

# ASCE STANDARD

---

American Society of Civil Engineers

## Specification for the Design of Cold-Formed Stainless Steel Structural Members

This document uses both Système International (SI) units and customary units.



American Society of Civil Engineers

# Specification for the Design of Cold-Formed Stainless Steel Structural Members

This document uses both International System of Units (SI) and customary units.



Published by the American Society of Civil Engineers  
1801 Alexander Bell Drive  
Reston, Virginia 20191-4400

## ABSTRACT

ASCE's standard *Specification for the Design of Cold-Formed Stainless Steel Structural Members* (ASCE 8-02) provides design criteria for the determination of the strength of stainless steel structural members and connections for use in buildings and other statically loaded structures. The members may be cold-formed to shape from annealed and cold-rolled sheet, strip, plate, or flat bar stainless steel material. Design criteria are provided for axially loaded tension or compression members, flexural members subjected to bending and shear, and members subjected to combined axial load and bending. The specification provides the design strength criteria using the load and resistance factor design (LRFD) and the allowable stress design (ASD) methods. The reasoning behind, and the justification for, various provisions of the specification are also presented. The design strength requirements of this standard are intended for use by structural engineers and those engaged in preparing and administering local building codes.

## Library of Congress Cataloging-in-Publication Data

Specification for the design of cold-formed stainless steel structural members / American Society of Civil Engineers.  
p. cm.

"Revision of ANSI/ASCE 8-90."

Includes bibliographical references and index.

ISBN 0-7844-0556-5

1. Building, Iron and steel—Specifications—United States.  
2. Steel, Structural—Specifications—United States. 3. Load factor design. I. American Society of Civil Engineers.

TA684 .S652 2001

624.1'821—dc21

2001022355

Photocopies. Authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act is granted by ASCE to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$8.00 per article plus \$.50 per page is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. The identification for ASCE Books is 0-7844-0556-5/02/\$8.00 + \$.50 per page. Requests for special permission or bulk copying should be addressed to Permissions & Copyright Dept., ASCE.

Copyright ©2002 by the American Society of Civil Engineers.

All Rights Reserved.

Library of Congress Catalog Card No: 2001022355

ISBN 0-7844-0556-5

Manufactured in the United States of America.

# STANDARDS

In April 1980, the Board of Direction approved ASCE Rules for Standards Committees to govern the writing and maintenance of standards developed by the Society. All such standards are developed by a consensus standards process managed by the Management Group F (MGF), Codes and Standards. The consensus process includes balloting by the balanced standards committee made up of Society members and nonmembers, balloting by the membership of ASCE as a whole, and balloting by the public. All standards are updated or reaffirmed by the same process at intervals not exceeding 5 years.

The following Standards have been issued.

ANSI/ASCE 1-82 N-725 Guideline for Design and Analysis of Nuclear Safety Related Earth Structures  
ANSI/ASCE 2-91 Measurement of Oxygen Transfer in Clean Water  
ANSI/ASCE 3-91 Standard for the Structural Design of Composite Slabs and ANSI/ASCE 9-91 Standard Practice for the Construction and Inspection of Composite Slabs  
ASCE 4-98 Seismic Analysis of Safety-Related Nuclear Structures  
Building Code Requirements for Masonry Structures (ACI 530-99/ASCE 5-99/TMS 402-99) and Specifications for Masonry Structures (ACI 530.1-99/ASCE 6-99/TMS 602-99)  
ASCE 7-98 Minimum Design Loads for Buildings and Other Structures  
ASCE 8-90 Standard Specification for the Design of Cold-Formed Stainless Steel Structural Members  
ANSI/ASCE 9-91 listed with ASCE 3-91  
ASCE 10-97 Design of Latticed Steel Transmission Structures  
SEI/ASCE 11-99 Guideline for Structural Condition Assessment of Existing Buildings  
ANSI/ASCE 12-91 Guideline for the Design of Urban Subsurface Drainage  
ASCE 13-93 Standard Guidelines for Installation of Urban Subsurface Drainage  
ASCE 14-93 Standard Guidelines for Operation and Maintenance of Urban Subsurface Drainage  
ASCE 15-98 Standard Practice for Direct Design of

Buried Precast Concrete Pipe Using Standard Installations (SIDD)  
ASCE 16-95 Standard for Load and Resistance Factor Design (LRFD) of Engineered Wood Construction  
ASCE 17-96 Air-Supported Structures  
ASCE 18-96 Standard Guidelines for In-Process Oxygen Transfer Testing  
ASCE 19-96 Structural Applications of Steel Cables for Buildings  
ASCE 20-96 Standard Guidelines for the Design and Installation of Pile Foundations  
ASCE 21-96 Automated People Mover Standards—Part 1  
ASCE 21-98 Automated People Mover Standards—Part 2  
ASCE 21-00 Automated People Mover Standards—Part 3  
SEI/ASCE 23-97 Specification for Structural Steel Beams with Web Openings  
SEI/ASCE 24-98 Flood Resistant Design and Construction  
ASCE 25-97 Earthquake-Actuated Automatic Gas Shut-Off Devices  
ASCE 26-97 Standard Practice for Design of Buried Precast Concrete Box Sections  
ASCE 27-00 Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction  
ASCE 28-00 Standard Practice for Direct Design of Precast Concrete Box Sections for Jacking in Trenchless Construction  
SEI/ASCE 30-00 Guideline for Condition Assessment of the Building Envelope  
EWRI/ASCE 33-01 Comprehensive Transboundary International Water Quality Management Agreement  
EWRI/ASCE 34-01 Standard Guidelines for Artificial Recharge of Ground Water  
EWRI/ASCE 35-01 Guidelines for Quality Assurance of Installed Fine-Pore Aeration Equipment  
CI/ASCE 36-01 Standard Construction Guidelines for Microtunneling  
SEI/ASCE 37-02 Design Loads on Structures During Construction

*This page intentionally left blank*

# FOREWORD

Prior to 1990, the design of cold-formed stainless steel structural members was based on the allowable stress design specification issued by the American Iron and Steel Institute. Based on the initiative of Chromium Steels Research Group at Rand Afrikaans University in 1989, a new ASCE Standard Specification for the Design of Cold-Formed Stainless Steel Structural Members was developed at the University of Missouri-Rolla under the Sponsorship of the American Society of Civil Engineers. It was subsequently reviewed and approved by the ASCE Stainless Steel Cold-Formed Sections Standards Committee in 1990. This ASCE project was financially supported by the Chromium Centre in South Africa, the Nickel Development Institute in Canada, and the Specialty Steel Industry of the United States. The development of this new ASCE Standard Specification was primarily based on the 1974 Edition of the AISI specification for stainless steel design and the recent extensive research conducted by Chromium Steels Research Group at Rand Afrikaans University under the sponsorship of Columbus Stainless Steel (the Middleburg Steel and Alloys) in South Africa.

This new ASCE Standard Specification includes both the load and resistance factor design (LRFD) method and the allowable stress design (ASD) method. In the LRFD method, separate load and resistance factors are applied to specified loads and nominal resistance to ensure that the probability of reaching a limit state is acceptably small. These factors reflect the uncertainties of analysis, design, loading, material properties, and fabrication.

The material presented in this publication has been prepared in accordance with recognized engineering principles. This Standard and Commentary should not be used without first securing competent advice with respect to suitability for any given application. The publication of the material contained herein is not intended as a representation or warranty on the part of the American Society of Civil Engineers, or of any other person named herein, that this information is suitable for any general or particular use or promises freedom from infringement of any patent or patents. Anyone making use of this information assumes all liability from such use.

*This page intentionally left blank*

# ACKNOWLEDGMENTS

The American Society of Civil Engineers (ASCE) acknowledges the devoted efforts of Wei-Wen Yu, Theodore V. Galambos, and Shin-Hua Lin for developing this Standard Specification. Appreciation is expressed to the American Iron and Steel Institute for relinquishing to ASCE the 1974 edition of AISI Specification for the Design of Cold-Formed Stainless Steel Structural Members for revision and publication as an ASCE standard.

ASCE acknowledges the work of the Stainless Steel Cold-Formed Section Standards Committee of

the Management Group F. Codes and Standards. This group comprises individuals from many backgrounds including: consulting engineering, research, construction industry, education, government, design, and private practice.

This Standard was prepared through the consensus standards process by balloting in compliance with procedures of ASCE's Management Group F. Codes and Standards. Those individuals who serve on the Standards Committee are:

Prodyot K. Basu  
Adrian F. Dier  
Mark W. Fantozzi  
Theodore Galambos, Chairman  
Joseph C. Kotlarz  
Roger A. LaBoube  
Shin-Hua Lin, Secretary  
Robert R. McCluer

Albert C. Nuhn  
Clarkson W. Pinkham  
Kim Rasmussen  
James D. Redmond  
Reinhold M. Schuster  
John G. Tack  
Torkel Stenquist  
Cosmas A. Tzavelis

Gert J. Van den Berg  
Pieter Van Der Merwe  
Ivan M. Viest  
Shien T. Wang  
Vernon Watwood  
Don S. Wolford, Vice Chairm.  
Wei-Wen Yu  
John P. Ziemianski



*This page intentionally left blank*

# CONTENTS

Acknowledgments .....	vii
Notation .....	xiii
1. General Provisions .....	1
1.1 Limits of Applicability and Terms .....	1
1.1.1 Scope and Limits of Applicability .....	1
1.1.2 Terms .....	1
1.1.3 Units of Symbols and Terms .....	1
1.2 Nonconforming Shapes and Constructions .....	2
1.3 Material .....	2
1.3.1 Applicable Stainless Steels .....	2
1.3.2 Other Stainless Steels .....	2
1.3.3 Ductility .....	2
1.3.4 Delivered Minimum Thickness .....	2
1.4 Loads .....	2
1.4.1 Dead Load .....	2
1.4.2 Live and Snow Load .....	2
1.4.3 Impact Load .....	2
1.4.4 Wind and Earthquake Load .....	2
1.4.5 Ponding .....	2
1.5 Structural Analysis and Design .....	2
1.5.1 Design Basis .....	2
1.5.1.1 Design for Strength .....	3
1.5.1.2 Design for Serviceability .....	3
1.5.2 Loads, Load Factors, and Load Combinations .....	3
1.5.3 Resistance Factors .....	3
1.5.4 Yield Strength and Strength Increase from Cold Work of Forming .....	3
1.5.4.1 Yield Strength .....	3
1.5.4.2 Strength Increase from Cold Work of Forming .....	3
1.5.4.2.1 Type of Sections .....	4
1.5.4.2.2 Limitations .....	4
1.5.5 Design Tables and Figures .....	4
1.6 Reference Documents .....	4
2. Elements .....	4
2.1 Dimensional Limits and Considerations .....	4
2.1.1 Flange Flat-Width-to-Thickness Considerations .....	4
2.1.2 Maximum Web Depth-to-Thickness Ratio .....	5
2.2 Effective Widths of Stiffened Elements .....	5
2.2.1 Uniformly Compressed Stiffened Elements .....	5
2.2.2 Effective Widths of Webs and Stiffened Elements with Stress Gradient .....	6
2.3 Effective Widths of Unstiffened Elements .....	7
2.3.1 Uniformly Compressed Unstiffened Elements .....	7
2.3.2 Unstiffened Elements and Edge Stiffeners with Stress Gradient .....	7
2.4 Effective Widths of Elements with Edge Stiffener or One Intermediate Stiffener .....	8
2.4.1 Uniformly Compressed Elements with Intermediate Stiffener .....	8
2.4.2 Uniformly Compressed Elements with Edge Stiffener .....	9
2.5 Effective Widths of Edge-Stiffened Elements with Intermediate Stiffeners or Stiffened Elements with More Than One Intermediate Stiffener .....	10
2.6 Stiffeners .....	11
3. Members .....	11
3.1 Properties of Sections .....	11
3.2 Tension Members .....	11