AWS D14.1/D14.1M:2005
An American National Standard

Specification for Welding of Industrial and Mill Cranes and Other Material Handling Equipment

American Welding Society

Key Words—Cranes, industrial cranes, lifting devices, material handling equipment, mill cranes

AWS D14.1/D14.1M:2005
An American National Standard

Approved by
American National Standards Institute
February 24, 2005

Specification for Welding of Industrial and Mill Cranes and Other Material Handling Equipment

4th Edition

Supersedes ANSI/AWS D14.1-97

Prepared by
AWS D14 Committee on Machinery and Equipment

Under the Direction of
AWS Technical Activities Committee

Approved by
AWS Board of Directors

Abstract

Requirements are presented for the design and fabrication of constructional steel weldments that are used in industrial and mill cranes, lifting devices and other material handling equipment. Requirements are also included for modification, weld repair, and postweld treatments of new and existing weldments. Filler metal and welding procedure guidelines are recommended for the applicable base metals, which are limited to carbon and low-alloy steels. Allowable unit stresses are provided for weld metal and base metal for various cyclically loaded joint designs.

American Welding Society
550 N.W. LeJeune Road, Miami, Florida 33126

Statement on Use of AWS American National 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 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.

International Standard Book Number: 0-87171-736-0

American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126

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 guaranty or warranty as to the accuracy or completeness of any information published herein.

In issuing and making this standard available, AWS is not 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.

This standard may be superseded by the issuance of new editions. Users should ensure that they have the latest edition.

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.

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

On occasion, text, tables, or figures are printed incorrectly, constituting errata. Such errata, when discovered, are posted on the AWS web page (www.aws.org).

Official interpretations of any of the technical requirements of this standard may only be obtained by sending a request, in writing, to the Managing Director, Technical Services Division, American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126 (see Annex C). With regard to technical inquiries made concerning AWS standards, oral opinions on AWS standards may be rendered. However, 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 D14 Committee on Machinery and Equipment. 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 D14 Committee on Machinery and Equipment 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 D14 Committee on Machinery and Equipment 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, 550 N.W. LeJeune Road, Miami, FL 33126.

Photocopy Rights

Personnel

AWS D14 Committee on Machinery and Equipment

J. L. Warren, Chair	CNH America LLC
D. J. Malito, 1st Vice Chair	Girard Machine Company, Incorporated
L. L. Schweinegruber, 2nd Vice Chair	Robinson Industries, Incorporated
P. Howe, Secretary	American Welding Society
D. B. Ashley	Hartford Steam Boiler Inspection & Insurance Company
B. K. Banzhaf	CNH America LLC
P. W. Cameron	Crenlo, Incorporated
P. Collins	WeldCon Engineering
**R. T. Hemzacek*	Consultant
B. D. Horn	Consultant
D. J. Landon	Vermeer Manufacturing Company
T. J. Landon	Chicago Bridge & Iron Company
M. R. Malito	Girard Machine Company, Incorporated
**G. W. Martens*	Grove Worldwide, Incorporated, Manitowoc Crane Group
D. C. Martinez	Danmar Engineering Company, Incorporated
A. R. Mellini	Mellini & Associates, Incorporated
**H. W. Mishler*	Consultant
R. E. Munson	R&M Engineering
J. G. Nelson	Northrop Grumman
A. R. Olsen	ARO Testing, Incorporated
**P. J. Palzkill*	Consultant
C. R. Reynolds	Deere & Company
W. A. Svekric	Welding Consultants, Incorporated
E. G. Yevick	Weld-Met International, Incorporated
V. R. Zegers	R. E. Technical Services, Incorporated

AWS D14A Subcommittee on Industrial and Mill Cranes

J. G. Nelson, Chair	Northrop Grumman
P. Howe, Secretary	American Welding Society
**L. Seum*	Sheedy Drayage Company
W. A. Svekric	Welding Consultants, Incorporated
E. G. Yevick	Weld-Met International, Incorporated

*Advisor

This page is intentionally blank.

Foreword

(This Foreword is not a part of AWS D14.1/D14.1M:2005, *Specification for Welding of Industrial and Mill Cranes and Other Material Handling Equipment*, but is included for informational purposes only.)

This specification was prepared for the overhead crane and material handling industries to continue the advancement of welding and to increase product reliability. This 4th edition provides revisions to ANSI/AWS D14.1-97, *Specification for Welding of Industrial and Mill Cranes and Other Material Handling Equipment*, under the direction of the AWS Machinery and Equipment Committee.

The participating committee, representing manufacturers, users, and government, joined in the preparation of this document. It will provide all concerned, including the general public, with high quality, reliable products and an economical approach to production, consistent with the industry's capabilities.

This specification will be reviewed periodically to assure its success in serving all parties concerned with its provisions. Revisions will be issued when warranted.

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS D14 Committee on Machinery and Equipment, American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

Official interpretations of any of the technical requirements of this standard may only be obtained by sending a request, in writing, to the Managing Director, Technical Services Division, American Welding Society. A formal reply will be issued after it has been reviewed by the appropriate personnel following established procedures (see Annex C).

This page is intentionally blank.

Table of Contents

Page No.

Page No.

Page No.

Page No.

List of Tables

List of Figures

Figure **Page No.**

This page is intentionally blank.

Specification for Welding of Industrial and Mill Cranes and Other Material Handling Equipment

1. Scope and General Provisions

1.1 Scope. This specification applies to the welding of all principal structural weldments and all primary welds used in the manufacture of cranes for industrial, mill, power house, and nuclear facilities. Furthermore, the specification applies to other overhead material handling machinery and equipment that support and transport loads within the design rating, vertically or horizontally, during normal operations, and, when agreed upon between the Owner and Manufacturer, to loading caused by abnormal operations or environmental events, such as seismic loading.

Secondary welds that will be subjected to tensile stresses of less than 5000 psi [34.5 MPa] need only meet the requirements of Section 7, Workmanship, and Section 10, Weld Quality and Inspection. The engineering drawings shall specify the joint detail, type, and size of weld. This specification is not intended for application to construction- or crawler-type cranes. For the welding of rails, refer to AWS D15.2, *Recommended Practice for the Welding of Rails and Related Rail Components for Use by Rail Vehicles*.

All provisions of this specification are equally applicable to the strengthening and repairing of existing overhead cranes and material handling equipment as described above.

This specification makes use of both U.S. Customary Units and the International System of Units (SI). The measurements may not be exact equivalents; therefore each system shall be used independently of the other without combining in any way. The specification with the designation D14.1 uses U.S. Customary Units. The specification D14.1M uses SI Units. The latter are shown in appropriate columns in tables and figures or within brackets [ ]. Detailed dimensions on figures are in inches. A separate tabular form that relates the U.S. Customary Units with SI Units may be used in tables and figures.

Safety and health issues and concerns are beyond the scope of this standard, and therefore are not fully addressed herein. Safety and health information is available from other sources, including, but not limited to, ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes* and applicable federal and state regulations. Some other sources of safety and health information can be found in Annex D.

1.2 General Provisions. The Manufacturer's[1] adherence to this specification shall include responsibility for the following:

(1) Welding, as defined in the Scope, in accordance with this specification;

(2) Producing the welds designated on the drawings by appropriate welding symbols and notes containing sufficient detail to show joint preparations compatible with the designated welding processes;

(3) Providing written welding procedures;

(4) Recording results of all procedure and welder qualification tests;

(5) Controlling the use of designated base metals and consumables; and

(6) Inspecting the welds to the requirements of this specification.

1.2.1 Acceptance. Acceptance shall be as agreed upon between the Manufacturer and the Owner (purchaser). The fundamental premise of this specification is to provide general stipulations applicable to most situations. Acceptance criteria for production welds different from those stated in this specification may be used for a particular application, provided they are suitably documented by the proposer and approved by the Engineer. These alternate acceptance criteria can be based upon evaluation of suitability for service using past experience, experimental evidence or engineering analysis considering material type, service-load effects, and environmental factors.

1. Manufacturer refers to the organization responsible for the performance of the work covered by this specification (see definition in Section 3).