AWS D9.1/D9.1M:2018
An American National Standard

Sheet Metal Welding Code

American Welding Society®

AWS D9.1/D9.1M:2018
An American National Standard

Approved by the
American National Standards Institute
September 29, 2017

Sheet Metal Welding Code

7th Edition

Supersedes AWS D9.1M/D9.1:2012

Prepared by the
American Welding Society (AWS) D9 Committee on Welding of Sheet Metal

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This code covers the arc and braze welding requirements for nonstructural sheet metal fabrications using the commonly welded metals available in sheet form. Requirements and limitations governing procedure and performance qualification are presented, and workmanship and inspection standards are supplied. The informative annexes provide useful information on materials and processes.

American Welding Society®

International Standard Book Number: 978-0-87171-929-4
American Welding Society
8669 Doral Blvd., Doral, FL 33166

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 superseded by new editions. This standard may also be 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, Technical Services Division, 8669 NW 36 St, # 130, Miami, FL 33166 (see Annex K). 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 D9 Committee on Sheet Metal. 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 AWS D9 Committee on Sheet Metal 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 D9 Committee on Sheet Metal 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.

This page is intentionally blank.

Personnel

AWS D9 Committee on the Welding of Sheet Metal

T. J. White, Chair	*First Energy*
M. J. Brooks, Vice Chair	*Excel Bridge*
J. A. Molin, Secretary	*American Welding Society*
E. W. Beckman	*Consultant*
M. C. Cook	*Southern Illinois CJAP*
J. L. Cooley	*J C & Associates, Incorporated*
R. J. Denaker	*Rango Inspections*
G. E. Donovan	*International Training Institute*
J. J. Sekely	*Welding Services, Incorporated*
C. R. Whatley	*Harris Companies*

Advisors to the AWS D9 Committee on the Welding of Sheet Metal

D. L. McQuaid	*D L McQuaid & Associates, Incorporated*

This page is intentionally blank.

Foreword

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

This code was developed to provide standardized requirements for the qualification, production, and acceptance of welding or braze welding of nonstructural sheet metal components. Preparation of this document is in response to the many requests received from the sheet metal and construction industries.

The AWS Committee on Welding of Sheet Metal was organized in May 1978 and has published six previous versions of D9.1.

The 1st edition, D9.1-80, *Specification for Welding of Sheet Metal*, was limited to the more common welding processes.

The 2nd edition, D9.1-84, bore the same title, but was augmented to provide coverage of braze welding.

The 3rd edition, D9.1-90, *Sheet Metal Welding Code*, was written to refine and clarify several areas of the standard and to upgrade it to the status of a code in order to enhance its use and to promote a minimum quality level for those who invoke it.

The 4th edition, D9.1M/D9.1:2000, *Sheet Metal Welding Code*, provides for maintenance of the document and updates to keep abreast of practices being encountered in sheet metal welding and joining processes since the last revision.

The 5th edition D9.1M/D9.1:2006, *Sheet Metal Welding Code*, also provides for maintenance of the document and presents up to date practices in sheet metal welding and joining processes since the 2000 revision.

The 6th edition D9.1M/D9.1:2012, *Sheet Metal Welding Code*, provides for maintenance of the document and incorporates many of the comments received during the balloting process for the 2006 edition.

The 7th edition D9.1/D9.1M:2017, *Sheet Metal Welding Code*, provides for maintenance of the document as well as some updates intended to enhance its use and to promote a minimum quality level for those who invoke it.

Underlined text in clauses, tables, or figures indicates an editorial or technical change from the 2012 edition. A vertical line in the margins indicates a deletion from the 6th edition, while a vertical line in the margins of Tables or Figures also indicates an addition or deletion from 6th edition (D9.1M/D9.1:2012).

As new applications are developed and more experience is gathered, it is anticipated that changes in this standard will be required. Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS D9 Committee on the Welding of Sheet Metal, American Welding Society, 8669 NW 36th Street, #130, Miami, FL 33166.

This page is intentionally blank.

Table of Contents

Page No.

List of Tables

List of Figures

Sheet Metal Welding Code

1. General Requirements

1.1 Scope. This code provides qualification, workmanship, and inspection requirements for both arc welding (Part A) and braze welding (Part B), as they apply to the fabrication, manufacture, and erection of nonstructural sheet metal components and systems.

1.1.1 This code was developed to provide standardized requirements for the qualification, production, and acceptance of welding or braze welding of nonstructural sheet metal components.

1.1.2 General applications of this code are in the following industrial areas:

(1) Heating, ventilating, and air conditioning systems

(2) Food processing equipment

(3) Architectural sheet metal and similar applications

(4) Other nonstructural sheet metal applications

This code covers sheet metal thicknesses up to and including 0.2391 in [6.07 mm]. Also covered are the attachment of accessories and components of the system, and joining or attachment of any member, regardless of thickness, whose sole purpose is stiffening, supporting, or reinforcing the sheet metal.

1.1.2.1 Limitations/Exceptions. This code is not intended to apply:

(1) Where negative pressure or positive pressure exceeds 5 psi [30 kPa], which is approximately 120 in [3 m] of standing water

(2) Where structural requirements apply (Note: AWS D1.3/D1.3M, *Structural Welding Code—Sheet Steel* is intended for such applications)

(3) Where sheet metal products related to automotive applications are concerned

(4) Where brazing qualifications are specified to be in accordance with AWS B2.2/B2.2M, *Specification for Brazing Procedure and Performance Qualification*

(5) Where soldering qualifications are specified to be in accordance with AWS B2.3/B2.3M, *Specification for Soldering Procedure and Performance Qualification*

1.1.3 This code requires values to be specified by the Engineer for weld type, size, and location of the application. See subclauses 8.2, 8.4, 13.1, and 13.3.

1.1.4 Symbols used in this code shall be in accordance with the latest edition of AWS A2.4, *Standard Symbols for Welding, Brazing, and Nondestructive Examination*.

1.2 Units of Measurement. This standard makes use of both the U.S. Customary Units and International System of Units (SI). The latter are shown within brackets ([ ]) or in appropriate columns in tables and figures. The measurements are not exact equivalents; therefore, each system must be used independently.