

AWS B4.0M:2000 (R2010)
An American National Standard



Standard Methods for Mechanical Testing of Welds



American Welding Society



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Standard Methods for
Mechanical Testing of Welds

1st Edition

Prepared by the
American Welding Society (AWS) B4 Committee on Mechanical Testing of Welds

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

Mechanical test methods that are applicable to welds and welded joints are described. For each testing method, information is provided concerning applicable American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), and American Petroleum Institute (API) documents; the required testing apparatus, specimen preparation, procedure to be followed, and report requirements are also described.



American Welding Society

550 N.W. LeJeune Road, Miami, FL 33126

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J. H. Smith	<i>Consultant</i>
K. Zerkle	<i>Consultant</i>

Advisors to the AWS B4 Committee on Mechanical Testing of Welds

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D. B. Holiday	<i>Northrop Grumman Corporation</i>
E. L. Lavy	<i>Consultant</i>
L. Li	<i>Utah State University</i>
T. McGaughy	<i>Edison Welding Institute</i>
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Foreword

This foreword is not part of AWS B4.0M:2000 (R2010), *Standard Methods for Mechanical Testing of Welds*, but is included for informational purposes only.

This standard covers the common tests for the mechanical testing of welds. They are defined and illustrated in five parts related to testing of groove welds, fillet welds, and stud welds. The tests include: bend tests, tension tests, fracture toughness tests, soundness tests, shear tests, nick-break test, hardness tests, stud weld tests, and selected weldability tests.

This document extensively uses American Society for Testing and Materials (ASTM) Standard Methods and specifies how to use these methods when testing weldments. It takes into consideration the variations in properties that can occur between different regions (base metal, heat-affected zone, and weld metal) of a weldment.

Methods of hardness testing and mechanical property tests for base metals are covered by ASTM standards or the individual material specification. The joint tests for brazements are covered in AWS C3.2, *Standard Methods for Evaluating the Strength of Brazed Joints in Shear*.

This Foreword applies to all five parts. Additional information on the mechanical testing of welded joints may be obtained from the AWS Welding Handbook, Volume 1.

The values stated in SI Units and used throughout this document are to be regarded as standard. Recommendation for style and usage of SI Units may be found in AWS A1.1, *Metric Practice Guide for the Welding Industry*.

An expanded section on weldability testing is included in this edition of B4.0M. Selected weldability test methods are described.

Safety Precautions. Safety precautions shall conform to the latest edition of ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*, published by the American Welding Society.

Note: This standard may involve hazardous materials, operations, and equipment. The standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user to establish appropriate safety and health practices. The user should determine the applicability of any regulatory limitations prior to use.

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS B4 Committee on Mechanical Testing of Welds, American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

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Standard Methods for Mechanical Testing of Welds

Part A *Testing of Groove Welds*

A1. Bend Tests

1. Scope

1.1 This section covers the bend testing of groove welds in butt joints and the bend testing of surfacing welds. The standard gives the requirements for bend test specimen preparation, test parameters and testing procedures but does not specify the bend radius requirements or acceptance criteria.

1.2 The base materials may be homogenous, clad or otherwise surfaced, except for hardfacing.

1.3 This standard is applicable to the following, where specified:

- (1) Qualification of materials, welding personnel and welding procedures
- (2) Information, specifications of acceptance, manufacturing quality control
- (3) Research and development

1.4 When this standard is used, the following information shall be furnished:

- (1) The specific location and orientation of the specimens
- (2) The specific types of tests, for example, face bend, side bend or root bend and number of specimens required
- (3) The type of data required and observations to be made
- (4) Bend radius or percent (%) elongation
- (5) Postweld thermal or mechanical processing treatments

1.5 Safety Precautions. Safety precautions shall conform to the latest edition of ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*, published by the American Welding Society.

Note: This standard may involve hazardous materials, operations, and equipment. The standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user to establish appropriate safety and health practices. The user should determine the applicability of any regulatory limitations prior to use.

2. Applicable Documents

Reference should be made to the latest edition of the following documents:

ANSI/ASME B46.1	Surface Texture
ASTM E 190	Standard Method for Guided Bend Test for Ductility of Welds
ASTM A 370	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
AWS A2.4	Standard Symbols for Welding, Brazing, and Nondestructive Examination
AWS A3.0	Standard Welding Terms and Definitions