AWS C3.6M/C3.6:2016
An American National Standard

Specification for Furnace Brazing

American Welding Society®

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Specification for Furnace 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 provides the minimum fabrication, equipment, material, process procedure requirements, as well as inspection requirements for the furnace brazing of steels, copper, copper alloys, and heat- and corrosion-resistant alloys and other materials that can be adequately furnace brazed (the furnace brazing of aluminum alloys is addressed in AWS C3.7M/C3.7, *Specification for Aluminum Brazing*). This specification provides criteria for classifying furnace 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 furnace 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 C3.6M/C3.6:2016, *Specification for Furnace 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 five 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*, the present document; AWS C3.6M/C3.6, *Specification for Furnace Brazing*; AWS C3.7M/C3.7, *Specification for Aluminum Brazing*; and 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 five specifications would cover the vast majority of brazing performed today.

There is not a direct conversion of the MIL-B-7883 Grades and the AWS Classes and the quality assurance requirements differ. The cancellation of MIL-B-7883 was not intended to add additional inspection requirements to legacy hardware (i.e., MIL-B-7883 Grade B with only external inspection was not intended to become AWS Class B with internal NDT requirements). Each Organization Having Quality Responsibility must provide instructions on how or if the cancellation is to be handled for their hardware.

After the completion of the brazing specifications, 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.

This fourth edition supersedes AWS C3.6M/C3.6:2007, bearing the same title. Revisions made to this edition were coordinated with changes in AWS C3.4M/C3.4 and AWS C3.5M/C3.5, incorporating many of the improvements in the 2011 edition of AWS C3.7M/C3.7, and coordinating the wording between the three documents. Revisions were made throughout the document.

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, 8669 NW 36 St, #130, Miami, FL 33166.

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Specification for Furnace Brazing

1. General Requirements

1.1 Scope. This specification presents the minimum fabrication and quality requirements for the furnace brazing of materials such as steels, stainless steels, nickel, nickel alloys, copper, copper alloys, and heat- or corrosion-resistant materials as well as other materials that can be adequately furnace brazed. Note that the furnace brazing of aluminum alloys is addressed in AWS C3.7M/C3.7, *Specification for Aluminum Brazing*.

The purpose of this specification is to standardize furnace brazing process requirements and brazed joint quality requirements for all applications requiring brazed joints of assured quality. This document establishes 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.

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 in brackets ([ ]) or in appropriate columns in tables and figures. 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) 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.

See 5.6 for additional safety and health information.