivide the technology in this way was based on a survey of production brazing applications conducted by the AWS C3 Committee on Brazing and Soldering. The survey demonstrated that these six specifications would cover the vast majority of brazing performed today.

This fourth edition supersedes AWS C3.7M/C3.7:2005, bearing the same title and includes changes to numerous clauses to provide clarification, correct inconsistencies, and updates representative of current industry practices.

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS C3 Committee on Brazing and Soldering, American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

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Specification for Aluminum Brazing

1. General Requirements

1.1 Scope. This specification presents the minimum fabrication and quality requirements for brazing of aluminum and aluminum alloys. Its purpose is to standardize brazing process requirements and control brazed joint quality for all applications for which brazed joints of assured quality are required. This document establishes the minimum requirements for processes and products with a minimum of explanatory information so that sources of ambiguity are minimized. It assigns responsibility for the ultimate quality of the brazed product to a single organization and permits that organization to modify requirements if appropriate to the application. It requires proper documentation of any such modification.

1.2 Units of Measurement. This standard makes use of both the International System of Units (SI) and U.S. Customary Units; the latter are shown within brackets ([]). The measurements may not be exact equivalents; therefore, each system must be used independently.

1.3 Safety. Safety and health issues and concerns are beyond the scope of this standard; some safety and health information is provided, but such issues are not fully addressed herein.

Safety and Health information is available from the following sources:

American Welding Society:

- (1) ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*
- (2) AWS Safety and Health Fact Sheets
- (3) Other safety and health information on the AWS website

Material or Equipment Manufacturers:

- (1) Material Safety Data Sheets supplied by the materials manufacturers
- (2) Operating Manuals supplied by equipment manufacturers

Applicable Regulatory Agencies:

- (1) United States Department of Labor, Occupational Safety & Health Administration (OSHA)
- (2) Equivalent agencies of other countries and individual states

Work performed in accordance with this standard may involve the use of materials that have been deemed hazardous, and may involve operations or equipment that may cause injury or death. This standard does not purport to address all safety and health risks that may be encountered. The user of this standard should establish an appropriate safety program to address such risks as well as to meet applicable regulatory requirements. ANSI Z49.1 should be considered when developing the safety program.

2. Normative References

The standards listed below contain provisions that, through reference in this text, constitute mandatory provisions of this AWS standard. For undated references, the latest edition of the referenced standard shall apply. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply.

American Welding Society (AWS) standards:¹

AWS A2.4, *Standard Symbols for Welding, Brazing, and Nondestructive Examination*;

AWS A3.0M/A3.0, *Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying*;

AWS A5.8M/A5.8, *Specification for Filler Metals for Brazing and Braze Welding*;

AWS C3.3, *Recommended Practices for the Design, Manufacture, and Examination of Critical Brazed Components*;

AWS C3.4M/C3.4, *Specification for Torch Brazing*;

AWS C3.5M/C3.5, *Specification for Induction Brazing*; and

AWS C3.8M/C3.8, *Specification for the Ultrasonic Pulse-Echo Examination of Brazed Joints*.

American National Standards Institute (ANSI) standards:²

ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*³; and

ANSI Z540-1, *General Requirements for Calibration Laboratories and Measuring and Test Equipment*.

American Society for Quality (ASQ) standard:⁴

ASQ Z1.4, *Sampling Procedures and Tables for Inspection by Attributes*

ASTM International standards:⁵

ASTM E 230, *Standard Specification and Temperature-Electromotive Force (EMF) Tables for Standardized Thermocouples*;

ASTM E 1417, *Standard Practice for Liquid Penetrant Inspection*; and

ASTM E 1742, *Standard Practice for Radiographic Examination*.

SAE International standard:⁶

SAE AMS 2750, *Pyrometry*

3. Terms and Definitions

AWS A3.0M/A3.0, *Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying*, provides the basis for terminology used herein. However, the following terms and definitions are included below to accommodate usage specific to this document.

brazed joint. The total area, as defined by the engineering drawing, of the faying surfaces to be joined by brazing and the fillets that form at the edges of that area.

brazed joint proper. The total area, as defined by the engineering drawing, of the faying surfaces to be joined by brazing, excluding any fillets that form at the edges of that area.

¹ AWS standards are published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

² ANSI standards are published by the American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

³ This ANSI standard is published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

⁴ ASQ standards are published by the American Society for Quality (ASQ), 600 North Plankinton Avenue, Milwaukee, WI 53203-3005.

⁵ ASTM International standards are published by ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

⁶ SAE International standards are published by SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001.