AWS C3.9M/C3.9:2009
An American National Standard

Specification for Resistance Brazing

American Welding Society

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Specification for Resistance Brazing

1st Edition

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 provides the minimum fabrication, equipment, material, and process procedure requirements, as well as discontinuity limits for the resistance brazing of steels, copper, copper alloys, heat- and corrosion-resistant alloys, and other materials that can be adequately resistance brazed (the resistance brazing of aluminum alloys is addressed in AWS C3.7M/C3.7, *Specification for Aluminum Brazing*). This specification provides criteria for classifying resistance brazed joints based on loading and the consequences of failure and quality assurance criteria defining the limits of acceptability in each class. This specification defines acceptable resistance brazing equipment, materials, and procedures, as well as the required inspection for each class of joint.

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Foreword

This foreword is not part of AWS C3.9M/C3.9:2009, *Specification for Resistance 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 the Society of Automotive Engineers (SAE) 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*; AWS C3.7M/C3.7, *Specification for Aluminum Brazing*; AWS C3.8M/C3.8, *Specification for the Ultrasonic Examination of Brazed Joints*; and the present document, AWS C3.9M/C3.9, *Specification for Resistance Brazing*.

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.

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 Examination of Brazed Joints*, was written to complement this series.

AWS C3.9M/C3.9, *Specification for Resistance Brazing*, has been added to this group of diverse standards on brazing processes because resistance brazing is an additional commercial brazing method used in many industries. The specifics for this method are detailed in the same manner as the other five independent brazing specifications.

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 Resistance Brazing

1. Scope

This specification presents the minimum fabrication and quality requirements for the resistance brazing of materials such as steels, stainless steels, copper, copper alloys, and heat- or corrosion-resistant materials as well as other materials that can be adequately resistance brazed.

The purpose of this specification is to standardize resistance brazing process requirements and control braze joint quality for all applications requiring brazed joints of assured quality. 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 modifications.

Procedures for the protection of the safety and health of those performing resistance brazing and related operations are of great importance. However, safety and health issues and concerns are beyond the scope of this standard and therefore are not fully addressed herein. Safety and health information is available from other sources, including, but not limited to, ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*.

This standard makes use of both the International System of Units (SI) and U.S. Customary Units. The latter are shown within brackets [ ], or in appropriate columns in tables and figures. The measurements may not be exact equivalents; therefore, each system shall be used independently.

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, *Symbols for Welding, Brazing, and Nondestructive Examination*;

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

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

AWS A5.31/A5.31M, *Specification for Fluxes for Braze and Braze Welding*;

AWS B2.2, *Standard for Brazing Procedure and Performance Qualification*;

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

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

American Society for Quality (ASQ) standard:[2]

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

SAE International/Aerospace Materials Division (AMD) standards:[3]

SAE AMS 2403, *Plating, General Purpose*;

SAE AMS 2424, *Plating, Nickel, Low Stressed Deposit*;

[1] AWS standards are published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.
[2] ASQ standards are published by the American Society for Quality (ASQ), 600 North Plankinton Avenue, Milwaukee, WI 53203-3005.
[3] SAE International standards are published by the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001.