Specification for the Ultrasonic Pulse-Echo Examination of Brazed Joints
Abstract

This specification provides the minimum requirements for the ultrasonic pulse-echo examination of brazed joints. Its purpose is to standardize brazed-joint ultrasonic examination requirements for all applications in which brazed joints of acceptable quality are required. It provides the minimum requirements for equipment, procedures, and the documentation of such tests.
Statement on the Use of American Welding Society Standards

All standards (codes, specifications, recommended practices, methods, classifications, and guides) of the American Welding Society (AWS) are voluntary consensus standards that have been developed in accordance with the rules of the American National Standards Institute (ANSI). When AWS American National Standards are either incorporated in, or made part of, documents that are included in federal or state laws and regulations, or the regulations of other governmental bodies, their provisions carry the full legal authority of the statute. In such cases, any changes in those AWS standards must be approved by the governmental body having statutory jurisdiction before they can become a part of those laws and regulations. In all cases, these standards carry the full legal authority of the contract or other document that invokes the AWS standards. Where this contractual relationship exists, changes in or deviations from requirements of an AWS standard must be by agreement between the contracting parties.

AWS American National Standards are developed through a consensus standards development process that brings together volunteers representing varied viewpoints and interests to achieve consensus. While AWS administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy of any information or the soundness of any judgments contained in its standards.

AWS disclaims liability for any injury to persons or to property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, or reliance on this standard. AWS also makes no guarantee or warranty as to the accuracy or completeness of any information published herein.

In issuing and making this standard available, AWS is neither undertaking to render professional or other services for or on behalf of any person or entity, nor is AWS undertaking to perform any duty owed by any person or entity to someone else. Anyone using these documents should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances. It is assumed that the use of this standard and its provisions is entrusted to appropriately qualified and competent personnel.

This standard may be revised, corrected through publication of amendments or errata, or supplemented by publication of addenda. Information on the latest editions of AWS standards including amendments, errata, and addenda is posted on the AWS web page (www.aws.org). Users should ensure that they have the latest edition, amendments, errata, and addenda.

Publication of this standard does not authorize infringement of any patent or trade name. Users of this standard accept any and all liabilities for infringement of any patent or trade name items. AWS disclaims liability for the infringement of any patent or product trade name resulting from the use of this standard.

AWS does not monitor, police, or enforce compliance with this standard, nor does it have the power to do so.

Official interpretations of any of the technical requirements of this standard may only be obtained by sending a request, in writing, to the appropriate technical committee. Such requests should be addressed to the American Welding Society, Attention: Managing Director, Standards Development, 8669 NW 36 St, # 130, Miami, FL 33166 (see Annex C). With regard to technical inquiries made concerning AWS standards, oral opinions on AWS standards may be rendered. These opinions are offered solely as a convenience to users of this standard, and they do not constitute professional advice. Such opinions represent only the personal opinions of the particular individuals giving them. These individuals do not speak on behalf of AWS, nor do these oral opinions constitute official or unofficial opinions or interpretations of AWS. In addition, oral opinions are informal and should not be used as a substitute for an official interpretation.

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

This foreword is not part of this standard but is included for informational purposes only.

The American Welding Society (AWS) C3 Committee on Brazing and Soldering has prepared this specification to provide specific criteria and requirements for the application of ultrasonic pulse-echo examination to brazed joints.

This specification may be used for the inspection of brazements to show conformance to five associated independent brazing process specifications. 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; and AWS C3.9M/C3.9, Specification for Resistance Brazing.

Previous editions of this standard include:

AWS C3.8M/C3.8:2011
AWS C3.8M/C3.8:2005
ANSI/AWS C3.8-90

Revisions to this edition include an update to the personnel certification requirements and an updated Normative References.

All errata to a standard shall be published in the Welding Journal and posted on the AWS website.

Underlined text or a vertical line in the margin indicates a change from the previous edition.

Comments and suggestions for the improvement of this standard are welcome. These should be sent to the Secretary, AWS C3 Committee on Brazing and Soldering, American Welding Society, 8669 NW 36th Street, #130, Miami, FL 33166.
# Table of Contents

*Personnel* ................................................................. v
*Foreword* ................................................................. ix
*List of Figures* ............................................................ xii

1. **General Requirements** ................................................. 1
   1.1 Scope ........................................................................ 1
   1.2 Units of Measurement ............................................... 1
   1.3 Safety ...................................................................... 1

2. **Normative References** ................................................. 2

3. **Terms and Definitions** .................................................. 2

4. **Ultrasonic Examination Requirements** .............................. 3
   4.1 Ultrasonic Test Equipment ......................................... 3
   4.2 Required Procedures ................................................ 4
   4.3 Brazement Ultrasonic Examination .............................. 4
   4.4 Examination Techniques ........................................... 5

5. **Acceptance Criteria** ..................................................... 6

*Annex A (Informative)—Informative References* ......................... 7
*Annex B (Informative)—Figures* ........................................... 9
*Annex C (Informative)—Requesting an Official Interpretation on an AWS Standard* .................................................. 13

*List of AWS Documents on Brazing and Soldering* ...................... 15
List of Figures

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.1</td>
<td>Typical Immersion Ultrasonic Setup</td>
<td>9</td>
</tr>
<tr>
<td>B.2</td>
<td>Manual Contact Mode Inspection Technique</td>
<td>10</td>
</tr>
<tr>
<td>B.3</td>
<td>Automated Immersion Mode Inspection Technique</td>
<td>10</td>
</tr>
<tr>
<td>B.4</td>
<td>Example of Immersion Mode C-scan Reference Standard Inspection</td>
<td>11</td>
</tr>
</tbody>
</table>
Specification for the Ultrasonic Pulse-Echo Examination of Brazed Joints

1. General Requirements

1.1 Scope. This specification establishes the minimum equipment and procedure requirements for the ultrasonic pulse-echo examination of brazed joints. This specification addresses the following techniques: pulse-echo contact (manual) and pulse-echo immersion (automated).

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 ([ ]) 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 and therefore are not 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 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 documents listed below are referenced within this publication and are mandatory to the extent specified herein. For undated references, the latest edition of the referenced standard shall apply. For dated references, subsequent amendments or revisions of the publications may not apply since the relevant requirements may have changed.