AWS C3.2M/C3.2:2001
An American National Standard

Standard Method for Evaluating the Strength of Brazed Joints

American Welding Society

Approved American National Standard
ANSI

Key Words—Brazed single-lap shear specimen, testing of brazements, brazing, brazed joint strength, brazed double-lap shear specimen, butt brazed specimen, four-point bend brazed specimen

AWS C3.2M/C3.2:2001
An American National Standard

Approved by
American National Standards Institute
December 17, 2001

Standard Method for Evaluating the Strength of Brazed Joints

Supersedes ANSI/AWS C3.2-82

Prepared by
AWS C3 Committee on Brazing and Soldering

Under the Direction of
AWS Technical Activities Committee

Approved by
AWS Board of Directors

Abstract

A standardized single-lap shear brazed specimen was developed as the result of interlaboratory testing program. Additional test specimens have been added to obtain brazed strength data in butt tension, stress rupture, creep strength, and four-point bending. 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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Table of Contents

Page No.

List of Tables

List of Figures

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1. Scope

1.1 The purpose of this standard is to describe the test method 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 should be recognized that if the production practices for the brazed product do not follow the test specimen brazing practice, the joint strengths of the test specimen might not be the same as the product's joint strengths.

It is important that the user of this test maintain sufficient documentation of the materials, brazing parameters, and test conditions. This documentation will be required when comparing the results to 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.

The mechanical performance of a braze joint is necessarily an integration of the filler metal, the base metal, the geometry of the brazement, and the brazing procedure. Moreover, the properties of the base metal may be sensitive to the process parameters and joint overlap. As the overlap is increased, the failure location shifts from failure in the braze joint to failure in the base metal. Joints made with an overlap greater than this transition value will behave as being stronger than the materials being joined together. Material thicknesses (T) other than 3.0 mm (0.125 in.) may be used for test specimens. Overlaps should be adjusted accordingly.

When testing for long-term shear data such as stress rupture and creep properties, the double-lap shear specimen is required to achieve uniform test conditions. Shear strength versus overlap properties for the double-lap specimen show results similar to those obtained for the single-lap specimen.

The butt tensile specimen provides the tensile strength of the base metal-filler metal combinations when tested in tension. This specimen is not suitable for all filler metals such as those that produce butt tensile strengths far below the properties of the base metal. Filler metal-base-metal combinations of higher strength are often diffusion brazed to develop mechanical properties equal to those of the base metal. These tests provide excellent data for design purposes. The butt brazed tensile specimen can also be used to obtain stress rupture and creep design data. Moreover, impact and fatigue specimens can be cut from the butt brazed specimens.

The four-point bend specimen is specifically designed to obtain the butt tensile strength data of a brazed specimen that has very limited or no ductility. Typical of these materials are ceramics, graphite, cermets, and other similar materials.

1.2 Units of Measure and Rounding-Off Procedure. This specification makes use of both the International System of Units (SI) and inch-pound units. The standard sizes and dimensions in the two systems are not identical. For this reason, a conversion from a standard size or dimension in one system will not always coincide with a standard size or dimension in the other. However, if appropriate tolerances are applied in each case, suitable conversions encompassing the standard sizes of both systems of units can be made.

2. Referenced Documents

2.1 The following standards contain provisions which, through reference in this text, constitute provisions of this AWS standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this AWS standard are encouraged to investigate the possibility of applying the most recent editions of the documents shown below. For undated references, the latest edition of the standard referred to applies.