

AWS C3.2M/C3.2:2008
An American National Standard



Standard Method for Evaluating the Strength of Brazed Joints



American Welding Society



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Standard Method for Evaluating the Strength of Brazed Joints

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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 standard describes the test methods used to obtain brazed strength data of the short-time testing of single-lap joints in shear, butt-tension, stress-rupture, creep-strength, four-point-bending, and ceramic-tensile-button specimens. Specimen preparation methods, brazing procedures, testing techniques, and methods for data analysis are detailed. Sample forms for recording data are presented. A graphical method of data presentation relates shear stress to overlap distance.



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Foreword

This foreword is not part of AWS C3.2M/C3.2:2008, *Standard Method for Evaluating the Strength of Brazed Joints*, but is included for informational purposes only.

Over the years, design engineers have sought a standard methodology to measure the strength of brazed joints under various loading conditions. In 1963, the American Welding Society (AWS) Committee on Brazing and Soldering completed a project whose objective was to develop a brazed test specimen that, when tested, would result in reproducible data in a variety of laboratories at a minimum expenditure of time and money. The results of this project were described in AWS C3.1-63, *Establishment of a Standard Test for Brazing Joints*.

Nearly two decades later, this widely used document and test procedure was reviewed and updated as AWS C3.2-82, *Standard Method for Evaluating the Strength of Brazed Joints in Shear*.

A variety of test specimens have been developed both overseas and in the United States. Comparison of test data from a variety of sources has become increasingly difficult, if not impossible. Every test specimen design yields a different result; thus, it is imperative that the specimen geometry used for measuring the strength of brazed joints be standardized and that all strength data be obtained using standard specimens.

Test specimens have been included to provide additional design data for butt brazed joints, creep strength, stress rupture data, and four-point bending specimens for testing of brazed ceramics and similar low-ductility materials. New to this edition are a series of subclauses addressing ceramic tensile button strength testing. These new subclauses include a discussion of the preparation of tensile button test specimens, brazing procedures, leak checking, and mechanical testing.

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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Standard Method for Evaluating the Strength of Brazed Joints

1. Scope

The purpose of this standard is to describe the test methods used to obtain reliable data on the strength of metal-to-metal, metal-to-nonmetal, and nonmetal-to-nonmetal brazed joints. Test specimens should be prepared using consistent and proper fabrication and brazing practices. Interpretation of the test results is the responsibility of the user.

It is important that the user of these tests maintain sufficient documentation of the materials, brazing parameters, and test conditions. This documentation will be required when comparing the results with the joint strengths obtained by others using this standard method. General use of this standard method may permit a compilation of brazed joint strengths and brazing design criteria at some future time.

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 which, 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) documents:¹

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

AWS *Brazing Handbook*.

ASTM International standards:²

ASTM E 8, *Standard Test Methods for Tension Testing of Metallic Materials*;

ASTM C 1161, *Standard Test Method for Flexural Strength of Advanced Ceramics at Ambient Temperature*; and

ASTM F 19, *Standard Test Method for Tension and Vacuum Testing Metallized Ceramic Seals*.

3. Terms and Definitions

AWS 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.

For the purposes of this document, the following terms and definitions apply:

active brazing filler metal. A brazing filler metal that, through the addition of an active element such as titanium, zirconium, vanadium, hafnium, or niobium, is able to wet nonmetallic surfaces directly.

interlayer. A flat, metallic preform that is machined, stamped, or punched out from the same alloy that is being evaluated for brazeability with ceramic material.

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

² ASTM International standards are published by ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959.