AWS D1.2/D1.2M:2014
An American National Standard

Structural Welding Code—Aluminum

American Welding Society®

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An American National Standard

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Structural Welding Code—Aluminum

Sixth Edition

Supersedes AWS D1.2/D1.2M:2008

Prepared by the
American Welding Society (AWS) D1 Committee on Structural Welding

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This code covers the welding requirements for any type structure made from aluminum structural alloys, except for aluminum pressure vessels and pressure piping. Clauses 1 through 8 constitute a body of rules for the regulation of welding in aluminum construction. A commentary on the code is also included with the document.

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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, Technical Services Division, 8669 NW 36 St, # 130, Miami, FL 33166 (see Annex J). 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 D1 Committee on Structural Welding. It must be reviewed every five years, and if not revised, it must be either reaffirmed or withdrawn.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 required and should be addressed to AWS Headquarters. Such comments will receive careful consideration by the AW D1 Committee on Structural Welding 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 D1 Committee on Structural Welding 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.

Dedication

In Memoriam

Paul J. Sullivan
1926–2013

This issue of AWS D1.2, *Structural Welding Code—Aluminum*, is dedicated to the memory of Paul J. Sullivan. Among his many contributions to the American Welding Society, Paul was one of the charter members of the D1G Aluminum Subcommittee. He was a faithful member for many years and served as the Subcommittee Chairman for six years. Without Paul's wisdom and guidance, the D1.2 Code would not be the document we have today. Paul's intelligence, parliamentary knowledge, mentorship, and warm good humor will be missed by all of us.

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Foreword

This foreword is not part of AWS D1.2/D1.2M:2014, *Structural Welding Code—Aluminum*, but is included for informational purposes only.

In the early 1970s, interest was expressed in developing a consolidated code for the structural welding of aluminum similar to the AWS D1.1, *Structural Welding Code—Steel*. Because of the interest of both the Aluminum Association and the American Welding Society, it was decided to begin in the mid-70s the task of developing a structural welding code for aluminum. Initially, the effort was undertaken by a task force of the Aluminum Association. In 1979, this task force became a subcommittee of the AWS Structural Welding Committee and the *Structural Welding Code—Aluminum* resulted from the continued activity of that subcommittee.

The first edition of the *Structural Welding Code—Aluminum* (hereafter referred to as the *code*) represented the continuing AWS policy to provide standards for structural welding. This code is provided for the fabrication, erection, and manufacturing industries as a set of rules and regulations for the welding of structural aluminum. Some of the more important aspects of this edition of the code are outlined in the following paragraphs.

Recommended joint details have been prepared for numerous complete joint penetration groove welded joints. Herein lies one of the major differences between the *Structural Welding Code—Steel* and this code. While the steel code allows for prequalified welding procedures, this code does not. This is mainly because of the many and varied possible welding conditions that can be obtained with semiautomatic welding variables most often used with aluminum and the wide range of both heat-treatable and nonheat-treatable alloys that may be welded under this code. Therefore, all of the joint details and the welding procedures used with this code shall be individually qualified and included in the Welding Procedure Specification (WPS).

Procedures and standards are outlined for several methods of nondestructive testing. Methods included are visual, radiographic, and dye-penetrant. Ultrasonic testing is permitted, but the procedure and acceptance criteria shall be specified in the contract documents.

This code does not concern itself with such design considerations as the arrangements of parts, loading, and the computation of stresses for proportioning the load-carrying members of a structure and their connection. Such considerations, it is assumed, are covered elsewhere in a general code or specification, such as the *Specification for Aluminum Structures* (the Aluminum Association).

Many of the users of this code will also be users of the *Structural Welding Code—Steel*. As a result, it was felt that as much similarity as possible between the codes for steel and aluminum should be achieved. Thus, the same general format was used in the development of the 1983 and 1990 editions of the aluminum code as in the steel code. The D1.2-97 code was reorganized so that the 1990 Clauses 4 and 5 (Technique and Qualification) were merged into one new Clause 4. Furthermore, Appendix H of D1.2-90 was moved to after the Preface. Clauses 1 through 7 constitute a body of rules for the regulation of welding on aluminum structures. The 2003 edition represented a major reorganization of the D1.2-97 format. For example, Clauses 7, 8, and 9 of D1.2-97 were eliminated, and their provisions distributed throughout the code. The 2008 edition added design criteria and new alloys, revised inspection criteria, and included recommended PJP groove-welded joint details.

In this 6th edition, the following major revisions were made:

(1) Responsibilities of the Engineer, Contractor, and Inspector were added.

(2) Class I and Class II structure types were eliminated.

(3) 5652 was deleted from D1.2 because the Aluminum Association deactivated the alloy.

(4) A change from conventional to pulsed power supply is no longer an essential variable for WPS qualification.

(5) GTAW current type (AC or DC) is now an essential variable for performance qualification.

(6) A change in shielding gas is no longer an essential variable requiring welder requalification.

(7) Requirements for the preparation of base metal were revised.

(8) Base metal meeting ASTM B928 in alloys 5083, 5086, and 5456 was added.

(9) A requirement to RT or UT the entire length of CJP groove welds welded from one side without backing and inaccessible for visual inspection of the back side was added.

(10) The torque test for qualifying stud weld WPSs was eliminated.

(11) Studs other than 5xxx series were deleted.

(12) Minimum tensile strengths for studs were revised.

(13) Friction stir welding was added.

(14) The minimum size of reinforcing fillet welds in corner and tee joints was revised.

(15) Deletion of Annex E—Effective Throat.

(16) Annex J—Safe Practices. Safety clauses were updated including references to additional material; the safety annex was deleted.

A vertical line in the margin or underlined text in clauses, tables, or figures indicates an editorial or technical change from the 2008 edition.

Commentary. The Commentary is nonmandatory and is intended only to provide insightful information into provision rationale.

Normative Annexes. These annexes address specific subjects in the code and their requirements are mandatory requirements that supplement the code provisions.

Informative Annexes. These annexes are not code requirements but are provided to clarify code provisions by showing examples, providing information, or suggesting alternative good practices.

Index. As in previous codes, the entries in the Index are referred to by subclause number rather than by page number. This should enable the user of the Index to locate a particular item of interest in minimum time.

Errata. It is the Structural Welding Committee's policy that all errata should be made available to users of the code. Therefore, any significant errata will be published in the Society News Section of the AWS *Welding Journal* and posted on the AWS web site at: http://www.aws.org/technical/d1/.

Suggestions. Your comments for improving AWS D1.2/D1.2M:2014, *Structural Welding Code—Aluminum*, are welcome. Submit comments to the Managing Director, Technical Services Division, American Welding Society, 8669 NW 36 St, # 130, Miami, FL 33166; telephone (305) 443-9353; fax (305) 443-5951; e-mail info@aws.org; or via the AWS web site <http://www.aws.org>.

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1. General Requirements

1.1 Scope

This code contains requirements for fabricating and erecting welded aluminum structures. When this code is stipulated in contract documents, conformance with all requirements of this code is required except those that the Engineer (see 1.2.1) or contract documents modifies or exempts.

1.2 Definitions

The welding terms used in this code shall be as defined in AWS A3.0, *Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying*, supplemented by the following:

1.2.1 Engineer. "Engineer" is the entity who acts in behalf of the Owner on matters within the scope of this code.

1.2.2 Contractor. "Contractor" is the entity responsible for fabrication in conformance with this code.

1.2.3 Inspectors

1.2.3.1 Contractor's Inspector. "Contractor's Inspector" is the entity who acts for, and in behalf of, the Contractor on all inspection within the scope of the code and the contract documents.

1.2.3.2 Verification Inspector. "Verification Inspector" is the entity who acts in behalf of the Owner or Engineer on inspection specified by the Engineer.

1.2.3.3 Inspector (unmodified). When the unmodified term "Inspector" is used, it applies equally to the Contractor's Inspector and the Verification Inspector.

1.2.4 OEM (Original Equipment Manufacturer). "OEM" is the single Contractor that assumes some or all of the responsibilities assigned by this code to the Engineer.

1.2.5 Owner. "Owner" is the entity that exercises legal ownership of the structure produced under this code.

1.2.6 Code Terms "Shall," "Should," and "May." "Shall," "should," and "may" have the following meanings:

1.2.6.1 Shall. Code provisions that use "shall" are mandatory.

1.2.6.2 Should. Code provisions that use "should" are recommended but not mandatory.

1.2.6.3 May. The word "may" allows the use of requirements that are alternates to this code's requirements. The Contractor may use alternate requirements provided in this code when the code does not require the Engineer's approval.

1.3 Responsibilities

1.3.1 Engineer's Responsibilities. The Engineer is responsible for the contract documents that govern structures produced under this code. The Engineer may add to, delete from, or otherwise modify the requirements of this code to meet the requirements of a specific structure. Requirements that modify this code shall be incorporated into the contract documents.

The Engineer shall specify the following in contract documents:

(1) Code requirements that are applicable only when specified by the Engineer.

(2) Additional NDT that is not specifically addressed in this code.

(3) Verification inspection.

(4) Weld acceptance criteria other than that specified in Clause 5.

(5) Whether the structure is statically or cyclically loaded.