AWS D15.3/D15.3M:2026
An American National Standard

Specification for Resistance Welding for Railroad Applications



American Welding Society®



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An American National Standard

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Specification for Resistance Welding for Railroad Applications

1st Edition

Prepared by the
American Welding Society (AWS) D15 Committee on Railroad Welding

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This specification provides the general resistance welding requirements for railcars, locomotives, and their components. It includes, but is not limited to, resistance spot and resistance seam welding of aluminum and iron-based alloys. There are requirements for machine qualification, welding schedule certification, production witness samples, and inspection and acceptance criteria.

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Foreword

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

In 2010, the AWS D15 Committee on Welding in the Railroad Industries decided it was necessary to form a subcommittee to write a resistance spot and seam welding specification to take advantage of new developments in the resistance welding of passenger railcar shells.

This is the first edition of the D15.3/D15.3M specification. This specification is intended to replace the following documents for resistance welding of railcars, locomotives, and their components:

MIL-W-6858D, *Welding, Resistance: Spot and Seam*, March 28, 1978

AMS-W-6858A*, Welding, Resistance Spot and Seam*, April 1, 2000

AWS D17.2/D17.2M:2013, *Specification for Resistance Welding for Aerospace Applications*

MIL-W-6858D, AMS-W-6858A, or AWS D17.2/D17.2M:2013, take precedence over this specification only when they are cited by the contract documents.

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS D15 Committee on Welding in the Railroad Industries, American Welding Society, 8669 NW 36 St, # 130, Miami, FL 33166.

Dedication

The AWS D15 Committee on Railroad Welding dedicates this first edition of D15.3/D15.3M, *Specification for Resistance Welding for Railroad Applications*, to John B. Pearson, Jr.

John worked as a metallurgical consultant and welding engineer in the railroad industry for more than 40 years with LTK Engineering Services (now part of Hatch), helping to assure the safety and structural soundness of "trains and trolleys" all over North America. He served on several AWS committees for more than two decades and spearheaded the development of this document to help specifically tailor it to the needs of the North American transit industry. His depth of knowledge, breadth of experience, attention to detail and vision for this endeavor are greatly appreciated.

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Specification for Resistance Welding for Railroad Applications

1. General Requirements

1.1 Scope. This specification covers requirements for resistance spot and seam welding of railcars, locomotives, and their components. This specification is not intended to apply to tank car tanks, the welding of rails, or materials thinner than 0.008 in [0.2 mm]. Recommended practices for welding railroad rails and related components are included in D15.2, *Specification for Joining Railroad Rail and Related Rail Components*. Specifications for welding tank car tanks and components welded directly thereto are outlined in the AAR Manual of Standards and Specifications for Welding, *Section C—Part III, Specification M-1002 (AAR M-1002 C-III)*.

1.1.1 Material Groups

Group 1—Aluminum

Group 2—Carbon, low-alloy, and stainless steels

1.1.2 Classification. Classification is based on the following:

Class A—A welded joint, whose failure during any operating condition would cause loss of the equipment or system or one of its major components.

Class B—A welded joint whose failure would reduce the overall strength of the equipment or system or limit the intended functioning or use of equipment.

Class C—A welded joint for which no stress analysis is required and whose failure would not affect the performance of the equipment or system.

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

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.

American Welding Society (AWS) standards:

AWS A2.4, *Standard Symbols for Welding, Brazing, and Nondestructive Examination*

AWS A3.0M/A3.0, *Standard Welding Terms and Definitions*

AWS C1.1M/C1.1, *Recommended Practices for Resistance Welding*

AWS D8.9M, *Test Methods for Evaluating the Resistance Spot Welding Behavior of Automotive Sheet Steel Materials*

American Society for Testing and Materials (ASTM) standards:

ASTM E164, *Standard Practice for Contact Ultrasonic Testing of Weldments*

ASTM E317, *Practice for Evaluating Performance Characteristics of Ultrasonic Pulse-Echo Testing Instruments and Systems without the Use of Electronic Measurement Instruments*

ASTM E2700, *Standard Practice for Contact Ultrasonic Testing of Welds Using Phased Arrays*

ASTM E2491, *Standard Guide for Evaluating Performance Characteristics of Phased Array Ultrasonic Examination Instruments and Systems*

American Society for Nondestructive Testing (ASNT) standards:

SNT-TC-1A, *Recommended Practice for Personnel Qualification and Certification of NDT Personnel*

Canadian Standards Association (CSA) Group standards:

CSA W55.3-08, *Certification of Companies for Resistance Welding of Steel and Aluminum*

Resistance Welding Manufacturing Alliance

RWMA Bulletin 14, *Maintenance Manual for Resistance Welding Machines*

3. Terms and Definitions

AWS A3.0M/A3.0, *Standard Welding Terms and Definitions,* provides the basis for terms and definitions used herein. However, the following terms and definitions are included below to accommodate usage specific to this document.

close-spaced welds. Spot welds on sheet placed less than two diameters apart, center to center. Such proximity may require more power than other spot welds.

coring. Incipient melting adjacent to the nugget.

designated inspector. The individual who is given responsibility by the manufacturer or company to inspect fabrication/production welding operations and completed welds. Inspection may or may not be the individual's sole responsibility.

manufacturer. The original builder, fabricator, or installer of equipment, as well as any company or organization performing repairs or alterations to such equipment.

metallographic section. A transverse cut on the diameter of a spot weld or across a seam weld, or a longitudinal cut down the center of a seam weld, polished down to near the center of the weld, which may be etched to accentuate the metallographic structure.

Owner. The individual or company that exercises legal ownership of the product or structural assembly produced under this specification.

Owner's Engineer. A designated individual or company with engineering authority that acts for and on behalf of the purchaser or owner on all matters within the scope of this standard. The Owner's Engineer has responsibility for the structural integrity or maintenance of performance of the hardware and compliance with all contract documents.

peel test. A mechanical test in which the corners (or sides) of seam or spot-welded sheet members are gripped and pulled apart to determine if the joint fails by delamination, by fracture of a cleaved surface, or by tearing of a button (plug) out of the parent material. Delamination, in contrast to fracture, is a sign of lack of fusion between the two adjacent members. A button or plug, which is pulled out of the removed member, is not necessarily equal in size to the cast nugget underlying it.

penetration. The extent of the nugget (fusion zone) into the thickness of a joined member.

production witness specimen. Test coupon welded using production setup and procedure, and destructively tested to provide data on the quality of production welds.

reference weld. A weld specimen that has validated the parameters used to produce an acceptable weld.

resistance weld size. The diameter of a spot weld nugget or the width of a seam weld nugget measured at the plane of the faying surfaces.

sheet. A material having thickness, for the purpose of this specification, of more than 0.008 in through 0.250 in [0.20 mm through 6.35 mm].

verification inspector. The duly designated person who acts on behalf of the Owner or purchaser on all inspection and quality matters within the scope of the contract documents.

welding conditions. All circumstances surrounding the making of a given weld, including material, configuration, material preparation, electrode shape, machine number, and all weld parameters. Weld conditions that are relevant require documentation. A suggested form for documentation is found in Clause 9.

welding parameters. Machine settings or adjustments, such as, but not limited to, weld current, weld time, and electrode force.

4. Requirements

4.1 Design Requirements

4.1.1 The Owner's Engineer shall be responsible for the development of the contract specification that governs products or structural assemblies produced under this specification. The Owner's Engineer may add to, delete from, or otherwise modify, the requirements of this specification to meet the particular requirements of a specific structure. All requirements that modify this specification shall be incorporated into contract documents, engineering drawings, or item specifications. The Owner's Engineer shall determine the suitability of all joint details to be used in a welded assembly.

4.1.2 When conditions are encountered which cause any of the requirements of this specification to be unattainable, the manufacturer may submit alternate procedures and requirements for approval by the Owner's Engineer.

4.1.3 The class of welding shall be designated on the item specification or engineering drawing. In the event of any conflict between the requirements of this specification and those requirements specified on the engineering drawing, the engineering drawing shall prevail.

4.1.4 Spot Weld Certification. There shall be two methods of certification for spot welding schedules.